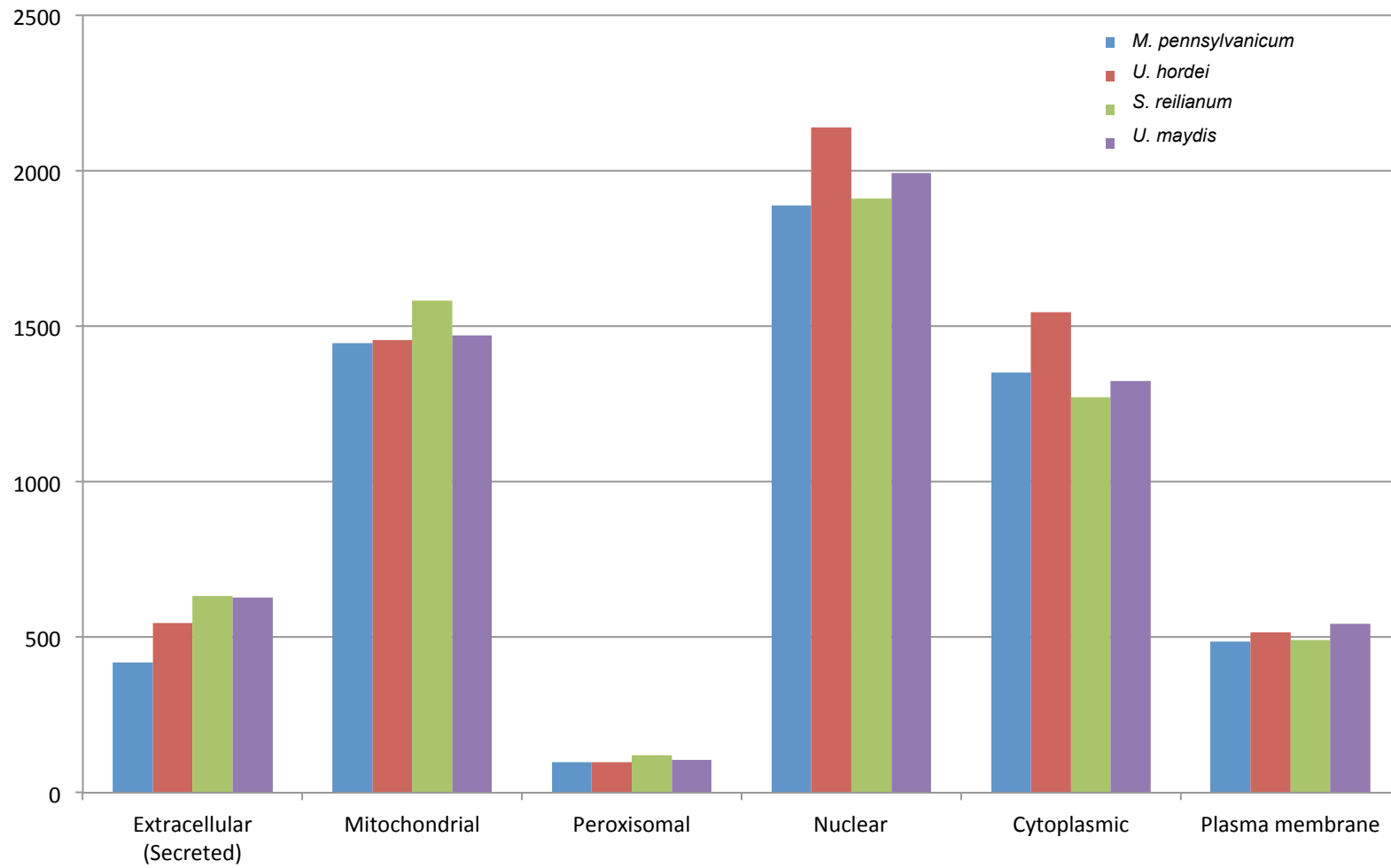
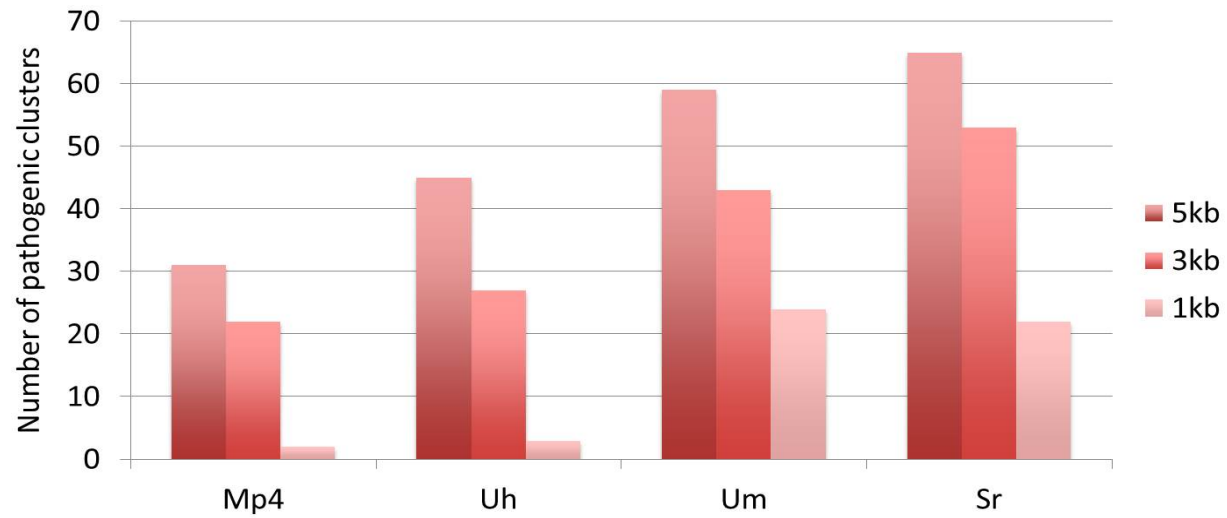


**Supplementary Figure 1:** Whole genome alignments of the *M. pennsylvanicum* genome with the other three genomes.



**Supplementary Figure 2:** Number of proteins targeted to certain subcellular organelles of the four smut genomes.

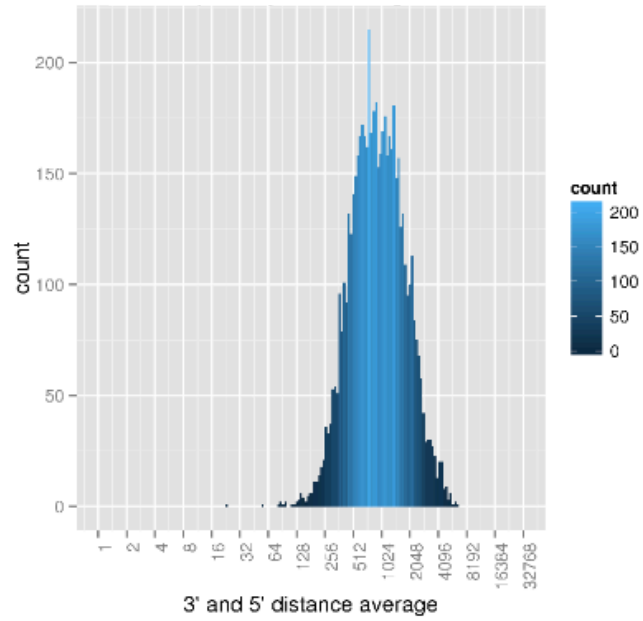


|                          | 5kb* | 3kb* | 1kb* |
|--------------------------|------|------|------|
| <i>M. pennsylvanicum</i> | 31   | 22   | 2    |
| <i>U. hordei</i>         | 45   | 27   | 3    |
| <i>U. maydis</i>         | 59   | 43   | 24   |
| <i>S. reilianum</i>      | 65   | 53   | 22   |

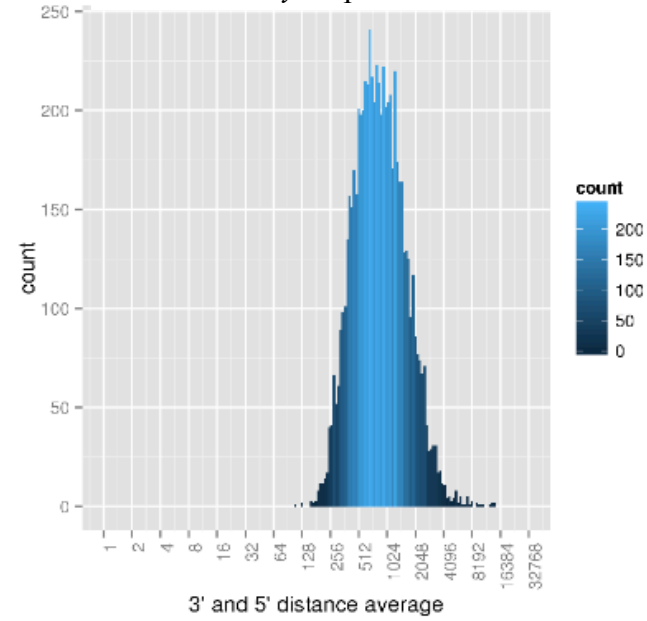
\*Number of candidate pathogenicity clusters detected using window of mentioned size

**Supplementary Figure 3:** Comparisons of different window lengths used for defining candidate pathogenicity clusters.

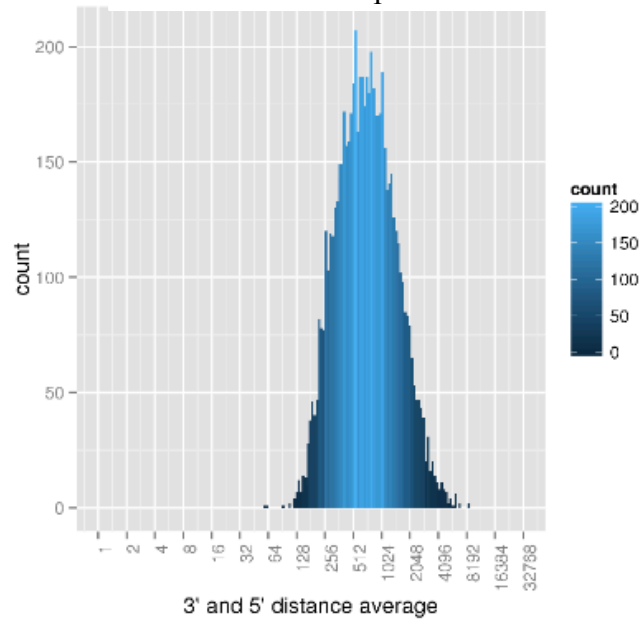
**A** *M. pennsylvanicum* proteins



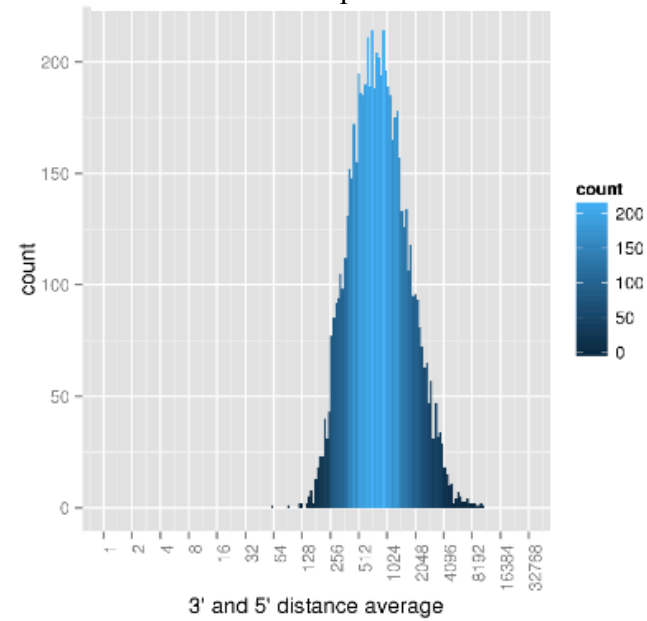
**B** *U. maydis* proteins



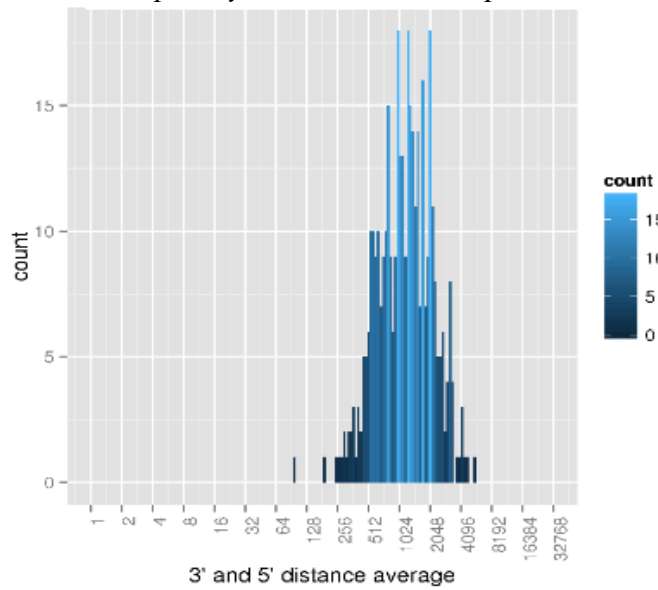
**C** *S. reilianum* proteins



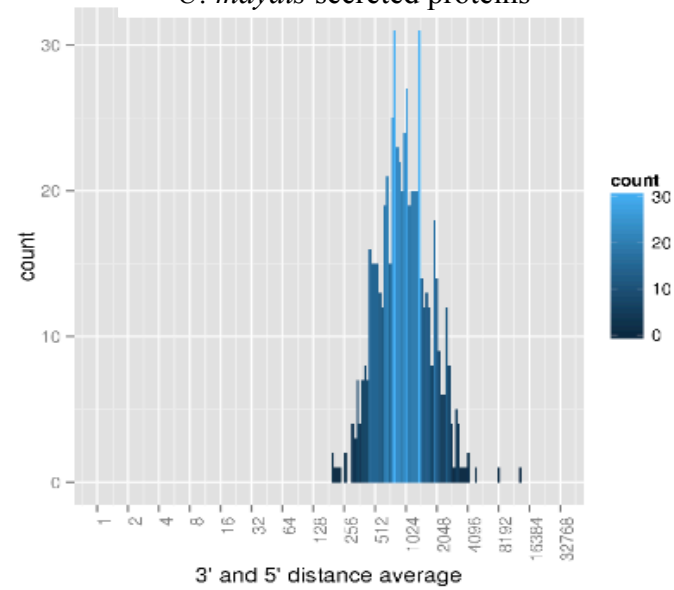
**D** *U. hordei* proteins



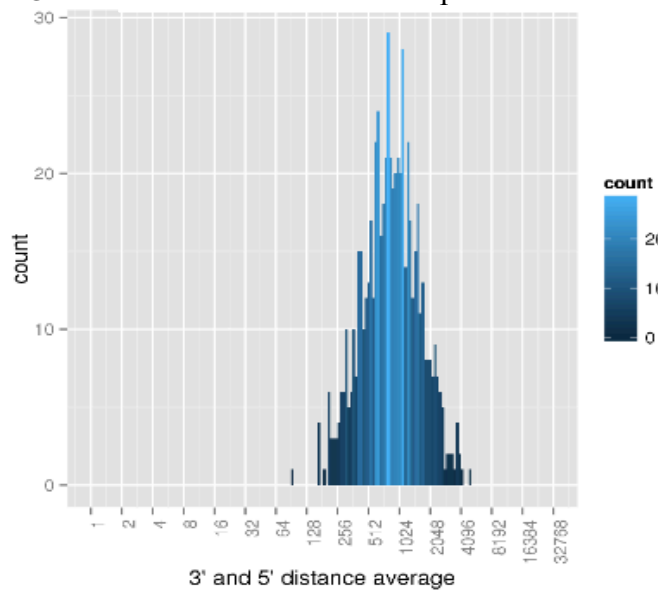
**E** *M. pennsylvanicum* secreted proteins



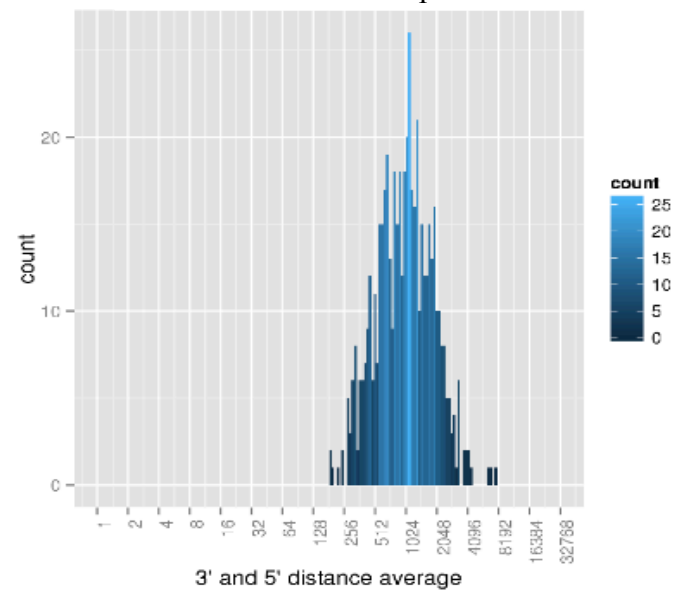
**F** *U. maydis* secreted proteins



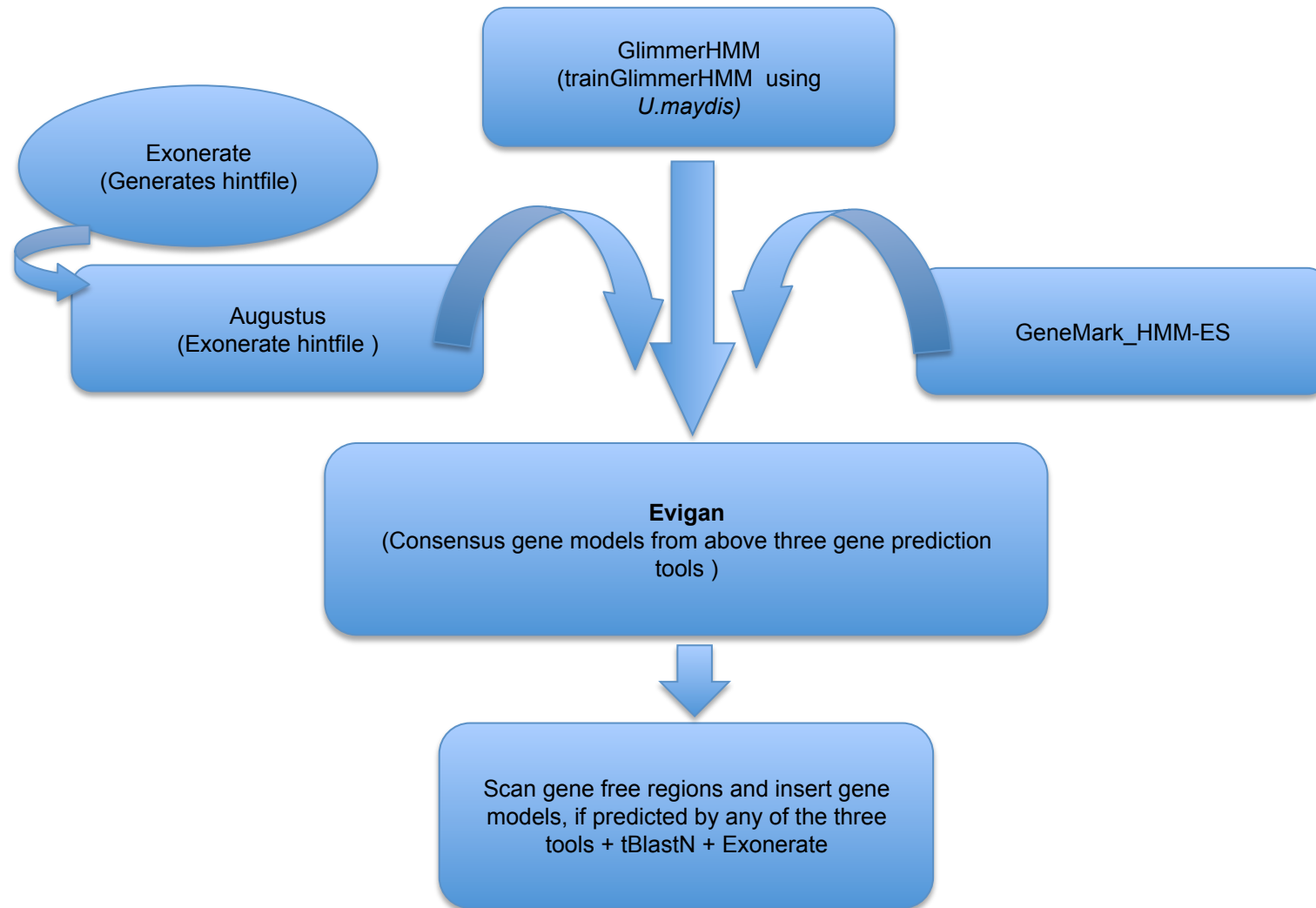
**G** *S. reilianum* secreted proteins



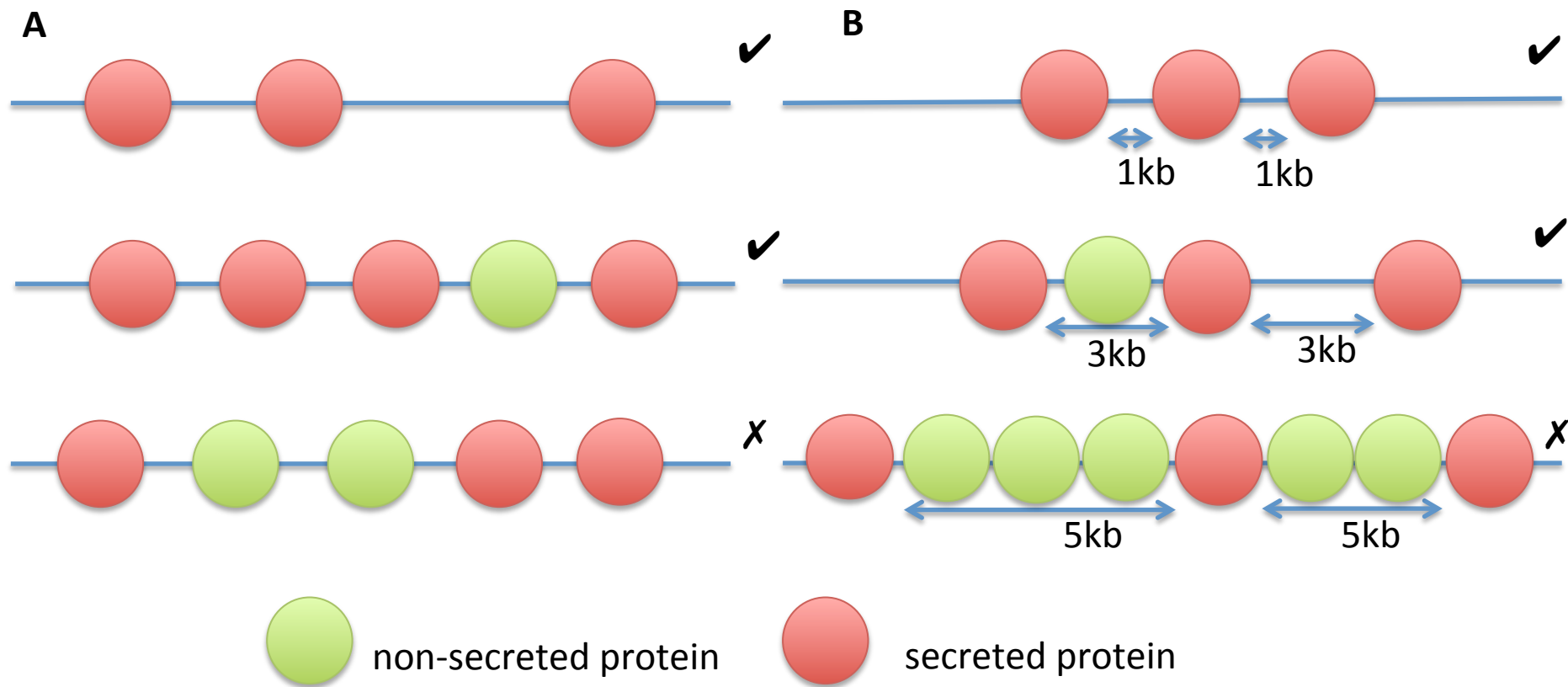
**H** *U. hordei* secreted proteins



**Supplementary Figure 4:** Frequency plots of the average of the 5' and 3' end gene flanking regions.



**Supplementary Figure 5:** Flowchart representing the *M. pennsylvanicum* gene prediction workflow.



**Supplementary Figure 6:** Pathogenicity cluster definition using the ‘three direct neighbor’ and ‘3 kb distance’ approaches.



Supplementary Tables

Supplementary Table 1. The 292 genes absent in *M. pennsylvanicum*, but present in the other smut genomes.

|    | <i>U. maydis</i> gene id | Annotations  | Secreted/Non-Secreted |
|----|--------------------------|--|-----------------------|
| 1  | um00210                  | conserved hypothetical protein   | Non-Secreted          |
| 2  | um00222.2                | related to monocarboxylate transporter   | Non-Secreted          |
| 3  | um11606                  | putative protein   | Non-Secreted          |
| 4  | um00384                  | hypothetical protein   | Non-Secreted          |
| 5  | um00478                  | hypothetical protein   | Non-Secreted          |
| 6  | um00564                  | related to adenosine deaminase   | Non-Secreted          |
| 7  | um00606                  | putative protein   | Non-Secreted          |
| 8  | um00616                  | putative protein   | Non-Secreted          |
| 9  | um00645                  | conserved hypothetical protein   | Non-Secreted          |
| 10 | um11172                  | probable FEN2 - Pantothenate permease  | Non-Secreted          |
| 11 | um00771                  | hypothetical protein   | Non-Secreted          |
| 12 | um00784.2                | putative protein   | Non-Secreted          |
| 13 | um00866                  | related to Endoglucanase   | Non-Secreted          |
| 14 | um00928                  | putative protein   | Non-Secreted          |
| 15 | um15060                  | conserved hypothetical protein   | Non-Secreted          |
| 16 | um11858                  | conserved hypothetical protein   | Non-Secreted          |
| 17 | um01148                  | putative protein   | Non-Secreted          |
| 18 | um01179                  | putative protein   | Non-Secreted          |
| 19 | um12129.2                | related to Tubulin-specific chaperone A  | Non-Secreted          |
| 20 | um11337.2                | related to fumarylacetoacetate hydrolase   | Non-Secreted          |
| 21 | um01424                  | probable Cytochrome P450 monooxygenase/Phenylacetate hydroxylase                   | Non-Secreted          |
| 22 | um01425                  | probable homogentisate 1,2-dioxygenase   | Non-Secreted          |
| 23 | um12137                  | conserved hypothetical protein   | Non-Secreted          |
| 24 | um01568                  | putative protein   | Non-Secreted          |
| 25 | um01665                  | hypothetical protein   | Non-Secreted          |
| 26 | um01710                  | related to N-carbamoyl-L-amino acid hydrolase                                      | Non-Secreted          |
| 27 | um01716                  | conserved hypothetical protein   | Non-Secreted          |
| 28 | um02214.2                | putative protein   | Non-Secreted          |
| 29 | um02222                  | related to membrane protein Dik6   | Non-Secreted          |
| 30 | um02237                  | conserved hypothetical protein   | Non-Secreted          |
| 31 | um02175                  | related to 3-phytase A precursor   | Non-Secreted          |
| 32 | um02325.2                | conserved hypothetical protein   | Non-Secreted          |
| 33 | um10168                  | conserved hypothetical protein   | Non-Secreted          |
| 34 | um02529                  | conserved hypothetical protein   | Non-Secreted          |
| 35 | um10301                  | hypothetical protein   | Non-Secreted          |
| 36 | um02745                  | conserved hypothetical protein   | Non-Secreted          |
| 37 | um02770                  | hypothetical protein   | Non-Secreted          |
| 38 | um02774                  | related to alternative oxidase precursor, mitochondrial                            | Non-Secreted          |
| 39 | um02917                  | conserved hypothetical Ustilago-specific protein                                   | Non-Secreted          |
| 40 | um02974                  | related to AUT4 - breakdown of autophagic vesicles inside the vacuole              | Non-Secreted          |
| 41 | um03011                  | conserved hypothetical protein   | Non-Secreted          |
| 42 | um10982                  | related to ribonucleoprotein   | Non-Secreted          |
| 43 | um12228                  | putative protein   | Non-Secreted          |
| 44 | um03377                  | hypothetical protein   | Non-Secreted          |
| 45 | um03424                  | conserved hypothetical protein   | Non-Secreted          |
| 46 | um03522                  | related to UGA4 - GABA permease - also involved in delta-aminolevulinate transport | Non-Secreted          |
| 47 | um03575                  | putative protein   | Non-Secreted          |
| 48 | um03605                  | related to Sucrose-6-phosphate hydrolase   | Non-Secreted          |
| 49 | um03638                  | hypothetical protein   | Non-Secreted          |
| 50 | um03652                  | conserved hypothetical protein   | Non-Secreted          |
| 51 | um03857                  | conserved hypothetical protein   | Non-Secreted          |
| 52 | um03906                  | hypothetical protein   | Non-Secreted          |
| 53 | um04484                  | probable choline-sulfatase   | Non-Secreted          |
| 54 | um12009                  | conserved hypothetical protein   | Non-Secreted          |
| 55 | um12010                  | putative protein   | Non-Secreted          |
| 56 | um11768                  | hypothetical protein   | Non-Secreted          |
| 57 | um10712                  | conserved hypothetical protein   | Non-Secreted          |
| 58 | um10713.2                | conserved hypothetical protein   | Non-Secreted          |
| 59 | um10714                  | conserved hypothetical protein   | Non-Secreted          |
| 60 | um05649                  | conserved hypothetical protein   | Non-Secreted          |
| 61 | um05789                  | conserved hypothetical protein   | Non-Secreted          |
| 62 | um10851                  | conserved hypothetical protein   | Non-Secreted          |
| 63 | um11575                  | conserved hypothetical protein   | Non-Secreted          |
| 64 | um05593                  | hypothetical protein   | Non-Secreted          |
| 65 | um05617                  | related to Lipase/esterase   | Non-Secreted          |
| 66 | um05270                  | conserved hypothetical protein   | Non-Secreted          |



|     |                  |   |              |
|-----|------------------|---|--------------|
| 67  | <b>um05272</b>   | conserved hypothetical protein  | Non-Secreted |
| 68  | <b>um05422</b>   | conserved hypothetical protein  | Non-Secreted |
| 69  | <b>um11190</b>   | putative protein  | Non-Secreted |
| 70  | <b>um05942</b>   | related to monocarboxylate permease                                       | Non-Secreted |
| 71  | <b>um11203</b>   | conserved hypothetical protein  | Non-Secreted |
| 72  | <b>um06186</b>   | related to oxidoreductase, short-chain dehydrogenase/reductase            | Non-Secreted |
| 73  | <b>um06367</b>   | putative protein  | Non-Secreted |
| 74  | <b>um06453</b>   | related to Transaldolase B  | Non-Secreted |
| 75  | <b>um06454</b>   | related to Mannose-6-phosphate isomerase                                  | Non-Secreted |
| 76  | <b>um04130</b>   | Dik6, novel virulence factor  | Non-Secreted |
| 77  | <b>um10885.2</b> | putative protein  | Non-Secreted |
| 78  | <b>um10888</b>   | putative protein  | Non-Secreted |
| 79  | <b>um04229</b>   | conserved hypothetical protein  | Non-Secreted |
| 80  | <b>um04498</b>   | putative protein  | Non-Secreted |
| 81  | <b>um11984</b>   | conserved hypothetical protein  | Non-Secreted |
| 82  | <b>um11754</b>   | putative protein (C-terminal fragment)                                    | Non-Secreted |
| 83  | <b>um01722</b>   | conserved hypothetical protein  | Non-Secreted |
| 84  | <b>um10451</b>   | conserved hypothetical protein  | Non-Secreted |
| 85  | <b>um01968</b>   | conserved hypothetical protein  | Non-Secreted |
| 86  | <b>um01971</b>   | conserved hypothetical protein  | Non-Secreted |
| 87  | <b>um11378</b>   | probable Cyanate hydratase  | Non-Secreted |
| 88  | <b>um02008</b>   | conserved hypothetical protein  | Non-Secreted |
| 89  | <b>um11391</b>   | conserved hypothetical protein  | Non-Secreted |
| 90  | <b>um05230</b>   | probable Salicylate hydroxylase   | Non-Secreted |
| 91  | <b>um06326</b>   | conserved hypothetical protein  | Non-Secreted |
| 92  | <b>um02124</b>   | conserved hypothetical protein  | Non-Secreted |
| 93  | um00011          | probable AMD2 - amidase   | Non-Secreted |
| 94  | um10005          | conserved hypothetical protein  | Non-Secreted |
| 95  | um10016          | conserved hypothetical protein  | Non-Secreted |
| 96  | um00103          | related to ESBP6 - similarity to Monocarboxylate transporter              | Non-Secreted |
| 97  | um10028          | conserved hypothetical protein  | Non-Secreted |
| 98  | um00182          | related to Lipase 2 precursor   | Non-Secreted |
| 99  | um10054.2        | hypothetical protein (fragment)   | Non-Secreted |
| 100 | um00211          | conserved hypothetical protein  | Non-Secreted |
| 101 | um00317          | hypothetical protein  | Non-Secreted |
| 102 | um00400          | conserved hypothetical protein  | Non-Secreted |
| 103 | um00439          | conserved hypothetical protein  | Non-Secreted |
| 104 | um00445          | conserved hypothetical protein  | Non-Secreted |
| 105 | um00483          | putative protein  | Non-Secreted |
| 106 | um10124          | related to RNA splicing endonuclease gamma subunit                        | Non-Secreted |
| 107 | um15088          | conserved hypothetical protein  | Non-Secreted |
| 108 | um11445          | putative protein  | Non-Secreted |
| 109 | um11614          | related to TOM5 - mitochondrial outer membrane protein                    | Non-Secreted |
| 110 | um00736          | conserved hypothetical protein  | Non-Secreted |
| 111 | um00805          | putative protein  | Non-Secreted |
| 112 | um11244          | related to FRE4 - Ferric reductase  | Non-Secreted |
| 113 | um00893          | related to veA protein  | Non-Secreted |
| 114 | um15056          | related to CCC2 - copper resistance-associated P-type ATPase              | Non-Secreted |
| 115 | um12125          | conserved hypothetical protein  | Non-Secreted |
| 116 | um10232          | probable cytochrome b5  | Non-Secreted |
| 117 | um01299          | conserved hypothetical Ustilago-specific protein                          | Non-Secreted |
| 118 | um11311          | putative protein  | Non-Secreted |
| 119 | um01403          | conserved hypothetical protein  | Non-Secreted |
| 120 | um11333          | related to NDE1 - mitochondrial cytosolically directed NADH dehydrogenase | Non-Secreted |
| 121 | um01435          | related to MCH4 - monocarboxylate transporter                             | Non-Secreted |
| 122 | um11670          | putative protein  | Non-Secreted |
| 123 | um12142          | conserved hypothetical protein  | Non-Secreted |
| 124 | um01567          | related to 2,5-diketo-D-gluconic acid reductase                           | Non-Secreted |
| 125 | um11357          | conserved hypothetical protein  | Non-Secreted |
| 126 | um01718          | probable glucosamine-6-phosphate isomerase                                | Non-Secreted |
| 127 | um11365          | conserved hypothetical protein  | Non-Secreted |
| 128 | um02283          | conserved hypothetical protein  | Non-Secreted |
| 129 | um02286          | conserved hypothetical protein  | Non-Secreted |
| 130 | um02354          | putative protein  | Non-Secreted |
| 131 | um10131          | related to phosphatidylserine decarboxylase proenzyme 2 precursor         | Non-Secreted |
| 132 | um12188          | hypothetical protein  | Non-Secreted |
| 133 | um02460          | putative protein  | Non-Secreted |
| 134 | um02473          | conserved hypothetical Ustilago-specific protein                          | Non-Secreted |
| 135 | um10164          | related to E2 ubiquitin-conjugating enzyme                                | Non-Secreted |
| 136 | um02514.2        | related to UPF3 - Nonsense-mediated mRNA decay protein                    | Non-Secreted |
| 137 | um02574          | related to c-module-binding factor  | Non-Secreted |
| 138 | um02585          | related to TPO1 - Vacuolar polyamine-H <sup>+</sup> antiporter            | Non-Secreted |

|     |           |   |              |
|-----|-----------|---|--------------|
| 139 | um02666   | putative protein  | Non-Secreted |
| 140 | um02727   | probable lysozyme   | Non-Secreted |
| 141 | um11726   | conserved hypothetical protein  | Non-Secreted |
| 142 | um02765   | conserved hypothetical protein  | Non-Secreted |
| 143 | um10596   | probable aldehyde dehydrogenase   | Non-Secreted |
| 144 | um02771   | putative protein  | Non-Secreted |
| 145 | um02791   | related to GABA permease  | Non-Secreted |
| 146 | um02948   | conserved hypothetical protein  | Non-Secreted |
| 147 | um10333   | conserved hypothetical protein  | Non-Secreted |
| 148 | um02972   | putative protein  | Non-Secreted |
| 149 | um03016   | conserved hypothetical protein  | Non-Secreted |
| 150 | um11947   | conserved hypothetical protein  | Non-Secreted |
| 151 | um03128   | conserved hypothetical protein  | Non-Secreted |
| 152 | um10393   | conserved hypothetical protein  | Non-Secreted |
| 153 | um03221   | conserved hypothetical protein  | Non-Secreted |
| 154 | um03288   | related to dna polymerase epsilon p17 subunit                           | Non-Secreted |
| 155 | um03337   | related to MRPL35 - mitochondrial ribosomal protein, large subunit      | Non-Secreted |
| 156 | um12223   | putative protein  | Non-Secreted |
| 157 | um12227   | related to DASH complex subunit spc19 (Outer kinetochore protein spc19) | Non-Secreted |
| 158 | um11017   | related to CAP59 (required for capsule formation)                       | Non-Secreted |
| 159 | um03417   | putative acetamidase  | Non-Secreted |
| 160 | um03422   | conserved hypothetical protein  | Non-Secreted |
| 161 | um03513   | conserved hypothetical protein  | Non-Secreted |
| 162 | um03518   | related to pyrimidine 5-nucleotidase                                    | Non-Secreted |
| 163 | um03524   | related to peroxisomal amine oxidase (copper-containing)                | Non-Secreted |
| 164 | um03540   | conserved hypothetical protein  | Non-Secreted |
| 165 | um11731   | related to nadh-ubiquinone oxidoreductase 9.5 kDa subunit               | Non-Secreted |
| 166 | um03620   | related to Regulatory protein alcR                                      | Non-Secreted |
| 167 | um03642   | conserved hypothetical protein  | Non-Secreted |
| 168 | um03653   | conserved hypothetical protein  | Non-Secreted |
| 169 | um03691   | probable lysine-specific permease                                       | Non-Secreted |
| 170 | um03835   | putative protein  | Non-Secreted |
| 171 | um10511   | conserved hypothetical protein  | Non-Secreted |
| 172 | um11151   | related to Type I protein geranylgeranyltransferase beta subunit        | Non-Secreted |
| 173 | um04388   | conserved hypothetical protein  | Non-Secreted |
| 174 | um10514   | conserved hypothetical protein  | Non-Secreted |
| 175 | um10535   | related to cell cycle control protein cwf15                             | Non-Secreted |
| 176 | um12011   | putative protein  | Non-Secreted |
| 177 | um11561   | related to 60S ribosomal protein L28                                    | Non-Secreted |
| 178 | um05014   | related to Serine/threonine kinase                                      | Non-Secreted |
| 179 | um05050   | hypothetical protein  | Non-Secreted |
| 180 | um10741   | related to Sedlin (trafficking protein particle complex protein 2)      | Non-Secreted |
| 181 | um10917   | probable RING-box protein 1   | Non-Secreted |
| 182 | um12024   | putative protein  | Non-Secreted |
| 183 | um11582   | conserved hypothetical protein  | Non-Secreted |
| 184 | um11586   | putative protein  | Non-Secreted |
| 185 | um05790   | conserved hypothetical protein  | Non-Secreted |
| 186 | um04770   | related to splicing factor SPF30  | Non-Secreted |
| 187 | um10698   | related to NEFA-interacting nuclear protein NIP30                       | Non-Secreted |
| 188 | um10746.2 | conserved hypothetical protein  | Non-Secreted |
| 189 | um10757   | conserved hypothetical protein  | Non-Secreted |
| 190 | um10355   | conserved hypothetical protein  | Non-Secreted |
| 191 | um05547   | related to Alpha-1,2 glucosyltransferase ALG10                          | Non-Secreted |
| 192 | um11180   | putative protein  | Non-Secreted |
| 193 | um11181   | probable LEU2 - beta-isopropyl-malate dehydrogenase                     | Non-Secreted |
| 194 | um05600   | probable UGA2 - succinate semialdehyde dehydrogenase                    | Non-Secreted |
| 195 | um05601   | hypothetical protein  | Non-Secreted |
| 196 | um05331   | conserved hypothetical protein  | Non-Secreted |
| 197 | um05335   | related to Protein C20orf43   | Non-Secreted |
| 198 | um05423   | related to Monoamine oxidase A [flavin-containing]                      | Non-Secreted |
| 199 | um05830   | putative protein  | Non-Secreted |
| 200 | um12027   | putative protein  | Non-Secreted |
| 201 | um11208   | putative protein  | Non-Secreted |
| 202 | um10971   | related to transcription factor hap3                                    | Non-Secreted |
| 203 | um12331   | conserved hypothetical protein  | Non-Secreted |
| 204 | um06389   | conserved hypothetical protein  | Non-Secreted |
| 205 | um06455   | conserved hypothetical protein  | Non-Secreted |
| 206 | um03930   | conserved hypothetical protein  | Non-Secreted |

|     |                |   |              |
|-----|----------------|---|--------------|
| 207 | um03960        | putative protein  | Non-Secreted |
| 208 | um03978        | hypothetical protein                                    | Non-Secreted |
| 209 | um04051        | conserved hypothetical protein                          | Non-Secreted |
| 210 | um04070        | Rho3 GTP binding protein                                | Non-Secreted |
| 211 | um04186.2      | probable general amino acid permease                    | Non-Secreted |
| 212 | um10420        | related to meiotic recombination protein SPO11          | Non-Secreted |
| 213 | um11987        | conserved hypothetical protein                          | Non-Secreted |
| 214 | um10911        | conserved hypothetical protein                          | Non-Secreted |
| 215 | um04592        | conserved hypothetical protein                          | Non-Secreted |
| 216 | um10986        | putative protein  | Non-Secreted |
| 217 | um04637        | conserved hypothetical protein                          | Non-Secreted |
| 218 | um04661        | conserved hypothetical protein                          | Non-Secreted |
| 219 | um04673        | related to RecQ family helicase RecQL1                  | Non-Secreted |
| 220 | um11752        | conserved hypothetical protein                          | Non-Secreted |
| 221 | um04362        | related to Cytochrome P450 8B1                          | Non-Secreted |
| 222 | um12263        | hypothetical protein                                    | Non-Secreted |
| 223 | um15074        | related to ABC transporter                              | Non-Secreted |
| 224 | um10881        | probable ribonuclease T1                                | Non-Secreted |
| 225 | um12176        | conserved hypothetical protein                          | Non-Secreted |
| 226 | um01916        | conserved hypothetical protein                          | Non-Secreted |
| 227 | um11379        | putative protein  | Non-Secreted |
| 228 | um01988        | related to Oxidoreductase                               | Non-Secreted |
| 229 | um02022        | conserved hypothetical protein                          | Non-Secreted |
| 230 | um05128        | conserved hypothetical protein                          | Non-Secreted |
| 231 | um10178        | conserved hypothetical protein                          | Non-Secreted |
| 232 | um05207        | conserved hypothetical protein                          | Non-Secreted |
| 233 | um06270        | conserved hypothetical protein                          | Non-Secreted |
| 234 | um10764        | related to TR4 orphan receptor associated protein TRA16 | Non-Secreted |
| 235 | um02147        | related to Cytoplasmic acetyl-CoA hydrolase 1           | Non-Secreted |
| 236 | <b>um11362</b> | putative protein  | Secreted     |
| 237 | <b>um05097</b> | related to secreted aspartic protease 2                 | Secreted     |
| 238 | <b>um05229</b> | related to Beta-mannosidase precursor                   | Secreted     |
| 239 | <b>um02212</b> | related to trehalase precursor                          | Secreted     |
| 240 | <b>um02229</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 241 | <b>um02298</b> | hypothetical protein                                    | Secreted     |
| 242 | <b>um02466</b> | hypothetical protein                                    | Secreted     |
| 243 | <b>um02510</b> | probable PGU1 - Endo-polygalacturonase                  | Secreted     |
| 244 | <b>um02535</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 245 | <b>um11931</b> | conserved hypothetical protein                          | Secreted     |
| 246 | <b>um02851</b> | putative protein  | Secreted     |
| 247 | <b>um02852</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 248 | <b>um12197</b> | putative protein  | Secreted     |
| 249 | <b>um03065</b> | putative protein  | Secreted     |
| 250 | <b>um03105</b> | hypothetical protein                                    | Secreted     |
| 251 | <b>um03112</b> | conserved hypothetical protein                          | Secreted     |
| 252 | <b>um03201</b> | hypothetical protein                                    | Secreted     |
| 253 | <b>um10403</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 254 | <b>um03223</b> | Mig1 protein, induced during biotrophic phase           | Secreted     |
| 255 | <b>um12215</b> | hypothetical protein                                    | Secreted     |
| 256 | <b>um12216</b> | related to Mig1 protein                                 | Secreted     |
| 257 | <b>um03397</b> | hypothetical protein                                    | Secreted     |
| 258 | <b>um03749</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 259 | <b>um03750</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 260 | <b>um03923</b> | conserved hypothetical protein                          | Secreted     |
| 261 | <b>um11763</b> | related to acetylxylylase                               | Secreted     |
| 262 | <b>um04309</b> | probable Alpha-L-arabinofuranosidase precursor          | Secreted     |
| 263 | <b>um05295</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 264 | <b>um05306</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 265 | <b>um05312</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 266 | <b>um05928</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 267 | <b>um05930</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 268 | <b>um11002</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 269 | <b>um00534</b> | conserved hypothetical protein                          | Secreted     |
| 270 | <b>um00792</b> | conserved hypothetical Ustilago-specific protein        | Secreted     |
| 271 | <b>um00795</b> | hypothetical protein                                    | Secreted     |
| 272 | <b>um01422</b> | probable Lipase B precursor                             | Secreted     |
| 273 | <b>um01690</b> | hypothetical protein                                    | Secreted     |

|     |           |  |          |
|-----|-----------|--|----------|
| 274 | um02071   | conserved hypothetical protein   | Secreted |
| 275 | um02921   | conserved hypothetical protein   | Secreted |
| 276 | um12226   | putative protein   | Secreted |
| 277 | um03411   | probable endo-1,4-beta-xylanase  | Secreted |
| 278 | um04057   | related to dihydroflavonol reductase                                   | Secreted |
| 279 | um05046   | conserved hypothetical protein   | Secreted |
| 280 | um04816   | related to Endoglucanase I precursor                                   | Secreted |
| 281 | um05495   | conserved hypothetical protein   | Secreted |
| 282 | um05964   | related to esterase  | Secreted |
| 283 | um06050   | conserved hypothetical protein   | Secreted |
| 284 | um06116   | putative protein   | Secreted |
| 285 | um06440   | conserved hypothetical protein   | Secreted |
| 286 | um10052   | conserved hypothetical protein   | Secreted |
| 287 | um00446   | probable beta-glucosidase  | Secreted |
| 288 | um00480   | transmembrane mucin involved in surface sensing via MAP-kinase cascade | Secreted |
| 289 | um00837.2 | related to Alpha-L-arabinofuranosidase I precursor                     | Secreted |
| 290 | um12127   | hypothetical protein   | Secreted |
| 291 | um01553   | conserved hypothetical protein   | Secreted |
| 292 | um10816   | conserved hypothetical protein   | Secreted |

Gene ids in bold representing *U. maydis* genes with no gene remnants or distantly similar genes in the genome of *M. pennsylvanicum*.

**Supplementary table 2.** *Ustilago maydis* previously defined 12 pathogenicity clusters and their orthologous genes in other genomes.

| <i>U. maydis</i>  |    |           | <i>M. pennsylvanicum</i> |    |            |         |          |    | <i>S. reilianum</i> |    |           |           |            |    | <i>U. hordei</i> |    |            |            |    |    |
|-------------------|----|-----------|--------------------------|----|------------|---------|----------|----|---------------------|----|-----------|-----------|------------|----|------------------|----|------------|------------|----|----|
| Our Results       |    | Published | orthoMCL                 |    | Inparanoid |         | orthoMCL |    | Inparanoid          |    | orthoMCL  |           | Inparanoid |    | orthoMCL         |    | Inparanoid |            |    |    |
| SP                | TP | SP        | TP                       | SP | TP         | SP      | TP       | SP | TP                  | SP | TP        | SP        | TP         | SP | TP               | SP | TP         |            |    |    |
| <b>Um_1A:</b>     |    |           |                          |    |            |         |          |    |                     |    |           |           |            |    |                  |    |            |            |    |    |
| um00444           |    |           | mp04347                  | NS | NS         | mp04347 | NS       | NS | sr10114             | NS | NS        | sr10114   | NS         | NS | UHOR_00696       | NS | NS         | UHOR_00696 | NS | NS |
| um10115           | 1  | 1         | NA                       |    |            | NA      |          |    | NA                  |    |           | NA        |            |    | NA               |    |            | NA         |    |    |
| um00445           | 1  | 1         | NA                       |    |            | NA      |          |    | sr10115             | 2  | sr10115   | 2         |            |    | UHOR_00698       | NS | NS         | NA         |    |    |
| um00446           | 1  | 1         | NA                       |    |            | NA      |          |    | sr10116             | 1  | sr10116   | 1         |            |    | UHOR_00702       | 1  | UHOR_00702 | 1          |    |    |
| um00447           |    |           | mp02192                  | NS | NS         | mp02192 | NS       | NS | sr10118.2           | NS | NS        | sr10118.2 | NS         | NS | UHOR_00703       | NS | NS         | UHOR_00703 | NS | NS |
| <b>Um_2A:</b>     |    |           |                          |    |            |         |          |    |                     |    |           |           |            |    |                  |    |            |            |    |    |
| um01233           |    |           | mp05071                  | NS | NS         | mp05071 | NS       | NS | sr10307             | NS | NS        | sr10307   | NS         | NS | UHOR_01859       | NS | NS         | UHOR_01859 | NS | NS |
| um01234           | 5  | 5         | mp05037                  |    |            | mp05037 |          |    | sr10308             | NS | sr10308   | NS        |            |    | UHOR_01860       | NS | 5          | UHOR_01860 | NS | 5  |
| um01235           | 1  | 1         | NA                       |    |            | NA      |          |    | sr10309             | 1  | sr10309   | 1         |            |    | NA               |    |            | UHOR_01863 |    | 1  |
| um01236           | 2  | 2         | mp05069                  | NS | NS         | NA      |          |    | [sr10310]           | 1  | [sr10310] | 1         |            |    | UHOR_01866       | NS | NS         | NA         |    |    |
| um01237           | 2  | 2         | mp05069                  | NS | NS         | mp05069 | NS       | NS | sr10311             | 1  | sr10311   | 1         |            |    | UHOR_01866       | NS | NS         | NA         |    |    |
| um01238           | 1  | 1         | NA                       |    |            | NA      |          |    | [sr10312]           | 2  | [sr10312] | 2         |            |    | UHOR_01866       | NS | NS         | NA         |    |    |
| um01239           | 1  | 1         | NA                       |    |            | NA      |          |    | sr10312             | 2  | sr10312   | 2         |            |    | NA               |    |            | NA         |    |    |
| um01240           | 1  | 1         | NA                       |    |            | NA      |          |    | [sr10311]           | 2  | [sr10311] | 2         |            |    | NA               |    |            | NA         |    |    |
| um01241           | 4  | 4         | mp05068                  |    |            | mp05068 |          | 1  | sr10316             | 2  | sr10316   | 2         |            |    | NA               |    |            | NA         |    |    |
| um01242           |    |           | mp05067                  | NS | NS         | mp05067 | NS       | NS | [sr10317]           | 2  | [sr10317] | 2         |            |    | UHOR_01868       | NS | NS         | UHOR_01868 | NS | NS |
| <b>Um_2B</b>      |    |           |                          |    |            |         |          |    |                     |    |           |           |            |    |                  |    |            |            |    |    |
| um01296           |    |           | mp03960                  | NS | NS         | mp03960 | NS       | NS | sr10428.2           | NS | NS        | sr10428.2 | NS         | NS | UHOR_01942       | NS | NS         | UHOR_01942 | NS | NS |
| um01297           | 1  | 1         | NA                       |    |            | mp03981 |          | 2  | sr10429.2           | 1  | sr10429.2 | 1         |            |    | UHOR_01944       | 1  | UHOR_01944 | 1          |    |    |
| um01298.2         | 1  | 1         | NA                       |    |            | mp03086 |          | NS | sr10430.2           | NS | NS        | sr10430.2 | NS         | NS | NA               |    |            | NA         |    |    |
| um01299           | 1  | 1         | NA                       |    |            | NA      |          |    | sr10431.2           | 1  | sr10431.2 | 1         |            |    | UHOR_01950       | NS | NS         | UHOR_01950 | NS | NS |
| um01300           | 2  | 2         | NA                       |    |            | NA      |          |    | NA                  |    | NA        |           |            |    | UHOR_01952       | 1  | UHOR_01952 | 1          |    |    |
| um01301           | 2  | 2         | NA                       |    |            | NA      |          |    | sr10432.2           | 1  | sr10432.2 | 1         |            |    | NA               |    |            | NA         |    |    |
| um01302           | 1  | 1         | NA                       |    |            | NA      |          |    | sr20001             | 1  | sr20001   | 1         |            |    | NA               |    |            | NA         |    |    |
| um10233           | 3  | 3         | NA                       |    |            | NA      |          |    | NA                  |    | NA        |           |            |    | NA               |    |            | NA         |    |    |
| um10234           |    |           | mp03980                  | NS | NS         | mp03980 | NS       | NS | sr10434             | NS | NS        | sr10434   | NS         | NS | UHOR_01953       | NS | NS         | UHOR_01953 | NS | NS |
| <b>Um_3A</b>      |    |           |                          |    |            |         |          |    |                     |    |           |           |            |    |                  |    |            |            |    |    |
| um01885           |    |           | mp04219                  | NS | NS         | mp04219 | NS       | NS | sr10604             | NS | NS        | sr10604   | NS         | NS | UHOR_02794       | NS | NS         | UHOR_02794 | NS | NS |
| um01886           | 1  | 1         | mp04220                  |    |            | mp04220 |          | 1  | sr10606             | 1  | sr10606   | 1         |            |    | UHOR_02798       | 2  | UHOR_02798 | 2          |    |    |
| um01887 (um12173) |    | 1         | mp04192                  | NS | NS         | mp04192 | NS       | NS | sr10605             | NS | NS        | sr10605   | NS         | NS | UHOR_02796       | NS | NS         | UHOR_02796 | NS | NS |
| um01888           | 2  | 2         | mp04217                  |    |            | mp04217 |          | 3  | sr10607             | 2  | sr10607   | 2         |            |    | UHOR_02799       | 2  | UHOR_02799 | 2          |    |    |
| um01889           |    |           | mp04216                  |    |            | mp04216 |          |    | sr10608             | NS | NS        | sr10608   | NS         | NS | UHOR_02801       | NS | NS         | UHOR_02801 | NS | NS |

Um\_5A

|         |   |   |
|---------|---|---|
| um02191 |   |   |
| um02192 | 1 | 1 |
| um02193 | 1 | 1 |
| um02194 | 1 | 1 |
| um10070 | 2 | 2 |
| um02196 | 1 | 1 |
| um02197 |   |   |

|         |    |    |         |    |    |
|---------|----|----|---------|----|----|
| mp05142 | NS | NS | mp05142 | NS | NS |
| NA      |    |    | NA      |    |    |
| NA      |    |    | NA      |    |    |
| NA      |    |    | NA      |    |    |
| mp05143 | NS | 5  | mp05143 | NS | 5  |
| mp05158 |    | 1  | mp05158 |    | 1  |
| mp05157 | NS | NS | mp05157 | NS | NS |

|         |    |         |         |    |    |
|---------|----|---------|---------|----|----|
| sr10765 |    | sr10765 |         |    |    |
| NA      |    | sr10766 |         | 1  |    |
| NA      |    | NA      |         |    |    |
| NA      |    | NA      |         |    |    |
| sr10769 | NS | 5       | sr10769 | NS | 5  |
| sr10770 |    | 1       | NA      |    |    |
| sr10772 | NS | NS      | sr10772 | NS | NS |

|              |    |    |            |    |    |    |
|--------------|----|----|------------|----|----|----|
| UHOR_03611   | NS | NS | UHOR_03611 | NS | NS |    |
| NA           |    |    | NA         |    |    |    |
| NA           |    |    | NA         |    |    |    |
| NA           |    |    | NA         |    |    |    |
| UHOR_03615   | NS | NS | UHOR_03615 | NS | NS |    |
| UHOR_03616   |    |    |            |    |    |    |
| [UHOR_04380  |    |    |            |    |    |    |
| UHOR_12270   |    |    |            |    |    |    |
| UHOR_12275]  | NS | NS | NA         |    |    |    |
| UHOR_03617   |    |    |            |    |    |    |
| [UHOR_06287] | NS | NS | NA         |    | NS | NS |

Um\_5B

|         |   |   |
|---------|---|---|
| um02472 |   |   |
| um02473 | 2 | 2 |
| um02474 | 2 | 2 |
| um02475 | 1 | 1 |
| um02476 |   |   |

|         |    |    |         |    |    |
|---------|----|----|---------|----|----|
| mp01042 | NS | NS | mp01042 | NS | NS |
| NA      |    |    | NA      |    |    |
| NA      |    |    | NA      |    |    |
| mp01043 |    | 1  | NA      |    |    |
| mp00531 | NS | NS | mp00531 | NS | NS |

|           |    |    |           |    |    |
|-----------|----|----|-----------|----|----|
| sr10914   | NS | NS | sr10914   | NS | NS |
| sr10916.2 |    | 3  | sr10916.2 |    | 3  |
| NA        |    |    | NA        |    |    |
| sr10918.2 |    | 1  | sr10918.2 |    | 1  |
| sr10919   | NS | NS | sr10919   |    |    |

|            |    |    |            |    |    |
|------------|----|----|------------|----|----|
| UHOR_12669 | NS | NS | UHOR_12669 | NS | NS |
| UHOR_01858 | NS | NS | UHOR_01858 | NS | NS |
| NA         |    |    | NA         |    |    |
| UHOR_12209 |    | 1  | NA         |    |    |
| UHOR_12141 | NS | NS | UHOR_12141 | NS | NS |

Um\_6A

|         |   |   |
|---------|---|---|
| um11414 |   |   |
| um02533 | 2 | 2 |
| um11415 | 2 | 2 |
| um02535 | 1 | 1 |
| um11416 | 1 | 1 |
| um02537 | 1 | 1 |
| um02538 | 1 | 1 |
| um11417 | 1 | 1 |
| um02540 | 1 | 1 |
| um02541 |   |   |
| um02542 |   |   |

|           |    |    |           |    |    |
|-----------|----|----|-----------|----|----|
| mp01106   | NS | NS | mp01106   | NS | NS |
| NA        |    |    | NA        |    |    |
| NA        |    |    | NA        |    |    |
| NA        |    |    | mp01108   |    | 1  |
| NA        |    |    | mp01108   |    | 1  |
| NA        |    |    | mp01108   |    | 1  |
| NA        |    |    | NA        |    |    |
| mp01109   |    | 1  | mp01109   |    | 1  |
| [mp05408] |    |    | [mp05408] |    |    |
| mp01147   |    |    | mp05409   |    |    |
| [mp05409] | NS | NS | [mp01147] | NS | NS |
| mp01110   | NS | NS | mp01110   | NS | NS |

|           |    |    |           |    |    |
|-----------|----|----|-----------|----|----|
| sr10992   | NS | NS | sr10992   | NS | NS |
| sr10994.2 |    | 1  | sr10994.2 |    | 1  |
| sr20006   |    | 1  | sr20006   |    | 1  |
| sr10996.2 |    | 1  | sr10996.2 |    | 1  |
| NA        |    |    | sr10997.2 |    | 2  |
| NA        |    |    | NA        |    |    |
| sr20007   |    | 3  | sr20007   |    | 3  |
| sr11000.2 |    | 1  | sr11000.2 |    | 1  |
| sr11009   |    | 1  | sr11009   |    | 1  |
| sr11010   | NS | NS | sr11010   | NS | NS |
| sr11011   | NS | NS | sr11011   | NS | NS |

|            |    |    |            |    |    |    |
|------------|----|----|------------|----|----|----|
| UHOR_04066 | NS | NS | UHOR_04066 | NS | NS |    |
| NA         |    |    | NA         |    |    |    |
| NA         |    |    | NA         |    |    |    |
| UHOR_12257 |    | 1  | UHOR_12257 |    | 1  |    |
| NA         |    |    | NA         |    |    |    |
| NA         |    |    | UHOR_12260 |    | NS | NS |
| NA         |    |    | NA         |    |    |    |
| NA         |    |    | NA         |    |    |    |
| NA         |    |    | NA         |    |    |    |
| UHOR_04067 | NS | NS | UHOR_04067 | NS | NS |    |
| UHOR_04068 | NS | NS | UHOR_04068 | NS | NS |    |

Um\_8A

|           |   |   |
|-----------|---|---|
| um03200   |   |   |
| um03201   | 2 | 2 |
| um03202   |   |   |
| [um10403] | 1 | 1 |
| um10403   | 1 | 1 |
| um03204   |   |   |

|           |    |    |         |    |    |
|-----------|----|----|---------|----|----|
| mp02487   | NS | NS | mp02487 | NS | NS |
| NA        |    |    | NA      |    |    |
| NA        |    |    | NA      |    |    |
| mp02491   |    |    | NA      |    |    |
| [mp03783] | NS | NS | mp02491 | NS | NS |

|           |    |    |         |    |    |
|-----------|----|----|---------|----|----|
| sr11099   | NS | NS | sr11099 | NS | NS |
| sr11100   |    | 1  | sr11100 |    | 1  |
| sr11101   |    |    |         |    |    |
| [sr11102] |    | 1  | sr11102 |    | 1  |
| sr11101   |    |    |         |    |    |
| [sr11102] |    | 1  | sr11102 |    | 1  |
| sr11106   | NS | NS | sr11106 | NS | NS |

|              |    |    |            |    |    |
|--------------|----|----|------------|----|----|
| UHOR_04983   | NS | NS | UHOR_04983 | NS | NS |
| UHOR_04984   |    | 1  | UHOR_04984 |    | 1  |
| UHOR_04986   |    | 1  | UHOR_04986 |    | 1  |
| UHOR_04986   |    | 1  | UHOR_04986 |    | 1  |
| UHOR_04780   |    |    |            |    |    |
| [UHOR_04988] | NS | NS | UHOR_04988 | NS | NS |

Um\_9A

|         |   |   |
|---------|---|---|
| um03613 |   |   |
| um03614 | 4 | 4 |
| um03615 | 2 | 2 |
| um03616 | 1 | 1 |
| um03617 |   |   |

|         |    |    |         |    |    |
|---------|----|----|---------|----|----|
| mp00947 | NS | NS | mp00947 | NS | NS |
| mp00948 |    | 2  | mp00948 |    | 2  |
| mp00910 |    | 2  | mp00910 |    | 2  |
| mp00949 | NS | 1  | mp00949 | NS | 1  |
| mp00909 | NS | NS | mp00909 | NS | NS |

|           |    |    |           |    |    |
|-----------|----|----|-----------|----|----|
| sr11162   | NS | NS | sr11162   | NS | NS |
| sr11163.2 |    | 1  | sr11163.2 |    | 1  |
| sr11165   |    | 3  | sr11165   |    | 3  |
| sr11167.2 | NS | 1  | sr11167.2 | NS | 1  |
| sr11168   |    |    | sr11168   |    |    |

|            |    |    |            |    |    |
|------------|----|----|------------|----|----|
| UHOR_05544 | NS | NS | UHOR_05544 | NS | NS |
| UHOR_05545 |    | 1  | UHOR_05545 |    | 1  |
| UHOR_05546 |    | 2  | UHOR_05546 |    | 2  |
| UHOR_05548 |    | 1  | UHOR_05548 |    | 1  |
| UHOR_05550 | NS | NS | UHOR_05550 | NS | NS |

Um\_10A

|           |   |   |           |       |           |       |            |       |           |       |              |       |            |            |
|-----------|---|---|-----------|-------|-----------|-------|------------|-------|-----------|-------|--------------|-------|------------|------------|
| Um03743.2 |   |   | mp00222   | NS NS | mp00222   | NS NS | sr11224    | NS NS | sr11224   | NS NS | UHOR_15312   | NS NS | UHOR_15312 | NS NS      |
| um03744   | 1 | 1 | NA        |       | NA        |       | NA         |       | NA        |       | NA           |       | NA         |            |
| um03745   |   |   |           |       |           |       |            |       |           |       |              |       |            |            |
| [um03750] | 1 | 1 | NA        |       | NA        |       | sr11231    | 1     | sr11231   | 1     | UHOR_14478   |       | 1          | NA         |
| um03746   | 1 | 1 | mp00270   | NS NS | mp00270   | NS NS | sr20008    | 2     | sr20008   | 2     | UHOR_14479   |       | 3          | UHOR_14479 |
| um03747   | 1 | 1 | NA        |       | mp00269   |       | NA         |       | sr11233   | 1     | UHOR_14481   |       | 1          | UHOR_14481 |
| um03748   | 2 | 2 | NA        |       | NA        |       | NA         |       | NA        |       | NA           |       |            |            |
| um03749   | 2 | 2 | NA        |       | NA        |       | sr11234.2  | 1     | sr11234.2 | 1     | UHOR_07107   |       | 1          | UHOR_07107 |
| um03750   | 1 | 1 | NA        |       | NA        |       | sr11231    | 1     | sr11231   | 1     | UHOR_14478   |       | 1          | NA         |
| um03751   | 1 | 1 | NA        |       | NA        |       | sr11236.2  | 1     | sr11236.2 | 1     | NA           |       |            |            |
|           |   |   |           |       |           |       | sr11237    |       |           |       |              |       |            |            |
| um03752   |   |   | mp03415   |       | mp03415   |       | [sr11240,  |       |           |       | UHOR_07319   |       |            |            |
| [um03753] | 2 | 2 | [mp0267]  | NS    | [mp0267]  | NS    | sr11239.2] | 1     | sr11237   | 1     | [UHOR_08139] |       | 1          | NA         |
|           |   |   |           |       |           |       | sr11237    |       |           |       |              |       |            |            |
| um03753   | 1 | 1 | mp03415   |       | mp03415   |       | [sr11240,  |       |           |       | UHOR_07319   |       |            |            |
| um03754   |   |   | [mp00267] | NS    | [mp00267] | NS    | sr11239.2] | 1     | sr11240   | 1     | [UHOR_08139] |       | 1          | UHOR_07319 |
| um10660   |   |   | mp00266   |       | mp00266   |       | sr11241    | NS NS | sr11241   | NS NS | UHOR_05718   | NS NS | UHOR_05718 | NS NS      |
|           |   |   |           |       |           |       | NA         |       | NA        |       | NA           |       | NA         |            |

Um\_19A

|           |   |   |         |       |         |       |           |       |           |         |              |       |              |       |
|-----------|---|---|---------|-------|---------|-------|-----------|-------|-----------|---------|--------------|-------|--------------|-------|
| um05293   |   |   | mp02620 | NS NS | mp02620 | NS NS | sr10039   | NS NS | sr10039   | NS NS   | UHOR_08123   | NS NS | UHOR_08123   | NS NS |
| um05294   | 1 | 1 | NA      |       | NA      |       | NA        |       | NA        |         | NA           |       | UHOR_10021   | 3     |
| um05295   | 1 | 1 | NA      |       | NA      |       | sr10050   | 3     | sr10050   | 3       | UHOR_10021   | 3     | UHOR_10022   | 1     |
| um05296   |   |   | NA      |       | NA      |       | NA        |       | NA        |         | NA           |       | NA           |       |
| um10553   | 1 | 1 | NA      |       | NA      |       | sr10051   | NS NS | sr10051   | NS NS   | NA           |       | NA           |       |
| um10554   | 3 | 3 | NA      |       | NA      |       | Sr10052.2 | 1     | sr10052.2 | 1       | NA           |       | NA           |       |
| um05299   | 1 | 1 | NA      |       | NA      |       | sr10053   | NS    | 4         | sr10053 | NS           | 4     | NA           | NA    |
| um05300   | 1 | 1 | mp02621 |       | mp02621 |       | sr10054   | 2     | sr10054   | 2       | NA           |       | NA           | NA    |
| um05301   | 2 | 2 | NA      |       | NA      |       | sr10055   | 2     | sr10055   | 2       | NA           |       | NA           | NA    |
| um05302   | 1 | 1 | NA      |       | NA      |       | sr10057   | 2     | sr10057   | 2       | NA           |       | NA           | NA    |
| um05303   | 1 | 1 | NA      |       | NA      |       | sr20012   | NS NS | sr20012   | NS NS   | NA           |       | NA           | NA    |
| um10555   | 1 | 1 | NA      |       | NA      |       | NA        |       | NA        |         | NA           |       | NA           | NA    |
| um05305   | 1 | 1 | NA      |       | NA      |       | sr10058   | 2     | sr10058   | 2       | NA           |       | NA           | NA    |
| um05306   | 1 | 1 | NA      |       | NA      |       | sr10059   | 1     | sr10059   | 1       | UHOR_08128   | 1     | UHOR_08128   | 1     |
| um10556   | 1 | 1 | NA      |       | NA      |       | sr10060   | NS NS | sr10060   | NS NS   | NA           |       | NA           | NA    |
| um05308   | 1 | 1 | NA      |       | NA      |       | NA        |       | NA        |         | NA           |       | NA           | NA    |
| um05309   |   |   |         |       |         |       |           |       |           |         |              |       |              |       |
| [um05310] | 3 | 3 | NA      |       | NA      |       | sr20013   | 2     | sr20013   | 2       | NA           |       | NA           | NA    |
| um05310   | 1 | 1 | NA      |       | NA      |       | sr20013   | 2     | sr20013   | 2       | NA           |       | NA           | NA    |
|           |   |   |         |       |         |       |           |       |           |         |              |       |              |       |
| um05311   | 1 | 1 | NA      |       | NA      |       | NA        |       | NA        |         | UHOR_08130   |       | UHOR_08130   |       |
| um05312   | 1 | 1 | NA      |       | NA      |       | sr20014   | 1     | sr20014   | 1       | [UHOR_08132] | 1     | [UHOR_08132] | 1     |
|           |   |   |         |       |         |       |           |       |           |         |              |       |              |       |
|           |   |   |         |       |         |       |           |       |           |         |              |       |              |       |
| um05313   |   |   | NA      |       | NA      |       | NA        |       | sr05445   | NS NS   | NA           |       | UHOR_08134   |       |
| um05314   | 1 | 1 | NA      |       | NA      |       | sr10069   | 1     | sr10069   | 1       | NA           |       | UHOR_08134   |       |
| um10557   | 1 | 1 | NA      |       | NA      |       | NA        |       | NA        |         | NA           |       | UHOR_07208   |       |
| um05316   |   |   | NA      |       | NA      |       | NA        |       | NA        |         | NA           |       | [UHOR_01239, |       |
| um05317   | 1 | 1 | NA      |       | NA      |       | NA        |       | NA        |         | NA           |       | UHOR_1255,   |       |
| um05318   | 1 | 1 | NA      |       | NA      |       | sr10075   | 2     | sr10075   | 2       | NA           |       | UHOR_12189]  | NS NS |
| um05319   | 1 | 1 | NA      |       | NA      |       | sr10073   | 1     | sr10073   | 1       | NA           |       | UHOR_10033   | 1     |
| um10558   |   |   | mp02624 | NS NS | mp02624 | NS NS | sr10071   | NS NS | sr10071   | NS NS   | UHOR_08135   | NS NS | UHOR_08135   | NS NS |

Um\_22A



|         |   |   |         |    |    |         |    |    |         |    |    |         |    |    |            |    |            |            |    |    |
|---------|---|---|---------|----|----|---------|----|----|---------|----|----|---------|----|----|------------|----|------------|------------|----|----|
| um11233 |   |   | mp02835 | NS | NS | mp02835 | NS | NS | sr11349 | NS | NS | sr11349 | NS | NS | UHOR_08817 | NS | NS         | UHOR_08817 | NS | NS |
| um06221 | 4 | 4 | NA      |    |    | NA      |    |    | NA      |    |    | NA      |    |    | UHOR_08818 | 1  | UHOR_08818 | 1          |    |    |
| um06222 | 1 | 1 | NA      |    |    | NA      |    |    | NA      |    |    | NA      |    |    | NA         |    | NA         |            |    |    |
| um06223 | 2 | 2 | NA      |    |    | NA      |    |    | NA      |    |    | NA      |    |    | NA         |    | NA         |            |    |    |
| um06224 |   |   | mp02841 | NS | NS | mp02841 | NS | NS | sr11356 | NS | NS | sr11356 | NS | NS | UHOR_08820 | NS | NS         | UHOR_08820 | NS | NS |

NS specifies non-secreted protein coding genes

NA specifies the absence of an orthologous gene

Grey shade highlights PSEP-encoding genes

SP and TP columns represent the SignalP v4 and TargetP v1.1 predicted PSEPs, respectively

OrthoMCL and Inparanoid columns represent the orthologous genes predicted by OrthoMCL and Inparanoid tools, respectively

Gene Ids in brackets are the gene Ids of paralogous genes.

Supplementary table 3. *Ustilago maydis* newly identified pathogenicity clusters and their orthologous genes in other genomes.

| <i>U.maydis</i>   |    |    | <i>M. pennsylvanicum</i> |    |         |            | <i>S.reilianum</i> |    |  |    |                      | <i>U.hordei</i>                        |    |                      |            |    |            |                             |              |        |            |    |    |
|---|----|----|--------------------------|----|---------|------------|--------------------|----|--|----|----------------------|--|----|----------------------|------------|----|------------|-----------------------------|--------------|--------|------------|----|----|
| Gene Ids  | SP | TP | OrthoMCL                 | SP | TP      | Inparanoid | SP                 | TP | OrthoMCL   | SP | TP                   | Inparanoid                             | SP | TP                   | OrthoMCL   | SP | TP         | Inparanoid                  | SP           | TP     |            |    |    |
| <b>Um_1A_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um00104   |    | 1  | mp02114                  |    | 1       | mp02114    |                    | 1  | sr11444  |    | 1                    | sr11444                                |    | 1                    | UHOR_00167 |    | 3          | NA                          |              |        |            |    |    |
| um00105   |    | 1  | mp02113                  |    | 1       | mp02113    |                    | 1  | sr11445  |    | 1                    | sr11445                                |    | 1                    | UHOR_00168 |    | 1          | UHOR_00168                  |              |        | 1          |    |    |
| um10023   |    | 5  | mp01976                  | NS | 4       | mp01976    | NS                 | 4  | sr11446  | NS | 5                    | sr11446                                | NS | 5                    | UHOR_00169 | NS | 5          | UHOR_00169                  | NS           |        | 5          |    |    |
| um10024   |    | 2  | mp02112                  |    | 2       | mp02112    |                    | 2  | sr11447  |    | 1                    | sr11447                                |    | 1                    | UHOR_00170 |    | 2          | UHOR_00170                  |              |        | 2          |    |    |
| <b>Um_1B_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um11443   |    | 2  | NA                       |    | NA      |            |                    |    | NA   |    | NA                   |  |    |                      | UHOR_08916 |    |            | [UHOR_08915]                |              | 2 [ 1] |            |    |    |
| um00538   |    | 1  | mp02666                  |    | 1       | mp02666    |                    | 1  | sr11817  |    | 1                    | sr11817                                |    | 1                    | UHOR_00823 |    | 1          | UHOR_00823                  |              |        | 1          |    |    |
| um11444   |    | 1  | NA                       |    | NA      |            |                    |    | NA   |    | NA                   |  |    |                      | UHOR_08916 |    | 2          | [UHOR_08915]                |              | 2 [ 1] |            |    |    |
| <b>Um_2A_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um01427   |    | 2  | mp01568                  |    | 2       | mp01568    |                    | 2  | NA   |    | NA                   |  |    |                      | UHOR_02143 |    | 1          | UHOR_02143                  |              |        | 1          |    |    |
| um01428   | NS | 3  | mp01567                  | NS | 3       | mp01567    | NS                 | 3  | sr12494  | NS | NS                   | sr12494                                | NS | NS                   | UHOR_02144 | NS | 4          | UHOR_02144                  | NS           |        | 4          |    |    |
| um01429   | NS | 1  | NA                       |    | NA      |            |                    |    | sr12497  | NS | 3                    | sr12497                                | NS | 3                    | UHOR_02147 | NS | 1          | UHOR_02147                  | NS           |        | 1          |    |    |
| <b>Um_3A_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um01854   |    | 2  | mp02373                  |    | 2       | mp02373    |                    | 2  | sr10554  |    | 2                    | sr10554                                |    | 2                    | UHOR_02751 |    | 2          | UHOR_02751                  |              |        | 2          |    |    |
| um01855   |    | 3  | mp02372                  |    | 2       | mp02372    |                    | 2  | sr10555  |    | 1                    | sr10555                                |    | 1                    | UHOR_02752 |    | 1          | UHOR_02752                  |              |        | 1          |    |    |
| um01856   | NS | 4  | mp02313                  | NS | 3       | mp02313    | NS                 | 3  | sr10556  | NS | 2                    | sr10556                                | NS | 2                    | UHOR_02759 | NS | 4          | UHOR_02759                  | NS           |        | 4          |    |    |
| um01857   | NS | NS | mp02314                  | NS | NS      | mp02314    | NS                 | NS | sr10553.2  | NS | NS                   | sr10553.2                              | NS | NS                   | UHOR_02758 | NS | NS         | UHOR_02758                  | NS           | NS     |            |    |    |
| um01858   |    | 1  | mp02317                  |    | 4       | mp02317    |                    | 4  | NA   |    | NA                   |  |    |                      | UHOR_02756 |    | 1          | UHOR_02756                  |              |        | 1          |    |    |
| <b>Um_5A_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um02134   |    | 2  | mp05657                  |    | 3       | mp05657    |                    | 3  | sr13360  |    | 5                    | sr13360                                |    | 5                    | UHOR_03533 |    | 3          | UHOR_03533                  |              |        | 3          |    |    |
| um02135   |    | 2  | NA                       |    | NA      |            |                    |    | NA   |    | sr13362              |  | 4  | NA                   |            | NA |            | NA                          |              |        |            |    |    |
| um02136   |    | 4  | NA                       |    | NA      |            |                    |    | NA   |    | sr13363              |  | 1  | NA                   |            | NA |            | NA                          |              |        |            |    |    |
| um02137   |    | 2  | NA                       |    | NA      |            |                    |    | NA   |    | NA                   |  |    | NA                   |            | NA |            | NA                          |              |        |            |    |    |
| um02138   |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| [um11377.2,<br>um01796]   |    | 1  | NA                       |    | mp05658 |            | 2                  | NA |  |    | sr13364              |  | 1  | NA                   |            |    | UHOR_15387 | [UHOR_15725]                |              | 1 [1]  |            |    |    |
| um02139   |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| [um03314,<br>um03313,<br>um02140.2]   |    | 2  | mp05659                  |    | 2       | mp05671    |                    | 1  | sr13377  | NS | NS                   | sr13377                                | NS | NS                   | NA         |    |            | UHOR_15858                  | [UHOR_13170] |        | 1 [1]      |    |    |
| um02140.2   |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| [um02139,<br>um03314,<br>um3313]  |    | 1  | mp05659                  |    | 2       | mp05659    |                    | 2  | sr13377  | NS | NS                   | sr13377                                | NS | NS                   | NA         |    |            | UHOR_15858                  | [UHOR_13170] |        | 1 [1]      |    |    |
| um02141   |    | 1  | NA                       |    | NA      |            |                    |    | sr13382 [sr13380,<br>sr13381, sr13379,<br>sr13376] | NS | 1 [2,<br>1, 1,<br>1] | sr13382 [sr13380,<br>sr13379, sr13376] | NS | 1 [2,<br>1, 1,<br>1] | NA         |    | NA         |                             |              |        |            |    |    |
| <b>Um_5B_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um10076   |    | 1  | NA                       |    | NA      |            |                    |    | NA   |    | NA                   |  |    |                      | NA         |    |            | UHOR_15323                  | NS           |        | 5          |    |    |
| um02229   |    | 1  | NA                       |    | NA      |            |                    |    | sr13418  |    | 1                    | sr13418                                |    | 1                    | UHOR_03665 |    | 1          | UHOR_03665                  |              |        | 1          |    |    |
| um02230   |    | 1  | NA                       |    | NA      |            |                    |    | sr13419  |    | 2                    | sr13419                                |    | 2                    | NA         |    | NA         |                             |              |        |            |    |    |
| um02231   |    | 1  | NA                       |    | NA      |            |                    |    | sr13420  |    | 1                    | sr13420                                |    | 1                    | NA         |    | NA         |                             |              |        |            |    |    |
| <b>Um_5C_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um02285   | NS | 2  | mp03251                  | NS | 2       | mp03251    | NS                 | 2  | sr13482  | NS | 3                    | sr13482                                | NS | 3                    | UHOR_03753 | NS | 3          | UHOR_03753                  | NS           |        | 3          |    |    |
| um02286   |    | 1  | NA                       |    | NA      |            |                    |    | sr13483  | NS | NS                   | sr13483                                | NS | NS                   | UHOR_03754 | NS | NS         | UHOR_03754                  | NS           | NS     |            |    |    |
| um11403   |    | 1  | mp03275                  |    | 1       | mp03275    |                    | 1  | sr13484  |    | 1                    | sr13484                                |    | 1                    | UHOR_03756 |    | 1          | UHOR_03756                  |              |        | 1          |    |    |
| <b>Um_5D_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um02293   |    | 2  | mp03254                  |    | 4       | mp03254    |                    | 4  | sr13490  |    | 1                    | sr13490                                |    | 1                    | UHOR_03765 |    | 1          | NA                          |              |        |            |    |    |
| um02294   |    | 1  | NA                       |    | NA      |            |                    |    | sr13491  |    | 1                    | sr13491                                |    | 1                    | NA         |    | NA         |                             |              |        |            |    |    |
| um02295   |    | 1  | NA                       |    | NA      |            |                    |    | NA   |    | sr13492              |  | 2  | NA                   |            | NA |            | NA                          |              |        |            |    |    |
| um02296   |    | 1  | NA                       |    | NA      |            |                    |    | sr13493  |    | 1                    | sr13493                                |    | 1                    | NA         |    | NA         |                             |              |        |            |    |    |
| um02297   |    | 1  | NA                       |    | NA      |            |                    |    | sr13494  |    | 1                    | sr13494                                |    | 1                    | NA         |    | NA         |                             |              |        |            |    |    |
| um02298   |    | 2  | NA                       |    | NA      |            |                    |    | sr13495  |    | 1                    | sr13495                                |    | 1                    | UHOR_03786 |    | 1          | UHOR_03786                  |              |        | 1          |    |    |
| um02299   |    | 1  | NA                       |    | NA      |            |                    |    | sr13496  |    | 1                    | sr13496                                |    | 1                    | NA         |    | NA         |                             |              |        |            |    |    |
| <b>Um_5E_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um02504   | NS | 1  | NA                       |    | NA      |            |                    |    | sr13612  | NS | 1                    | sr13612                                | NS | 1                    | NA         |    | NA         |                             |              |        |            |    |    |
| um10169   |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| [um03636,<br>um00827,<br>um12058,<br>um11874,<br>um01443,<br>um04693,<br>um06356,<br>um06479,<br>um06351,<br>um03635,<br>um05621,<br>um04887,<br>um05066,<br>um04689,<br>um06505,<br>um11979,<br>um10981,<br>um11109,<br>um05436,<br>um06514] |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um02506   | NS | 5  | mp04509                  | NS | NS      | mp04509    | NS                 | NS | sr14681  | NS | NS                   | NA                                     |    |                      | UHOR_07450 |    |            | [UHOR_03234,<br>UHOR_02119] | NS           | NS     | UHOR_13031 | NS | NS |
| [um00445]   |    | 1  | NA                       |    | NA      |            |                    |    | sr10115  |    | 2                    | NA                                     |    |                      | UHOR_00698 | NS | NS         | UHOR_00698                  | NS           | NS     |            |    |    |
| um02508   | NS | NS | mp01158                  | NS | NS      | mp01158    | NS                 | NS | sr10955  | NS | NS                   | sr10955                                | NS | NS                   | UHOR_04034 | NS | NS         | UHOR_04034                  | NS           | NS     |            |    |    |
| um11406   | NS | 5  | mp01159                  | NS | 3       | mp01159    | NS                 | 3  | sr10956  | NS | 4                    | sr10956                                | NS | 4                    | UHOR_04036 | NS | NS         | UHOR_04036                  | NS           | NS     |            |    |    |
| um02510   |    | 1  | NA                       |    | NA      |            |                    |    | sr10957  |    | 1                    | sr10957                                |    | 1                    | UHOR_04037 |    | 1          | UHOR_04037                  |              |        | 1          |    |    |
| um11407   |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| [um11407]   |    | 1  | mp01160                  |    | 1       | mp01160    |                    | 1  | sr10958  |    | 1                    | sr10958                                |    | 1                    | UHOR_04038 |    | 1          | UHOR_04038                  |              |        | 1          |    |    |
| <b>Um_7A_1</b>  |    |    |                          |    |         |            |                    |    |  |    |                      |  |    |                      |            |    |            |                             |              |        |            |    |    |
| um02851   |    | 1  | NA                       |    | NA      |            |                    |    | sr13898 [sr13902]                                  |    | 1 [1]                | sr13902                                |    | 1                    | UHOR_04494 |    | 1          | UHOR_04494                  |              |        | 1          |    |    |
| um02852   |    | 2  | NA                       |    | NA      |            |                    |    | sr13903  |    | 2                    | sr13903                                |    | 2                    | UHOR_04496 |    | 1          | UHOR_04496                  |              |        | 1          |    |    |
| um02853   |    | 1  | NA                       |    | NA      |            |                    |    | sr13904  |    | 1                    | sr13904                                |    | 1                    | NA         |    | NA         |                             |              |        |            |    |    |
| um02854   |    | 1  | NA                       |    | NA      |            |                    |    | NA   |    | sr13905              |  | 2  | NA                   |            | NA |            | NA                          |              |        |            |    |    |
| um11484   |    | 1  | NA                       |    | NA      |            |                    |    | NA   |    | NA                   |  |    | NA                   |            | NA |            | NA                          |              |        |            |    |    |



|  |   |  |  |   |   |  |  |  |  |                           |
|--|---|--|--|---|---|--|--|--|--|---------------------------|
| um06178<br>[um06126,<br>um06180,<br>um06181,<br>um11250,<br>um06179]<br>um06179<br>[um06126,<br>um06180,<br>um06181,<br>um11250,<br>um06178]<br>um06180<br>[um06126,<br>um06178,<br>um06181,<br>um11250,<br>um06179]<br>um06181<br>[um06126,<br>um06178,<br>um06180,<br>um11250,<br>um06179] | 2<br><br>1<br><br>1<br><br>2                  | NA<br><br>NA<br><br>NA<br><br>NA               | NA<br><br>NA<br><br>NA<br><br>NA                         | NA<br><br>NA<br><br>NA<br><br>NA          | NA<br><br>NA<br><br>NA<br><br>NA                | UHOR_14902<br>[UHOR_08758,<br>UHOR_08757,<br>UHOR_12644]<br><br>UHOR_14902<br>[UHOR_08758,<br>UHOR_08757,<br>UHOR_12644]<br><br>UHOR_14902<br>[UHOR_08758,<br>UHOR_08757,<br>UHOR_12644]<br><br>UHOR_14902<br>[UHOR_08758,<br>UHOR_08757,<br>UHOR_12644] | 1 [1, 1,<br>1]<br><br>1 [1, 1,<br>1]<br><br>1 [1, 1,<br>1]<br><br>1 [1, 1,<br>1]     |  |  |                           |
| <b>Um_11</b>   |   |  |  |   |   |  |  |  |  |                           |
| um00792<br>um00793<br>[um00794]<br>um00795   | 1<br>1 [NS]<br>2                              | NA<br>NA<br>NA                                 | NA<br>NA<br>NA   | sr12084 [sr12085]<br>sr12086<br>sr12087   | 1[1]<br>1 sr12086<br>2 sr12087                  | 1<br>1<br>2  | UHOR_01209<br>[UHOR_01211]<br>UHOR_01209<br>[UHOR_01211]<br>UHOR_01210<br>UHOR_01210 | 1[1]<br><br>1<br>1   |  |                           |
| <b>Um_21</b>   |   |  |  |   |   |  |  |  |  |                           |
| um10565<br>um00874<br>um00876<br>um10568.2<br>um00878  | 1<br>NS 5<br>2<br>NS 3<br>NS 5                | mp00857<br>NA<br>mp00859<br>mp06340<br>mp00860 | 1 mp00857<br>NA<br>2 mp00859<br>NS NS NA<br>NS 4 mp00860 | 1<br>1<br>2<br>NS 3<br>NS 5               | sr12163<br>NA<br>sr12165<br>sr17063<br>sr12167  | 2 sr12163<br>NA<br>2 sr12165<br>3 sr17063<br>5 sr12167   | 2<br>2<br>NS 3<br>NS 5   | UHOR_01315<br>NA<br>UHOR_01319<br>UHOR_17004<br>UHOR_01323 | 1 UHOR_01315<br>NA<br>2 UHOR_01319<br>3 UHOR_17004<br>5 UHOR_01323 | 1<br>2<br>NS 3<br>NS 5    |
| <b>Um_21I</b>  |   |  |  |   |   |  |  |  |  |                           |
| um11839.2<br>um11840<br>um00882  | 1<br>NS<br>1                                  | mp00862<br>mp00861<br>mp03838                  | 1 mp00862<br>NS NS mp00861<br>1 mp03838                  | 1<br>NS NS<br>2                           | sr12171<br>sr12172<br>sr12175                   | 1 sr12171<br>NS NS sr12172<br>2 sr12175  | 1<br>NS NS<br>2  | UHOR_01328<br>UHOR_01329<br>UHOR_01332                     | 1 UHOR_01328<br>NS NS UHOR_01329<br>1 UHOR_01332                   | 1<br>NS NS<br>1           |
| <b>Um_31</b>   |   |  |  |   |   |  |  |  |  |                           |
| um01705<br>um11362<br>um01708  | 2<br>1<br>NS 2                                | mp04177<br>NA<br>mp04072                       | 4 mp04177<br>NA<br>NS 3 mp04072                          | 4<br>NS 3                                 | sr12778<br>sr12780<br>sr12783                   | 2 sr12778<br>1 sr12780<br>NS 3 sr12783   | 2<br>1<br>NS 3   | UHOR_02535<br>UHOR_02538<br>UHOR_02545                     | 2 UHOR_02535<br>1 UHOR_02538<br>NS 2 UHOR_02545                    | 2<br>1<br>NS 2            |
| <b>Um_31I</b>  |   |  |  |   |   |  |  |  |  |                           |
| um01772<br>um01774<br>um01775  | 1<br>2<br>NS 5                                | mp04147<br>mp04107<br>mp04108                  | 1 mp04147<br>2 mp04107<br>NS 4 mp04108                   | 1<br>2<br>NS 4                            | sr12850<br>sr12852<br>sr12853                   | 2 sr12850<br>1 sr12852<br>NS 5 sr12853   | 2<br>1<br>NS 5   | UHOR_02636<br>UHOR_02638<br>UHOR_02640                     | 1 UHOR_02636<br>1 UHOR_02638<br>NS 5 UHOR_02640                    | 1<br>1<br>NS 5            |
| <b>Um_31II</b>   |   |  |  |   |   |  |  |  |  |                           |
| um01894<br>um10268<br>um01897<br>um01898   | NS 3<br>1<br>NS 3<br>1                        | NA<br>NA<br>mp04200<br>mp04202                 | mp04199<br>NA<br>NS NS mp04200<br>1 mp04202              | 3<br>NS NS<br>NS NS<br>1                  | NA<br>sr10618<br>sr10619<br>sr10621<br>sr10624  | 3<br>1 sr10618<br>2 sr10621<br>1 sr10624   | 3<br>1<br>2<br>1   | NA<br>UHOR_02811<br>UHOR_02812<br>UHOR_02816<br>UHOR_02820 | UHOR_02811<br>1 UHOR_02812<br>2 UHOR_02816<br>1 UHOR_02820         | 2<br>1<br>2<br>1          |
| <b>Um_81</b>   |   |  |  |   |   |  |  |  |  |                           |
| um10380<br>um03138<br>um03140.2  | NS 1<br>1<br>NS 1                             | mp02476<br>NA<br>mp02475                       | NS 1 mp02476<br>NA<br>NS 4 mp02475                       | NS 1<br>NS 4                              | sr11076<br>NA<br>sr11072                        | NS 1 sr11076<br>sr11075<br>1 sr11072   | NS 1<br>1<br>1   | UHOR_04959<br>NA<br>UHOR_04902                             | NS 1 UHOR_04959<br>NA<br>1 UHOR_04902                              | NS 1<br>1<br>1            |
| <b>Um_81I</b>  |   |  |  |   |   |  |  |  |  |                           |
| um11014<br>um12226<br>um11015<br>[um03372]   | NS 4<br>2<br>3<br>[NS]                        | mp02452<br>NA<br>mp01260                       | NS NS mp02452<br>NA<br>NS NS mp01260                     | NS NS<br>NS NS                            | sr14367<br>sr14368<br>sr14371                   | NS 4 sr14367<br>1 sr14368<br>NS NS sr14370   | NS 4<br>1<br>NS NS   | UHOR_05230<br>UHOR_05232<br>UHOR_05234                     | NS 4 UHOR_05230<br>2 UHOR_05232<br>NS NS UHOR_05234                | NS 4<br>2<br>NS NS        |
| <b>Um_91</b>   |   |  |  |   |   |  |  |  |  |                           |
| um11064<br>um03392.2<br>um03393  | NS 5<br>1<br>NS 4                             | NA<br>NA<br>NA                                 | NA<br>NA<br>NA   | NA<br>sr14504<br>NA                       | NA<br>2 sr14504<br>NA                           | 2<br>2   | NA<br>NA<br>NA   | NA<br>NA<br>NA   | NA<br>NA<br>NA   | NA<br>NA<br>NA            |
| <b>Um_131</b>  |   |  |  |   |   |  |  |  |  |                           |
| um04637<br>um11540<br>um11541  | NS 1<br>2<br>1                                | NA<br>mp05745<br>mp03463                       | NA<br>NS NS mp05745<br>1 1 mp03463                       | NS NS<br>NS NS<br>1 1                     | sr15521<br>sr15523<br>sr15524                   | NS 1 sr15521<br>1 sr15523<br>1 sr15524   | NS 1<br>1<br>1   | UHOR_06669<br>NA<br>UHOR_06672                             | NS 1 UHOR_06669<br>NA<br>NS 1 UHOR_06672                           | NS 1<br>1<br>NS 1         |
| <b>Um_191</b>  |   |  |  |   |   |  |  |  |  |                           |
| um05314<br>um10557<br>um05317<br>um05318<br>um05319  | 1<br>1<br>1<br>1<br>1                         | NA<br>NA<br>NA<br>NA<br>NA                     | NA<br>NA<br>NA<br>NA<br>NA                               | sr10069<br>NA<br>NA<br>sr10075<br>sr10073 | 1 sr10069<br>NA<br>NA<br>2 sr10075<br>1 sr10073 | 1<br>2<br>1  | NA<br>NA<br>NA<br>NA<br>UHOR_10033   | NA<br>NA<br>NA<br>NA<br>UHOR_10033                         | NA<br>NA<br>NA<br>NA<br>1  | NA<br>NA<br>NA<br>NA<br>1 |
| <b>Um_211</b>  |   |  |  |   |   |  |  |  |  |                           |
| um06126<br>[um06180,<br>um06181,<br>um06178,<br>um11250,<br>um06179]<br>um06127<br>[um06128]<br>um06128<br>[um06127]   | 2<br>[1, 2,<br>2, 1,<br>NS]<br>1 [1]<br>1 [1] | NA<br>NA<br>NA<br>NA                           | NA<br>NA<br>NA<br>NA                                     | NA<br>NA<br>NA<br>NA                      | NA<br>NA<br>NA<br>NA                            | NA<br>NA<br>NA<br>NA   | UHOR_08691<br>UHOR_08691   | 1 UHOR_08691<br>1 UHOR_08691                               | 1<br>1   |                           |

NS specifies the non-secreted protein coding genes

NA specifies the absence of an orthologous gene

Grey shade highlights the PSEPs genes

SP and TP columns represent the SignalP v4 and TargetP v1.1 predicted PSEPs, respectively

OrthoMCL and Inparanoid columns represent the orthologous genes predicted by OrthoMCL and Inparanoid tools respectively

Gene ids in brackets are the gene ids of paralogous genes

Pathogenicity cluster identifiers has been named according to this nomenclature: SpeciesName\_ChromosomeClusterNumber\_1

Clusters having letter as cluster number have been predicted by both of the "Three direct Neighbour" and "3kb Window based" methods  
Clusters having Roman numerals as cluster number have been predicted by the "3kb Window based" method  
"\_1" has been added to cluster identifier to distinguish the Ids from previously reported clusters

**Supplementary table 4. *Sporisorium reilianum* pathogenicity clusters and their orthologous genes in other genomes.**

| <i>S. reilianum</i>                 |    |    | <i>M. pennsylvanicum</i> |    |    |            | <i>U. hordei</i> |    |   |    |    | <i>U. maydis</i>        |    |    |                   |    |       |                      |    |          |  |
|-------------------------------------|----|----|--------------------------|----|----|------------|------------------|----|---|----|----|-------------------------|----|----|-------------------|----|-------|----------------------|----|----------|--|
| Gene Ids                            | SP | TP | OrthoMCL                 | SP | TP | Inparanoid | SP               | TP | OrthoMCL  | SP | TP | Inparanoid              | SP | TP | OrthoMCL          | SP | TP    | Inparanoid           | SP | TP       |  |
| <b>Sr_1A</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr11400 [sr13525, sr11401, sr11402] |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr11401 [sr13525, sr11400, sr11402] |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr11402 [sr13525, sr11401, sr11400] |    | 3  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr11403                             | NS | 1  | mp02129                  | NS | 2  | mp02129    | NS               | 2  | UHOR_00116                                      | NS | 2  | UHOR_00116              | NS | 2  | um10017           | NS | 1     | um10017              | NS | 1        |  |
| <b>Sr_1B</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr11444                             |    | 1  | mp02114                  |    | 1  | mp02114    |                  | 1  | UHOR_00167                                      |    | 3  | UHOR_00167              |    | 3  | um00104           |    | 1     | um00104              |    | 1        |  |
| sr11445                             |    | 1  | mp02113                  |    | 1  | mp02113    |                  | 1  | UHOR_00168                                      |    | 1  | UHOR_00168              |    | 1  | um00105           |    | 1     | um00105              |    | 1        |  |
| sr11446                             | NS | 5  | mp01976                  | NS | 4  | mp01976    | NS               | 4  | UHOR_00169                                      | NS | 5  | UHOR_00169              | NS | 5  | um10023           | NS | 5     | um10023              | NS | 5        |  |
| sr11447                             |    | 1  | mp02112                  |    | 2  | mp02112    |                  | 2  | UHOR_00170                                      |    | 2  | UHOR_00170              |    | 2  | um10024           |    | 2     | um10024              |    | 2        |  |
| <b>Sr_1C</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr20004                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr10115                             |    | 2  | NA                       |    |    | NA         |                  |    | UHOR_00698                                      | NS | NS | UHOR_00698              | NS | NS | um00445 [um02506] |    | 1 [1] | um00445              |    | 1        |  |
| sr10116                             |    | 1  | NA                       |    |    | NA         |                  |    | UHOR_00702                                      |    | 1  | UHOR_00702              |    | 1  | um00446           |    | 1     | um00446              |    | 1        |  |
| <b>Sr_1D</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr12084 [sr12085, sr12085 [sr12084] |    | 1  | NA                       |    |    | NA         |                  |    | UHOR_01209 [UHOR_01211] UHOR_01209 [UHOR_01211] |    | 1  | UHOR_01209 [UHOR_01211] |    | 1  | um00792           |    | 1     | um00792              |    | 1        |  |
| sr12086 [sr12087]                   |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | um00793 [um00794] |    | 1     | um00793 [um00794]    |    | 1        |  |
| sr12087                             |    | 2  | NA                       |    |    | NA         |                  |    | UHOR_01210                                      |    | 1  | UHOR_01210              |    | 1  | um00795           |    | 2     | um00795              |    | 2        |  |
| <b>Sr_2A</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr10309 [sr10310]                   |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | UHOR_01863              |    | 1  | um01235           |    | 1     | um01235              |    | 1        |  |
| sr10310 [sr10309]                   |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | UHOR_01863              |    | 1  | um01235           |    | 1     | um01235              |    | 1        |  |
| sr10311 [sr10312]                   |    | 1  | mp05069                  | NS | NS | mp05069    | NS               | NS | UHOR_01866                                      | NS | NS | UHOR_01866              | NS | NS | um01236 [um01236] |    | 2 [2] | um01236              |    | 2        |  |
| sr10312 [sr10311]                   |    | 2  | mp05069                  | NS | NS | NA         |                  |    | UHOR_01866                                      | NS | NS | UHOR_01866              | NS | NS | um01237 [um01237] |    | 2 [2] | um01237              |    | 2        |  |
| sr10313                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr10314                             |    | 2  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr10315                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr10316 [sr10317]                   |    | 2  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | um01240 [um01239] |    | 1 [1] | um01240 [um01239]    |    | 1 [1]    |  |
| sr10317 [sr10316]                   |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | um01239           |    |       | NA                   |    |          |  |
| sr10318                             |    | 2  | mp05068                  |    | 1  | mp05068    |                  | 1  | NA  |    |    | NA                      |    |    | um01240 [um01240] |    | 1 [1] | NA                   |    |          |  |
| um01241                             |    |    |                          |    |    |            |                  |    | NA  |    |    | NA                      |    |    | um01241           |    | 4     | um01241              |    | 4        |  |
| <b>Sr_2B</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr10431.2                           |    | 1  | NA                       |    |    | NA         |                  |    | UHOR_01950                                      | NS | NS | UHOR_01950              | NS | NS | um01299           |    | 1     | um01299              |    | 1        |  |
| sr10432.2                           |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | um01301           |    | 2     | um01301              |    | 2        |  |
| sr20001                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | um01302           |    | 1     | um01302              |    | 1        |  |
| sr10433                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| <b>Sr_3A</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr12850                             |    | 2  | mp04147                  |    | 1  | mp04147    |                  | 1  | UHOR_02636                                      |    | 1  | UHOR_02636              |    | 1  | um01772           |    | 1     | um01772              |    | 1        |  |
| sr12851                             | NS | NS | mp04146                  | NS | NS | mp04146    | NS               | NS | UHOR_02639                                      | NS | NS | UHOR_02639              | NS | NS | um01773           | NS | NS    | um01773              | NS | NS       |  |
| sr12852                             |    | 1  | mp04107                  |    | 2  | mp04107    |                  | 2  | UHOR_02638                                      |    | 1  | UHOR_02638              |    | 1  | um01774           |    | 2     | um01774              |    | 2        |  |
| sr12853                             | NS | 5  | mp04108                  | NS | 4  | mp04108    | NS               | 4  | UHOR_02640                                      | NS | 5  | UHOR_02640              | NS | 5  | um01775           | NS | 5     | um01775              | NS | 5        |  |
| sr12854                             | NS | NS | mp04145                  | NS | NS | mp04145    | NS               | NS | UHOR_02641                                      | NS | NS | UHOR_02641              | NS | NS | um01776           | NS | NS    | um01776              | NS | NS       |  |
| sr12855                             | NS | 5  | mp04144                  | NS | NS | mp04144    | NS               | NS | UHOR_02643                                      | NS | NS | UHOR_02643              | NS | NS | um01777           | NS | NS    | um01777              | NS | NS       |  |
| sr12856                             |    | 2  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr12857                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | UHOR_02647              |    | 2  | NA                |    |       | um01779              |    | 1        |  |
| <b>Sr_3B</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr10554                             |    | 2  | mp02373                  |    | 2  | mp02373    |                  | 2  | UHOR_02751                                      |    | 2  | UHOR_02751              |    | 2  | um01854           |    | 2     | um01854              |    | 2        |  |
| sr10555                             |    | 1  | mp02372                  |    | 2  | mp02372    |                  | 2  | UHOR_02752                                      |    | 1  | UHOR_02752              |    | 1  | um01855           |    | 3     | um01855              |    | 3        |  |
| sr10556                             | NS | 2  | mp02313                  | NS | 3  | mp02313    | NS               | 3  | UHOR_02759                                      | NS | 4  | UHOR_02759              | NS | 4  | um01856           | NS | 4     | um01856              | NS | 4        |  |
| <b>Sr_5A</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr13341                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr13342                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr13343                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr13344                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | um02119           |    | 1     | um02119              |    | 1        |  |
| sr13345                             |    | 1  | mp05677                  |    | 1  | mp05677    |                  | 1  | UHOR_03512                                      |    | 1  | UHOR_03512              |    | 1  | um10055           |    | 1     | um10055              |    | 1        |  |
| <b>Sr_5B</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr13360                             |    | 5  | mp05657                  |    | 1  | mp05657    |                  | 1  | UHOR_03533                                      |    | 3  | UHOR_03533              |    | 3  | um02134           |    | 2     | um02134              |    | 2        |  |
| sr13361                             |    | 3  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr13362                             |    | 4  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | um02135           |    |       | um02135              |    | 2        |  |
| sr13363                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | UHOR_03536              |    | 1  | NA                |    |       | um02136              |    | 4        |  |
| sr13364                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | [um11377.2, um01796] |    | 1 [1, 2] |  |
| sr13365                             |    | 1  | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr13366                             | NS | NS | NA                       |    |    | NA         |                  |    | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| sr13367 [sr13374, sr13375]          |    | 2  | NA                       |    |    | mp05658    |                  | 2  | NA  |    |    | NA                      |    |    | NA                |    |       | NA                   |    |          |  |
| <b>Sr_5C</b>                        |    |    |                          |    |    |            |                  |    |   |    |    |                         |    |    |                   |    |       |                      |    |          |  |
| sr13384                             |    | 1  | mp05668                  | NS | 1  | mp05668    | NS               | 1  | UHOR_03555                                      | NS | 1  | UHOR_03555              | NS | 1  | um02157           | NS | 2     | um02157              | NS | 2        |  |

|                                      |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
|--------------------------------------|----|----|-------------------|----|----|-------------------|----|----|---|----|----|-------------------------------------|----|----|-------------------------------|---------|----|-----------|---------|----|-----------|
| sr13383                              | NS | NS | mp05669           | NS | NS | mp05669           | NS | NS | UHOR_03556                                      | NS | NS | UHOR_03556                          | NS | NS | um02142                       | NS      | NS | um02142   | NS      | NS |           |
| sr13382                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr13380, sr13381, sr13379, sr13376] |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02141                       |         | 1  | um02141   |         | 1  |           |
| sr13381                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr13380, sr13382, sr13381, sr13379] |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02141                       |         | 1  | NA        |         |    |           |
| sr13380                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr13376, sr13382, sr13381, sr13379] |    | 2  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02141                       |         | 1  | um02141   |         | 1  |           |
| sr13379                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr13376, sr13382, sr13381, sr13380] |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02141                       |         | 1  | um02141   |         | 1  |           |
| sr13378                              | NS | NS | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02141                       |         | 1  | um02141   |         | 1  |           |
|                                      |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    | NA                            |         |    | NA        |         |    |           |
|                                      |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    | um02139                       |         |    | um02139   |         |    |           |
|                                      |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    | [um03314, um03313, um02140.2] |         | 2  | [1, 1, 1] |         | 2  |           |
|                                      |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| sr13377                              | NS | NS | mp05659           |    | 2  | mp05659           |    | 2  | NA  |    |    | UHOR_15858 [UHOR_15857, UHOR_13170] |    | 1  | [NS, 1]                       |         |    |           |         | 2  | [1, 1, 1] |
| sr13376                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr13379, sr13382, sr13381, sr13380] |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02141                       |         | 1  | um02141   |         | 1  |           |
| sr13375                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr13367, sr13374]                   |    | 5  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | NA        |         |    |           |
| sr13374                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr13367, sr13375]                   |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | NA        |         |    |           |
| sr13373                              | NS | 4  | NA                |    |    | NA                |    |    | UHOR_03541                                      | NS | NS | UHOR_03541                          | NS | NS | um02147                       | NS      |    | um02147   | NS      | 3  |           |
| Sr_5D                                |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| sr10766                              |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | um02192   |         | 1  |           |
| sr10767                              |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | NA        |         |    |           |
| sr10769                              | NS | 5  | mp05143           | NS | 5  | mp05143           | NS | 5  | UHOR_03615                                      | NS | NS | UHOR_03615                          | NS | NS | um10070                       | NS      | 2  | um10070   | NS      | 2  |           |
|                                      |    |    |                   |    |    |                   |    |    | UHOR_03616 [UHOR_12270, UHOR_04380, UHOR_12275] |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| sr10770                              |    | 1  | mp05158           |    | 1  | NA                |    |    | NS  | NS | NA |                                     |    |    | um02196                       |         | 1  | NA        |         |    |           |
| Sr_5E                                |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| sr13422                              | NS | 2  | NA                |    |    | NA                |    |    | UHOR_03667                                      | NS | NS | UHOR_03667                          | NS | NS | NA                            |         |    | NA        |         |    |           |
| sr13421                              | NS | NS | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | NA        |         |    |           |
| sr13420                              |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02231                       |         | 1  | um02231   |         | 1  |           |
| sr13419                              |    | 2  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02230                       |         | 1  | um02230   |         | 1  |           |
| sr13418                              |    | 1  | NA                |    |    | NA                |    |    | UHOR_03665                                      |    | 1  | UHOR_03665                          |    | 1  | um02229                       |         | 1  | um02229   |         | 1  |           |
| Sr_5F                                |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| sr16550                              |    | 1  | mp02910 [mp03261] |    | 4  | mp02910 [mp03261] |    | 4  | UHOR_03683                                      | NS | 3  | UHOR_03683                          | NS | 3  | um05927                       |         | 1  | um05927   |         | 1  |           |
|                                      |    |    |                   |    |    |                   |    |    | UHOR_03684                                      |    | 1  | UHOR_15327                          |    | 1  | um05928                       |         | 1  | um05928   |         | 1  |           |
| sr16551                              |    | 2  | NA                |    |    | NA                |    |    | [UHOR_15327]                                    |    |    | NA                                  |    |    | NA                            |         |    | NA        |         |    |           |
| sr16552                              |    | 2  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um05930                       |         | 1  | um05930   |         | 1  |           |
| sr16553                              |    | 1  | NA                |    |    | NA                |    |    | UHOR_03426                                      |    | 2  | UHOR_03426                          |    | 2  | NA                            |         |    | NA        |         |    |           |
| sr16554                              |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um05931                       |         | 1  | um05931   |         | 1  |           |
| sr16555                              |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | um02746   |         | NS |           |
| sr16556                              | NS | NS | NA                |    |    | NA                |    |    | UHOR_03466                                      | NS | NS | NA                                  |    |    | um02745                       | NS      | NS | NA        |         | NS |           |
| sr16557                              | NS | NS | NA                |    |    | NA                |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| sr16558                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr16559, sr16560, sr16561]          |    | 2  | NA                |    |    | mp06108           |    | 1  | NA  |    |    | UHOR_06592 [UHOR_15322]             |    | 2  | [1]                           | um05932 |    | 1         | um05932 |    | 1         |
| sr16559                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr16558, sr16560, sr16561]          |    | 1  | NA                |    |    | mp06108           |    | 1  | NA  |    |    | UHOR_06592 [UHOR_15322]             |    | 2  | [1]                           | um05932 |    | 1         | um05932 |    | 1         |
| sr16560                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr16559, sr16558, sr16561]          |    | 1  | NA                |    |    | mp06108           |    | 1  | NA  |    |    | UHOR_06592 [UHOR_15322]             |    | 2  | [1]                           | um05932 |    | 1         | um05932 |    | 1         |
| sr16561                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr16559, sr16560, sr16558]          |    | 1  | NA                |    |    | mp06108           |    | 1  | NA  |    |    | UHOR_06592 [UHOR_15322]             |    | 2  | [1]                           | um05932 |    | 1         | um05932 |    | 1         |
| Sr_6A                                |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| sr10956                              | NS | 4  | mp01159           | NS | 3  | mp01159           | NS | 3  | UHOR_04036                                      | NS | NS | UHOR_04036                          | NS | NS | um11406                       | NS      | 5  | um11406   | NS      | 5  |           |
| sr10957                              |    | 1  | NA                |    |    | NA                |    |    | UHOR_04037                                      |    | 1  | UHOR_04037                          |    | 1  | um02510                       |         | 1  | um02510   |         | 1  |           |
| sr10958                              |    | 1  | mp01160           |    | 1  | mp01160           |    | 1  | UHOR_04038                                      |    | 1  | UHOR_04038                          |    | 1  | um11407                       |         | 1  | um11407   |         | 1  |           |
| Sr_6B                                |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| sr10994.2                            |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02533                       |         | 2  | um02533   |         | 2  |           |
| sr10995.2                            |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | NA        |         |    |           |
| sr20006                              |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um11415                       |         | 2  | um11415   |         | 2  |           |
| sr10996.2                            |    | 1  | NA                |    |    | NA                |    |    | UHOR_12257                                      |    | 1  | UHOR_12257                          |    | 1  | um02535                       |         | 1  | um02535   |         | 1  |           |
| sr10997.2                            |    | 2  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | um11416   |         | 1  |           |
| sr10998.2                            | NS | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | NA        |         |    |           |
| sr20007                              |    | 3  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02538                       |         | 1  | um02538   |         | 1  |           |
| sr11000.2                            |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr11000.2]                          |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um11417                       |         | 1  | um11417   |         | 1  |           |
| sr11002.2                            |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr11008.2, sr11006, sr11003]        |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | NA        |         |    |           |
| sr11003                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr11008.2, sr11006, sr11002.2]      |    | 1  | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | NA                            |         |    | NA        |         |    |           |
| sr11004                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr17058, sr16641, sr17412]          | NS | NS | mp06294           | NS | NS | mp06294           | NS | NS | NA  |    |    | UHOR_16530                          | NS | NS | NA                            |         |    | NA        |         |    |           |
| sr11005                              |    |    |                   |    |    |                   |    |    |   |    |    |                                     |    |    |                               |         |    |           |         |    |           |
| [sr16642]                            | NS | NS | NA                |    |    | NA                |    |    | NA  |    |    | NA                                  |    |    | um02816                       | NS      | NS | NA        |         |    |           |



|  |      |                            |                            |                             |   |                             |           |       |           |
|--|------|----------------------------|----------------------------|-----------------------------|---|-----------------------------|-----------|-------|-----------|
| sr11006<br>[sr11002.2,<br>sr11008.2,<br>sr11003]<br>sr11008.2<br>[sr11002.2,<br>sr11006,<br>sr11003]   | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr11009  | 1    | NA<br>mp01109<br>[mp05408] | NA<br>mp01109<br>[mp05408] | 1                           | NA  | NA                          | um02540   | 1     | um02540   |
| <b>Sr_6C</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr13833  | 4    | NA                         | NA                         | UHOR_04718                  | 2   | UHOR_04718                  | 2         | NA    | NA        |
| sr13834  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr13835  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr13836  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| <b>Sr_7A</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr13900  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr13901  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr13902<br>[sr13898]   | 1    | NA                         | NA                         | UHOR_04494                  | 1   | NA                          | um02851   | 1     | um02851   |
| sr13903  | 2    | NA                         | NA                         | UHOR_04496                  | 1   | UHOR_04496                  | um02852   | 2     | um02852   |
| sr13904  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | um02853   | 1     | um02853   |
| sr13905  | 2    | NA                         | NA                         | NA                          | NA  | NA                          | um02854   | 1     | um02854   |
| sr13906  | 2    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| <b>Sr_8A</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr11100  | 1    | NA                         | NA                         | UHOR_04984                  | 1   | UHOR_04984                  | um03201   | 2     | um03201   |
| sr11101  | 1    | NA                         | NA                         | UHOR_04986                  | 1   | UHOR_04986                  | um03202   | 1     | um03202   |
| [sr11102]  | 1    | NA                         | NA                         | UHOR_04986                  | 1   | UHOR_04986                  | [um10403] | 1     | [um10403] |
| sr11102  | 1    | NA                         | NA                         | UHOR_04986                  | 1   | NA                          | um03202   | 1     | um03202   |
| [sr11101]  | 1    | NA                         | NA                         | UHOR_04986                  | 1   | NA                          | [um10403] | 1     | [um10403] |
| <b>Sr_8B</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr11130<br>[sr11132,<br>sr11133,<br>sr02614]<br>sr11132<br>[sr11130,<br>sr11133,<br>sr02614]<br>sr11133<br>[sr11130,<br>sr11132,<br>sr02614] | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr02613<br>sr02614<br>[sr11130,<br>sr11132,<br>sr11133]  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| <b>Sr_8C</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr14220  | 1    | NA                         | NA                         | UHOR_04675                  | 1   | UHOR_04675                  | um03223   | 1     | um03223   |
| sr14221  | 4    | NA                         | NA                         | UHOR_15214                  | 1   | UHOR_15214                  | um12215   | 1     | um12215   |
| sr14222  | 1    | NA                         | NA                         | UHOR_04676                  | 1   | UHOR_04676                  | um12216   | 1     | um12216   |
| sr14223  | 1    | NA                         | NA                         | [UHOR_04923,<br>UHOR_04922] | 1   | [UHOR_04923,<br>UHOR_04922] | NA        | 1     | NA        |
| <b>Sr_8D</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr14380  | 1    | mp01258                    | 1                          | mp01258                     | 1   | UHOR_05247                  | um03381   | 1     | um03381   |
| sr14381  | 2    | mp01259                    | 4                          | mp01259                     | 4   | UHOR_05245                  | um03382   | 2     | um03382   |
| sr14382  | NS 3 | mp01254                    | NS 3                       | mp01254                     | NS 3                                      | NA                          | um03383   | NS 3  | um03383   |
| <b>Sr_9A</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr14385<br>[sr14386]<br>sr14386<br>[sr14385]<br>sr14387  | 4    | NA                         | NA                         | UHOR_05259                  | 2   | UHOR_05259                  | um03397   | 1     | NA        |
|  | 1    | NA                         | NA                         | UHOR_05259                  | 2   | UHOR_05259                  | um03397   | 1     | um03397   |
|  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| <b>Sr_9B</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr14475  | 2    | mp01657                    | 2                          | mp01657                     | 2   | UHOR_05362                  | um03487   | 1     | um03487   |
| sr17427  | 4    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr14476  | 1    | mp01620                    | 1                          | mp01620                     | 1   | UHOR_05364                  | um11083   | 1     | um11083   |
| <b>Sr_9C</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr11167.2  | NS 1 | mp00949                    | NS 1                       | mp00949                     | NS 1                                      | UHOR_05548                  | um03616   | NS 1  | um03616   |
| sr11165  | 3    | mp00910                    | 2                          | mp00910                     | 2   | UHOR_05546                  | um03615   | 2     | um03615   |
| sr11163.2  | 1    | mp00948                    | 2                          | mp00948                     | 2   | UHOR_05545                  | um03614   | 4     | um03614   |
| <b>Sr_9D</b>   |      |                            |                            |                             |   |                             |           |       |           |
| sr14559  | NS 5 | mp00675                    | NS NS                      | mp00675                     | NS NS                                     | NA                          | um11732   | NS NS | NA        |
| sr14558  | 3    | mp00669                    | 4                          | mp00669                     | 4   | NA                          | Um03564.2 | 1     | um03564.2 |
| sr14557  | 2    | mp00670                    | 2                          | mp00670                     | 2   | NA                          | um03563   | 3     | um03563   |
| <b>Sr_10A</b>  |      |                            |                            |                             |   |                             |           |       |           |
| sr11226  | 2    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr11227  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr11231  | 1    | NA                         | NA                         | UHOR_14478                  | 1   | NA                          | um03750   | 1     | um03750   |
| sr20008  | 2    | mp00270                    | NS NS                      | mp00270                     | NS NS                                     | UHOR_14479                  | [um03745] | 1     | [um03745] |
| sr11232  | 1    | NA                         | NA                         | NA                          | NA  | UHOR_14479                  | um03746   | 1     | um03746   |
| sr11233  | 1    | NA                         | NA                         | NA                          | NA  | UHOR_14481                  | NA        | NA    | NA        |
| sr11234.2  | 1    | NA                         | NA                         | UHOR_07107                  | 1   | NA                          | um03749   | 2     | um03749   |
| sr11235.2  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | NA        | NA    | NA        |
| sr11236.2  | 1    | NA                         | NA                         | NA                          | NA  | NA                          | um03751   | 1     | um03751   |
| sr11237<br>[sr11239.2,<br>sr11240]   | 1    | mp00267<br>[mp03415]       | mp00267<br>[mp03415]       | 5                           | UHOR_07319<br>[UHOR_08139,<br>UHOR_14482] | 1                           | um03752   | 2     | um03752   |

|                                   |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
|-----------------------------------|-------|---|-----------|-------|----------------------|---------|-------|---|---|----------|------------|------------|----------------------|---------------|---------|
| sr11238                           |       | 1 | NA        |       | mp00267<br>[mp03415] | 5       | NA    |   | UHOR_07319<br>[UHOR_08139,<br>UHOR_14482] | 1 [1]    | NA         |            | NA                   |               |         |
| sr11239.2                         |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| [sr11237,<br>sr11240]             | NS    | 1 |           |       | mp00267<br>[mp03415] | 5       | NA    |   | UHOR_07319<br>[UHOR_08139]                | 1 [1]    | NA         |            | um03752<br>[um03753] | 2 [1] NA      |         |
| sr11240                           |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| [sr11239.2,<br>sr11237]           | NS    | 1 |           |       | mp00267<br>[mp03415] | 5       | NA    |   | UHOR_07319<br>[UHOR_08139]                | 1 [1]    | NA         |            | um03752<br>[um03753] | 2 [1] um03753 |         |
| <b>Sr_11A</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr14944                           |       | 2 | NA        |       | NA                   |         | NA    |   | NA  |          |            |            | um04035<br>[um04034] | 1 um04034     |         |
| sr14945                           |       | 1 | NA        |       | NA                   |         | NA    |   | NA  |          |            |            | NA                   | um04033       |         |
| sr14946                           |       | 1 | mp05943   | NS NS | mp05943              |         | NS NS |   | UHOR_13428                                | 1        | UHOR_13428 |            | 1                    | um04039       |         |
| sr14947                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          |            |            | NA                   | um04040       |         |
| sr14948                           |       | 1 | mp05944   |       | mp05944              |         | 2     |   | UHOR_06104                                | 2        | UHOR_06104 |            | 2                    | um11062       |         |
| <b>Sr_14A</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr15239                           |       |   | mp04205   |       |                      |         |       |   | UHOR_06804                                |          |            |            | um01902.2            |               |         |
| [sr10629]                         | NS    | 2 | [mp04983] |       | mp04983              |         | NS 1  |   | [UHOR_02822]                              | NS 2 [1] | UHOR_06804 |            | NS 2 [1]             | um04353       |         |
| sr15240                           |       | 3 | mp04926   |       | mp04926              |         | 2     |   | UHOR_06805                                | 1        | UHOR_06805 |            | 1                    | um04354       |         |
| sr15241                           |       | 2 | mp04927   |       | mp04927              |         | 3     |   | UHOR_06806                                | 4        | UHOR_06806 |            | 4                    | um04355       |         |
| <b>Sr_16A</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr16117                           |       | 3 | mp00633   | NS NS | mp00633              |         | NS NS |   | UHOR_07525                                | NS NS    | UHOR_07525 |            | NS NS                | um05786.2     |         |
| sr16118                           | NS    | 5 | mp00634   | NS NS | mp00634              |         | NS NS |   | UHOR_07527                                | NS 5     | UHOR_07527 |            | NS 5                 | um05787       |         |
| sr16119                           | NS    | 3 | NA        |       | NA                   |         |       |   | UHOR_07528                                | NS 2     | UHOR_07528 |            | NS 2                 | um11586       |         |
| <b>Sr_19A</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr10050                           |       | 3 | NA        |       | NA                   |         |       |   | UHOR_10021                                | 3        | UHOR_10021 |            | 3                    | um05295       |         |
| sr10051                           | NS NS |   | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um10553       |         |
| sr10052.2                         |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um10554       |         |
| sr10053                           | NS    | 4 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            | NS                   | um05299       |         |
| sr10054                           |       | 2 | mp02621   |       | mp02621              |         | 1     |   | NA  |          | NA         |            |                      | um05300       |         |
| sr10055                           |       | 2 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um05301       |         |
| <b>Sr_19B</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr20015                           |       | 4 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| sr10068                           | NS NS |   | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um05310       |         |
| sr20013                           |       | 2 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | [um05309]     |         |
| sr20014                           |       | 1 | NA        |       | NA                   |         |       |   | UHOR_08134                                | 4        | UHOR_08134 |            | 4                    | um05312       |         |
| sr10069                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um05314       |         |
| <b>Sr_19C</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr10073                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um05319       |         |
| sr10075                           |       | 2 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um05318       |         |
| sr10077                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| sr10079                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| <b>Sr_20A</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr13490                           |       | 1 | mp03254   |       | mp03254              |         | 4     |   | UHOR_03765                                | 1        | NA         |            |                      | um02293       |         |
| sr13491                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um02294       |         |
| sr13492                           |       | 2 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um02295       |         |
| sr13493                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um02296       |         |
| sr13494                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um02297       |         |
| sr13495                           |       | 1 | NA        |       | NA                   |         |       |   | UHOR_03786                                | 1        | UHOR_03786 |            | 1                    | um02298       |         |
| sr13496                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | um02299       |         |
| <b>Sr_20B</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr13520                           | NS    | 1 | NA        |       | NA                   |         |       |   | UHOR_03805                                | NS NS    | UHOR_03805 |            | NS NS                | Um02325.2     |         |
| sr13521                           | NS NS |   | mp04997   | NS NS | mp04997              |         | NS NS |   | UHOR_03807                                | NS NS    | UHOR_03807 |            | NS NS                | um02326       |         |
| sr13522                           |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| [sr13523,<br>sr13524]             |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| sr13523                           |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| [sr13522,<br>sr13524]             |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| sr13524                           |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| [sr13522,<br>sr13523]             |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| sr13525                           |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| [sr11400,<br>sr11401,<br>sr11402] |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| <b>Sr_20C</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr16901                           | NS    | 2 | mp02947   | NS    | 1                    | NA      | NS    | 1 | UHOR_03901                                | NS       | 1          | UHOR_03901 | NS                   | 1             | um02383 |
| sr16900                           | NS    | 3 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| sr13587                           |       | 2 | mp02948   |       | mp02948              |         | 2     |   | UHOR_03898                                | 2        | UHOR_03898 |            | 2                    | um02381       |         |
| <b>Sr_22A</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr11351                           |       | 2 | NA        |       | mp06260              |         | NS NS |   | NA  |          | UHOR_08818 |            | 1                    | NA            |         |
| sr11352                           |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| sr11354.2                         |       | 1 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| sr11355                           |       | 2 | NA        |       | NA                   |         |       |   | NA  |          | NA         |            |                      | NA            |         |
| <b>Sr_2I</b>                      |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr12165                           |       | 2 | mp00859   |       | mp00859              |         | 2     |   | UHOR_01319                                | 2        | UHOR_01319 |            | 2                    | um00876       |         |
| sr17063                           | NS    | 3 | mp06340   | NS NS | NA                   |         |       |   | UHOR_17004                                | NS 3     | UHOR_17004 |            | NS 3                 | um10568.2     |         |
| sr12167                           | NS    | 5 | mp00860   | NS    | 4                    | mp00860 | NS    | 4 | UHOR_01323                                | NS 5     | UHOR_01323 |            | NS 5                 | um00878       |         |
| <b>Sr_3I</b>                      |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr12809                           |       | 3 | mp04084   |       | mp04084              |         | 2     |   | UHOR_02584                                | 3        | UHOR_02584 |            | 3                    | um01734       |         |
| sr12812                           | NS    | 5 | mp04086   | NS    | 4                    | mp04086 | NS    | 4 | UHOR_02588                                | NS 4     | UHOR_02588 |            | NS 4                 | um01737.2     |         |
| sr12814                           | NS    | 1 | mp04166   | NS    | 1                    | mp04166 | NS    | 1 | UHOR_02590                                | 1        | UHOR_02590 |            | 1                    | um01739       |         |
| <b>Sr_3II</b>                     |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |
| sr10618                           | NS    | 3 | mp04199   | NS    | 3                    | mp04199 | NS    | 3 | UHOR_02811                                | NS 2     | UHOR_02811 |            | NS 2                 | um01894       |         |
| sr10619                           |       | 1 | NA        |       | NA                   |         |       |   | UHOR_02812                                | 1        | UHOR_02812 |            | 1                    | um10268       |         |
| sr10621                           |       | 2 | mp04200   | NS NS | mp04200              |         | NS NS |   | UHOR_02816                                | 2        | UHOR_02816 |            | 2                    | um01897       |         |
| <b>Sr_3III</b>                    |       |   |           |       |                      |         |       |   |   |          |            |            |                      |               |         |

|           |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
|-----------|----|---|---------|-------|---|---------|-------|---|------------|-------|----|------------|-------|----|-----------|-------|---|-----------|-------|---|
| sr12936   |    | 4 | mp03321 |       | 3 | mp03321 |       | 3 | UHOR_02931 |       | 2  | UHOR_02931 |       | 2  | um01976   |       | 4 | um01976   |       | 4 |
| sr12937   |    | 1 | mp03322 |       | 1 | mp03322 |       | 1 | UHOR_02933 |       | 1  | UHOR_02933 |       | 1  | um01977   |       | 1 | um01977   |       | 1 |
| sr12940   | NS | 5 | mp03319 | NS NS |   | mp03319 | NS NS |   | UHOR_02936 | NS    | 1  | UHOR_02936 | NS    | 1  | um01980   | NS NS |   | um01980   | NS NS |   |
| Sr_5I     |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr10778   |    | 4 | mp05151 | NS NS |   | mp05151 | NS NS |   | UHOR_03623 | NS NS |    | UHOR_03623 | NS NS |    | um02793   | NS NS |   | um02793   | NS NS |   |
| sr10780   | NS | 2 | mp05150 | NS    | 2 | mp05150 | NS    | 2 | UHOR_03625 | NS    | 2  | UHOR_03625 | NS    | 2  | um02203   | NS    | 2 | um02203   | NS    | 2 |
| sr10781   |    | 5 | mp05149 |       | 2 | mp05149 |       | 2 | UHOR_03626 |       | 1  | UHOR_03626 |       | 1  | um02204   |       | 1 | um02204   |       | 1 |
| Sr_7I     |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr14086   | NS | 5 | mp02287 | NS NS |   | mp02287 | NS NS |   | UHOR_04751 | NS    | 3  | UHOR_04751 | NS    | 3  | um10362   | NS    | 4 | um10362   | NS    | 4 |
| sr14088   | NS | 4 | mp03794 | NS    | 4 | mp03794 | NS    | 4 | UHOR_04754 | NS NS |    | UHOR_04754 | NS NS |    | um03028   | NS    | 5 | um03028   | NS    | 5 |
| sr14091   |    | 2 | mp03793 |       | 2 | mp03793 |       | 2 | UHOR_04758 |       | 2  | UHOR_04758 |       | 2  | um12205   |       | 2 | um12205   |       | 2 |
| Sr_8I     |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr14199   | NS | 1 | mp02465 | NS    | 1 | mp02465 | NS    | 1 | UHOR_04925 | NS    | 1  | UHOR_04925 | NS    | 1  | um03156   | NS    | 1 | um03156   | NS    | 1 |
| sr14197   |    | 2 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | NA        |       |   | NA        |       |   |
| sr14196   |    | 1 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | um03154   |       |   | um03154   |       | 4 |
| Sr_8II    |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr11072   |    | 1 | mp02475 | NS    | 4 | mp02475 | NS    | 4 | UHOR_04902 |       | 1  | UHOR_04902 |       | 1  | um03140.2 | NS    | 1 | um03140.2 | NS    | 1 |
| sr11075   |    | 1 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | um03138   |       |   | um03138   |       | 1 |
| sr11076   | NS | 1 | mp02476 | NS    | 1 | mp02476 | NS    | 1 | UHOR_04959 | NS    | 1  | UHOR_04959 | NS    | 1  | um10380   | NS    | 1 | um10380   | NS    | 1 |
| Sr_8III   |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr14367   | NS | 4 | mp02452 | NS NS |   | mp02452 | NS NS |   | UHOR_05230 | NS    | 4  | UHOR_05230 | NS    | 4  | um11014   | NS    | 4 | um11014   | NS    | 4 |
| sr14368   |    | 1 | NA      |       |   | NA      |       |   | UHOR_05232 |       | 2  | UHOR_05232 |       | 2  | um12226   |       | 2 | um12226   |       | 2 |
| sr14370   | NS | 4 | NA      |       |   | NA      |       |   | NA         |       |    | UHOR_05234 | NS NS |    | NA        |       |   | um11015   |       | 3 |
| Sr_12I    |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr15149   |    | 1 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | NA        |       |   | NA        |       |   |
| sr15147   |    | 2 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | NA        |       |   | um10418   |       | 1 |
| sr15146   |    | 1 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | um12258   |       | 1 | um12258   |       | 1 |
| Sr_13I    |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr15383   | NS | 1 | mp03071 | NS    | 1 | mp03071 | NS    | 1 | UHOR_06472 | NS    | 2  | UHOR_06472 | NS    | 2  | um04500   | NS    | 1 | um04500   | NS    | 1 |
| sr15385   | NS | 1 | NA      |       |   | NA      |       |   | UHOR_06473 | NS    | 1  | UHOR_06473 | NS    | 1  | um11984   | NS    | 1 | um11984   | NS    | 1 |
| sr15386   |    | 1 | mp03027 | NS    | 4 | mp03027 | NS    | 4 | NA         |       |    | NA         |       |    | um04503   |       | 5 | um04503   |       | 5 |
| Sr_13II   |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr15521   | NS | 1 | NA      |       |   | NA      |       |   | UHOR_06669 | NS    | 1  | UHOR_06669 | NS    | 1  | um04637   | NS    | 1 | um04637   | NS    | 1 |
| sr15523   |    | 1 | mp05745 | NS NS |   | mp05745 | NS NS |   | NA         |       |    | NA         |       |    | um11540   |       | 2 | um11540   |       | 2 |
| sr15524   |    | 1 | mp03463 |       | 1 | mp03463 |       | 1 | UHOR_06672 | NS    | 1  | UHOR_06672 | NS    | 1  | um11541   |       | 1 | um11541   |       | 1 |
| Sr_17I    |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr15595   |    | 3 | mp02718 | NS    | 5 | mp02718 | NS    | 5 | UHOR_07563 |       | NS | UHOR_07563 |       | NS | um10675   | NS    | 4 | um10675   | NS    | 4 |
| sr15597   |    | 2 | mp00396 |       | 2 | mp00396 |       | 2 | UHOR_07566 |       | 2  | UHOR_07566 |       | 2  | um10676   |       | 3 | um10676   |       | 3 |
| sr15598   | NS | 5 | mp00395 | NS    | 5 | mp00395 | NS    | 5 | UHOR_07567 | NS NS |    | UHOR_07567 | NS NS |    | um04720   | NS NS |   | um04720   | NS NS |   |
| Sr_19I    |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr10057   |    | 2 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | um05302   |       | 1 | um05302   |       | 1 |
| sr10058   |    | 2 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | um05305   |       | 1 | um05305   |       | 1 |
| sr10059   |    | 1 | NA      |       |   | NA      |       |   | UHOR_08128 |       | 1  | UHOR_08128 |       | 1  | um05306   |       | 1 | um05306   |       | 1 |
| Sr_21I    |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr16735   |    | 1 | mp03409 |       | 1 | NA      |       | 1 | UHOR_08673 |       | 1  | UHOR_08673 |       | 1  | um06112   |       | 1 | NA        |       |   |
| sr16737   |    | 1 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | NA        |       |   | NA        |       |   |
| sr16738   | NS | 4 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | NA        |       |   | NA        |       |   |
| Sr_21II   |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr16762   |    | 2 | mp03407 |       | 1 | mp03407 |       | 1 | UHOR_08684 |       | 1  | UHOR_08684 |       | 1  | um06118   |       | 2 | um06118   |       | 2 |
| sr16760   |    | 1 | NA      |       |   | mp03408 |       | 1 | UHOR_08680 |       | 1  | UHOR_08680 |       | 1  | um06116   |       | 1 | um06116   |       | 1 |
| sr16759   |    | 1 | mp03430 | NS NS |   | mp03430 | NS NS |   | UHOR_08679 | NS NS |    | UHOR_08679 | NS NS |    | um11211   |       | 1 | um11211   |       | 1 |
| Sr_22I    |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr11351   |    | 2 | NA      |       |   | NA      |       |   | NA         |       |    | UHOR_08818 |       | 1  | NA        |       |   | NA        |       |   |
| sr11352   |    | 1 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | NA        |       |   | NA        |       |   |
| sr11354.2 |    | 1 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | NA        |       |   | NA        |       |   |
| sr11355   |    | 2 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | NA        |       |   | NA        |       |   |
| Sr_23I    |    |   |         |       |   |         |       |   |            |       |    |            |       |    |           |       |   |           |       |   |
| sr16868   | NS | 3 | mp02516 | NS NS |   | mp02516 | NS NS |   | UHOR_08979 | NS    | 3  | UHOR_08979 | NS    | 3  | um06426   | NS    | 3 | um06426   | NS    | 3 |
| sr16869   | NS | 4 | NA      |       |   | NA      |       |   | UHOR_08981 | NS NS |    | UHOR_08981 | NS NS |    | NA        |       |   | NA        |       |   |
| sr16871   |    | 1 | NA      |       |   | NA      |       |   | NA         |       |    | NA         |       |    | um06428   |       | 2 | um06428   |       | 2 |

NS specifies the non-secreted protein coding genes  
NA specifies the absence of an orthologous gene  
Grey shade highlights the PSEPs genes  
SP and TP columns represent the SignalP v4 and TargetP v1.1 predicted PSEPs, respectively  
OrthoMCL and Inparanoid columns represent the orthologous genes predicted by OrthoMCL and Inparanoid tools respectively  
Gene Ids in brackets are the gene Ids of paralogous genes  
Pathogenicity cluster identifiers has been named according to this nomenclature: SpeciesName\_ChromosomeClusterNumber\_1  
Clusters having letter as cluster number have been predicted by both of the "Three direct Neighbour" and "3kb Window based" methods  
Clusters having Roman numerals as cluster number have been predicted by the "3kb Window based" method  
"\_" has been added to cluster identifier to distinguish the Ids from previously reported clusters



[UHOR\_14878,  
 UHOR\_13417,  
 UHOR\_14701,  
 UHOR\_17013,  
 UHOR\_16037,  
 UHOR\_16472,  
 UHOR\_15782,  
 UHOR\_16712,  
 UHOR\_15189,  
 UHOR\_14944,  
 UHOR\_15313,  
 UHOR\_13470,  
 UHOR\_13968,  
 UHOR\_13437,  
 UHOR\_17014,  
 UHOR\_14943,  
 UHOR\_14792,  
 UHOR\_15878,  
 UHOR\_14903,  
 UHOR\_13469,  
 UHOR\_08525,  
 UHOR\_12464,  
 UHOR\_15311,  
 UHOR\_13585,  
 UHOR\_12239,  
 UHOR\_00398,  
 UHOR\_10036,  
 [UHOR\_13014,  
 UHOR\_13171,  
 UHOR\_15097,  
 UHOR\_15241,  
 UHOR\_14582,  
 UHOR\_16473,  
 UHOR\_15081,  
 UHOR\_13015,  
 UHOR\_17012,  
 UHOR\_13172,  
 UHOR\_14558,  
 UHOR\_13022,  
 UHOR\_15715,  
 UHOR\_14945,  
 UHOR\_14891,  
 UHOR\_14904,  
 UHOR\_13166,  
 UHOR\_08922,  
 UHOR\_12248,  
 UHOR\_12478,  
 UHOR\_15967,  
 UHOR\_15121,  
 UHOR\_13543,  
 UHOR\_13884,  
 UHOR\_14890,  
 UHOR\_10035,  
 UHOR\_15096,

|    |    |    |    |    |    |                     |    |    |
|----|----|----|----|----|----|---------------------|----|----|
| NS | 2  | NA | NA | NA | NA | NA                  | NA | NA |
| 3  | NA | NA | NA | NA | NA | um01392,<br>um10959 | NA |    |

Uh\_5.00034A

|            |    |   |         |    |   |         |    |   |           |    |   |           |    |   |         |    |   |         |    |   |
|------------|----|---|---------|----|---|---------|----|---|-----------|----|---|-----------|----|---|---------|----|---|---------|----|---|
| UHOR_05548 | NS | 1 | mp00949 | NS | 1 | mp00949 | NS | 1 | sr11167.2 | NS | 1 | sr11167.2 | NS | 1 | um03616 | NS | 1 | um03616 | NS | 1 |
| UHOR_05546 |    | 2 | mp00910 |    | 2 | mp00910 |    | 2 | sr11165   |    | 3 | sr11165   |    | 3 | um03615 |    | 2 | um03615 |    | 2 |
| UHOR_05545 |    | 1 | mp00948 |    | 2 | mp00948 |    | 2 | sr11163.2 |    | 1 | sr11163.2 |    | 1 | um03614 |    | 4 | um03614 |    | 4 |

Uh\_5.00036A

|   |  |   |         |    |    |    |  |  |  |    |    |         |  |   |         |  |    |         |  |   |
|---|--|---|---------|----|----|----|--|--|--|----|----|---------|--|---|---------|--|----|---------|--|---|
| UHOR_15110<br>[UHOR_03787,<br>UHOR_16796] |  | 1 | mp05670 | NS | NS | NA |  |  | sr10056 [sr13899,<br>sr00526, sr00527] | NS | NS | NA      |  |   | NA      |  | NA |         |  |   |
| UHOR_03787<br>[UHOR_15110,<br>UHOR_16796] |  | 1 | mp05670 | NS | NS | NA |  |  | sr10056 [sr13899,<br>sr00526, sr00527] | NS | NS | NA      |  |   | NA      |  | NA |         |  |   |
| UHOR_03786                                |  | 1 | NA      |    |    | NA |  |  | sr13495                                |    | 1  | sr13495 |  | 1 | um02298 |  | 2  | um02298 |  | 2 |

Uh\_5.00037A

|   |    |    |         |    |   |         |    |   |         |    |    |         |    |    |         |    |    |         |    |    |
|---|----|----|---------|----|---|---------|----|---|---------|----|----|---------|----|----|---------|----|----|---------|----|----|
| UHOR_04925                                | NS | 1  | mp02465 | NS | 1 | mp02465 | NS | 1 | sr14199 | NS | 1  | sr14199 | NS | 1  | um03156 | NS | 1  | um03156 | NS | 1  |
| UHOR_04924                                | NS | NS | NA      |    |   | NA      |    |   | sr14198 | NS | NS | sr14198 | NS | NS | um10382 | NS | NS | um10382 | NS | NS |
| UHOR_04923<br>[UHOR_04922,<br>UHOR_04676] |    | 3  | NA      |    |   | NA      |    |   | sr14222 |    | 1  | sr14222 |    | 1  | um12216 |    | 1  | um12216 |    | 1  |
| UHOR_04922<br>[UHOR_04923,<br>UHOR_04676] |    | 1  | NA      |    |   | NA      |    |   | sr14222 |    | 1  | sr14222 |    | 1  | um12216 |    | 1  | um12216 |    | 1  |
| UHOR_04921                                |    | 1  | NA      |    |   | NA      |    |   | NA      |    |    | NA      |    |    | NA      |    |    | NA      |    |    |

Uh\_5.00037B

|            |    |   |         |    |   |         |    |   |         |    |   |         |    |   |           |    |   |           |    |   |
|------------|----|---|---------|----|---|---------|----|---|---------|----|---|---------|----|---|-----------|----|---|-----------|----|---|
| UHOR_04902 |    | 1 | mp02475 | NS | 4 | mp02475 | NS | 4 | sr11072 |    | 1 | sr11072 |    | 1 | um03140.2 | NS | 1 | um03140.2 | NS | 1 |
| UHOR_04900 |    | 1 | NA      |    |   | NA      |    |   | NA      |    |   | NA      |    |   | NA        |    |   | NA        |    |   |
| UHOR_04959 | NS | 1 | mp02476 | NS | 1 | mp02476 | NS | 1 | sr11076 | NS | 1 | sr11076 | NS | 1 | um10380   |    | 1 | um10380   |    | 1 |

Uh\_5.00040A

|   |    |   |                      |    |     |                      |    |     |         |  |   |         |  |   |         |  |   |         |  |   |
|---|----|---|----------------------|----|-----|----------------------|----|-----|---------|--|---|---------|--|---|---------|--|---|---------|--|---|
| UHOR_03683                                | NS | 3 | mp02910<br>[mp03261] | NS | [4] | mp02910<br>[mp03261] | NS | [4] | sr16550 |  | 1 | sr16550 |  | 1 | um05927 |  | 1 | um05926 |  | 1 |
| UHOR_15327<br>[UHOR_03684,<br>UHOR_15327] |    | 1 | NA                   |    |     | NA                   |    |     | sr16551 |  | 2 | sr16551 |  | 2 | um05928 |  | 1 | NA      |  |   |
| UHOR_03684<br>[UHOR_15327]                |    | 1 | NA                   |    |     | NA                   |    |     | sr16551 |  | 2 | NA      |  |   | um05928 |  | 1 | um05928 |  | 1 |

Uh\_5.00041A

|  |  |   |         |  |   |         |  |   |         |  |   |         |    |    |         |  |   |                                    |  |          |
|--|--|---|---------|--|---|---------|--|---|---------|--|---|---------|----|----|---------|--|---|------------------------------------|--|----------|
| UHOR_03533   |  | 3 | mp05657 |  | 3 | mp05657 |  | 3 | sr13360 |  | 5 | sr13360 |    | 5  | um02134 |  | 2 | um02134                            |  | 2        |
| UHOR_03534   |  | 1 | NA      |  |   | NA      |  |   | NA      |  |   | NA      |    |    | NA      |  |   | NA                                 |  |          |
| UHOR_03536   |  | 1 | NA      |  |   | NA      |  |   | NA      |  |   | sr13363 |    | 1  | NA      |  |   | NA                                 |  |          |
| UHOR_15387<br>[UHOR_15858,<br>UHOR_15725,<br>UHOR_13170] |  | 1 | NA      |  |   | mp05658 |  | 2 | NA      |  |   | sr13377 | NS | NS | NA      |  |   | um02138<br>[um11377.2,<br>um01796] |  | 1 [1, 2] |

|               |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
|---------------|------|---------|--|---------------|--|-------------------|-------|----------------|--|-------|-----------|----------------|------------------------------------|------|
| UHOR_03560    |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| [UHOR_15724]  | 4    | NA      |  | NA            |  | NA                |       | NA             |  | NA    |           | NA             |                                    |      |
| UHOR_03557    | 1    | NA      |  | NA            |  | NA                |       | NA             |  | NA    |           | NA             |                                    |      |
| Uh_5.00043A   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_04494    | 1    | NA      |  | NA            |  | sr13902 [sr13898] | 1 [1] | sr13898        |  | 1 [1] | um02851   | 1 um02851      | 1                                  |      |
| UHOR_04496    | 1    | NA      |  | NA            |  | sr13903           | 2     | sr13904        |  | 1     | um02852   | 2 um02852      | 2                                  |      |
| UHOR_04499    | 3    | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                |                                    |      |
| UHOR_04500    | 1    | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                |                                    |      |
| Uh_5.00044A   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_04736    |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| [UHOR_06702,  |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_08826,   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_08252,   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_06051,   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_06234 ]  | 2    | NA      |  | NA            |  | sr02613           |       | 1 sr02613      |  | 1     | NA        |                | NA                                 |      |
| UHOR_04746    | 1    | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                | NA                                 |      |
| UHOR_04747    | 2    | mp02285 |  | 1 mp02285     |  | sr14076           |       | 4 sr14076      |  | 4     | um03024   | 1 um03024      | 1                                  |      |
| UHOR_04748    | 1    | mp02286 |  | 1 mp02286     |  | sr14075           |       | 2 sr14075      |  | 2     | um03023   | 1 um03023      | 1                                  |      |
| Uh_5.00047A   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_15722    | NS 2 | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                | NA                                 |      |
| UHOR_15724    |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| [UHOR_03560]  | 5    | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                | NA                                 |      |
| UHOR_15725    |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| [UHOR_15387,  |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_15858,   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_13170]   | 1    | NA      |  | mp05658       |  | NA                |       | NA             |  |       | NA        |                | um02138<br>[um11377.2,<br>um01796] |      |
|               |      |         |  |               |  |                   |       |                |  |       |           |                | 1 [1, 2]                           |      |
| Uh_5.00054A   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_00167    | 3    | mp02114 |  | 1 mp02114     |  | sr11444           |       | 1 sr11444      |  | 1     | um00104   | 1 NA           |                                    |      |
| UHOR_00168    | 1    | mp02113 |  | 1 mp02113     |  | sr11445           |       | 1 sr11445      |  | 1     | um00105   | 1 um00105      | 1                                  |      |
| UHOR_00169    | NS 5 | mp01976 |  | NS 4 mp01976  |  | sr11446           |       | NS 5 sr11446   |  | NS 5  | um10023   | NS 5 um10023   | NS 5                               |      |
| UHOR_00170    | 2    | mp02112 |  | 2 mp02112     |  | sr11447           |       | 1 sr11447      |  | 1     | um10024   | 2 um10024      | 2                                  |      |
| Uh_5.00006I   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_08818    | 1    | NA      |  | NA            |  | NA                |       | sr11351        |  | 2     | um06221   | 4 um06221      | 4                                  |      |
| UHOR_08819    | 1    | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                | NA                                 |      |
| UHOR_13384    | 1    | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                | NA                                 |      |
| Uh_5.00009I   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_08680    | 1    | NA      |  | mp03408       |  | sr16760           |       | 1 sr16760      |  | 1     | um06116   | 1 um06116      | 1                                  |      |
| UHOR_08684    | 1    | mp03407 |  | 1 mp03407     |  | sr16762           |       | 2 sr16762      |  | 2     | um06118   | 2 um06118      | 2                                  |      |
| UHOR_08685    | 1    | mp03406 |  | 2 mp03406     |  | sr16757           |       | 1 sr16757      |  | 1     | um06120   | 3 um06120      | 3                                  |      |
| Uh_5.00024I   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_14478    | 1    | NA      |  | NA            |  | sr11231           |       | 1 NA           |  |       | um03750   | 1 [1] NA       |                                    |      |
| UHOR_14479    | 3    | mp00270 |  | NS NS mp00270 |  | sr20008           |       | 2 sr20008      |  | 2     | [um03745] | 1 um03746      | 1                                  |      |
| UHOR_14481    | 1    | NA      |  | NA            |  | NA                |       | sr11233        |  | 1     | um03747   | 1 um03747      | 1                                  |      |
| Uh_5.00049I   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_02931    | 2    | mp03321 |  | 3 mp03321     |  | sr12936           |       | 4 sr12936      |  | 4     | um01976   | 4 um01976      | 4                                  |      |
| UHOR_02933    | 1    | mp03322 |  | 1 mp03322     |  | sr12937           |       | 1 sr12937      |  | 1     | um01977   | 1 um01977      | 1                                  |      |
| UHOR_02936    | NS 1 | mp03319 |  | NS NS mp03319 |  | sr12940           |       | NS 5 sr12940   |  | NS 5  | um01980   | NS NS um01980  | NS NS                              |      |
| Uh_5.00050I   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_02636    | 1    | mp04147 |  | 1 mp04147     |  | sr12850           |       | 2 sr12850      |  | 2     | um01772   | 1 um01772      | 1                                  |      |
| UHOR_02638    | 1    | mp04107 |  | 2 mp04107     |  | sr12852           |       | 1 sr12852      |  | 1     | um01774   | 2 um01774      | 2                                  |      |
| UHOR_02640    | NS 5 | mp04108 |  | NS 4 mp04108  |  | sr12853           |       | NS 5 sr12853   |  | NS 5  | um01775   | NS 5 um01775   | NS 5                               |      |
| Uh_5.00050II  |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_02754    | NS 3 | mp02316 |  | NS 2 mp02316  |  | sr10561           |       | NS 3 sr10561   |  | NS 3  | um01860   | NS 4 um01860   | NS 4                               |      |
| UHOR_02756    | 1    | mp02317 |  | 4 mp02317     |  | NA                |       | NA             |  |       | um01858   | 1 um01858      | 1                                  |      |
| UHOR_02759    | NS 4 | mp02313 |  | NS 3 mp02313  |  | sr10556           |       | NS 2 sr10556   |  | NS 2  | um01856   | NS 4 um01856   | NS 4                               |      |
| Uh_5.00050III |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_02811    | NS 2 | NA      |  | mp04199       |  | NA                |       | sr10618        |  | NS 3  | NA        |                | um01894                            | NS 3 |
| UHOR_02812    | 1    | NA      |  | NA            |  | sr10619           |       | 1 sr10619      |  | 1     | um0268    | 1 um0268       | 1                                  |      |
| UHOR_02816    | 2    | mp04200 |  | NS NS mp04200 |  | sr10621           |       | NS 2 sr10621   |  | NS 2  | um01897   | NS 3 um01897   | NS 3                               |      |
| Uh_5.00060I   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_02001    | 2    | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                | um01334                            | NS 2 |
| UHOR_02005    | NS 1 | NA      |  | NA            |  | sr10477           |       | 1 sr10477      |  | 1     | um12133   | 1 um12133      | 1                                  |      |
| UHOR_02007    | NS 4 | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                | NA                                 |      |
| Uh_5.00061I   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_01944    | 1    | NA      |  | NA            |  | Sr10429.2         |       | NS 1 sr10429.2 |  | NS 1  | um01297   | 1 um01297      | 1                                  |      |
| UHOR_01947    | 1    | NA      |  | NA            |  | NA                |       | NA             |  |       | NA        |                | NA                                 |      |
| UHOR_01952    | 1    | NA      |  | NA            |  | NA                |       | NA             |  |       | um01300   | 2 um01300      | 2                                  |      |
| Uh_5.00066I   |      |         |  |               |  |                   |       |                |  |       |           |                |                                    |      |
| UHOR_01319    | 2    | mp00859 |  | 2 mp00859     |  | sr12165           |       | 2 sr12165      |  | 2     | um00876   | 2 um00876      | 2                                  |      |
| UHOR_17004    | NS 3 | mp06340 |  | NS NS NA      |  | sr17063           |       | NS 3 sr17063   |  | NS 3  | um10568.2 | NS 3 um10568.2 | NS 3                               |      |
| UHOR_01323    | NS 5 | mp00860 |  | NS 4 mp00860  |  | sr12167           |       | NS 5 sr12167   |  | NS 5  | um00878   | NS 5 um00878   | NS 5                               |      |

NS specifies the non-secreted protein coding genes

NA specifies the absence of an orthologous gene

Grey shade highlights the PSEPs genes

SP and TP columns represent the SignalP v4 and TargetP v1.1 predicted PSEPs, respectively

OrthoMCL and Inparanoid columns represent the orthologous genes predicted by OrthoMCL and Inparanoid tools respectively

Gene ids in brackets are the gene ids of paralogous genes

Pathogenicity cluster identifiers has been named according to this nomenclature: SpeciesName\_ChromosomeClusterNumber\_1

Clusters having letter as cluster number have been predicted by both of the "Three direct Neighbour" and "3kb Window based" methods

Clusters having Roman numerals as cluster number have been predicted by the "3kb Window based" method

"\_1" has been added to cluster identifier to distinguish the ids from previously reported clusters

**Supplementary table 6. *Melanopsichium pennsylvanicum* pathogenicity clusters and their orthologous genes in other genomes.**

| Mp4                |    |    | <i>S.reilianum</i> |    |                                     |            |         |    | <i>U.hordei</i> |    |            |            |    |      | <i>U.maydis</i> |    |      |            |    |      |  |
|--------------------|----|----|--------------------|----|-------------------------------------|------------|---------|----|-----------------|----|------------|------------|----|------|-----------------|----|------|------------|----|------|--|
| Gene_Id            | SP | TP | OrthoMCL           | SP | TP                                  | Inparanoid | SP      | TP | OrthoMCL        | SP | TP         | Inparanoid | SP | TP   | OrthoMCL        | SP | TP   | Inparanoid | SP | TP   |  |
| <b>Mp4_Sca1A</b>   |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp01975            |    | 1  | sr11441            |    | 1                                   | sr11441    |         | 1  | UHOR_00164      |    | 1          | UHOR_00164 |    | 1    | um00102         |    | 1    | um00102    |    | 1    |  |
| mp06008            |    | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp02114            |    | 1  | sr11444            |    | 1                                   | sr11444    |         | 1  | UHOR_00167      |    | 3          | UHOR_00167 |    | 3    | um00104         |    | 1    | um00104    |    | 1    |  |
| mp02113            |    | 1  | sr11445            |    | 1                                   | sr11445    |         | 1  | UHOR_00168      |    | 1          | UHOR_00168 |    | 1    | um00105         |    | 1    | um00105    |    | 1    |  |
| mp01976            | NS | 4  | sr11446            | NS | 5                                   | sr11446    | NS      | 5  | UHOR_00169      | NS | 5          | UHOR_00169 | NS | 5    | um10023         | NS | 5    | um10023    | NS | 5    |  |
| mp02112            |    | 2  | sr11447            |    | 1                                   | sr11447    |         | 1  | UHOR_00170      |    | 2          | UHOR_00170 |    | 2    | um10024         |    | 2    | um10024    |    | 2    |  |
| <b>Mp4_Sca116A</b> |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp00397            | NS | 4  | sr15599            | NS | NA                                  |            |         |    | UHOR_07569      | NS | NS         | NA         |    |      | um04721         | NS | NS   | NA         |    |      |  |
| mp00395            | NS | 5  | sr15598            | NS | 5                                   | sr15598    | NS      | 5  | UHOR_07567      | NS | NS         | UHOR_07567 | NS | NS   | um04720         | NS | NS   | um04720    | NS | NS   |  |
| mp00396            |    | 2  | sr15597            |    | 2                                   | sr15597    |         | 2  | UHOR_07566      |    | 2          | UHOR_07566 |    | 2    | um10676         |    | 3    | um10676    |    | 3    |  |
| <b>Mp4_Sca13A</b>  |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp00949            | NS | 1  | sr11167.2          | NS | 1                                   | sr11167.2  | NS      | 1  | UHOR_05548      | NS | 1          | UHOR_05548 | NS | 1    | um03616         | NS | 1    | um03616    | NS | 1    |  |
| mp00910            |    | 2  | sr11165            |    | 3                                   | sr11165    |         | 3  | UHOR_05546      |    | 2          | UHOR_05546 |    | 2    | um03615         |    | 2    | um03615    |    | 2    |  |
| mp00948            |    | 2  | sr11163.2          |    | 1                                   | sr11163.2  |         | 1  | UHOR_05545      |    | 1          | UHOR_05545 |    | 1    | um03614         |    | 4    | um03614    |    | 4    |  |
| <b>Mp4_Sca157A</b> |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp01253            | NS | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp01254            | NS | 3  | sr14382            | NS | 3                                   | sr14382    | NS      | 3  | NA              |    | NA         |            |    |      | um03383         | NS | 3    | um03383    | NS | 3    |  |
| mp01259            |    | 4  | sr14381            |    | 2                                   | sr14381    |         | 2  | UHOR_05245      |    | 2          | UHOR_05245 |    | 2    | um03382         |    | 2    | um03382    |    | 2    |  |
| mp01258            |    | 1  | sr14380            |    | 1                                   | sr14380    |         | 1  | UHOR_05247      |    | 2          | UHOR_05247 |    | 2    | um03381         |    | 1    | um03381    |    | 1    |  |
| mp01255            | NS | 4  | sr14378            | NS | 3                                   | sr14378    | NS      | 3  | UHOR_05242      | NS | 4          | UHOR_05242 | NS | 4    | um03379         | NS | 1    | um03379    | NS | 1    |  |
| <b>Mp4_Sca160A</b> |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp01355            | NS | 2  | sr13163            | NS | 2                                   | sr13163    | NS      | 2  | UHOR_03256      | NS | 4          | UHOR_03256 | NS | 4    | um06274         | NS | 2    | um06274    | NS | 2    |  |
| mp01354            | NS | 1  | sr13162            | NS | 1                                   | sr13162    | NS      | 1  | UHOR_03255      | NS | 1          | UHOR_03255 | NS | 1    | um06273         | NS | 1    | um06273    | NS | 1    |  |
| mp01353            | NS | 4  | sr13176            | NS | 3                                   | sr13176    | NS      | 3  | UHOR_03254      | NS | 3          | UHOR_03254 | NS | 3    | um06287         | NS | NS   | um06287    | NS | NS   |  |
| <b>Mp4_Sca175A</b> |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp01569            | NS | 1  | sr16122            | NS | 2                                   | NA         |         |    | NA              |    | NA         |            |    |      | um05791         | NS | 3    | NA         |    |      |  |
| mp01567            | NS | 3  | sr12494            | NS | NS                                  | sr12494    | NS      | NS | UHOR_02144      | NS | 4          | UHOR_02144 | NS | 4    | um01428         | NS | 3    | um01428    | NS | 3    |  |
| mp01568            |    | 2  | NA                 |    | NA                                  |            |         |    | UHOR_02143      |    | 1          | UHOR_02143 |    | 1    | um01427         |    | 2    | um01427    |    | 2    |  |
| mp01576            | NS | 2  | sr14845            | NS | NS                                  | NA         |         |    | UHOR_05967      | NS | NS         | NA         |    |      | um03941         | NS | NS   | NA         |    |      |  |
| <b>Mp4_Sca25A</b>  |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp02632            |    | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp02631            |    | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp02621            |    | 1  | sr10054            |    | 2                                   | sr10054    |         | 2  | NA              |    | NA         |            |    |      | um05300         |    | 1    | um05300    |    | 1    |  |
| mp02622            |    | 2  | sr10066            | NS | NS                                  | sr10066    | NS      | NS | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp02623            |    | 1  | sr10066            | NS | NS                                  | NA         |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp02630            |    | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| <b>Mp4_Sca28A</b>  |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp02842            |    | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp02836            |    | 2  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp06261            |    | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| <b>Mp4_Sca29A</b>  |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp02924            | NS | 3  | NA                 |    | NA                                  |            |         |    | UHOR_03655      | NS | NS         | UHOR_03655 | NS | NS   | um02223         | NS | NS   | um02223    | NS | NS   |  |
| mp02923            | NS | 5  | sr13406            | NS | NS                                  | sr13406    | NS      | NS | UHOR_03656      | NS | NS         | UHOR_03656 | NS | NS   | um02224         | NS | NS   | um02224    | NS | NS   |  |
| mp02922            | NS | 4  | sr13407            | NS | 5                                   | sr13407    | NS      | 5  | UHOR_03657      | NS | 5          | UHOR_03657 | NS | 5    | um02225         | NS | NS   | um02225    | NS | NS   |  |
| <b>Mp4_Sca29B</b>  |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp02913            |    | 4  | sr13431            |    | 2                                   | sr13431    |         | 2  | UHOR_03675      | NS | NS         | NA         |    |      | um12316         |    | 1    | um12316    |    | 1    |  |
| mp02912            | NS | 1  | sr13433            | NS | NS                                  | sr13433    | NS      | NS | UHOR_03677      | NS | NS         | UHOR_03677 | NS | NS   | um02238.2       | NS | NS   | um02238.2  | NS | NS   |  |
| mp06299            |    | 2  | sr13434            |    | 4                                   | sr13434    |         | 4  | NA              |    | UHOR_03678 |            | 2  |      | um02239         |    | 2    | um02239    |    | 2    |  |
| <b>Mp4_Sca29C</b>  |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp06108            |    | 1  | NA                 |    | sr16559 [sr16561, sr16560, sr16558] |            | 1, 1, 2 |    | NA              |    | UHOR_06592 |            | 2  |      | NA              |    | NA   |            |    |      |  |
| mp02885            |    | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | UHOR_15322 |            | 1  |      | NA              |    | NA   |            |    |      |  |
| mp06300            | NS | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | UHOR_15322 |            | 1  |      | NA              |    | NA   |            |    |      |  |
| <b>Mp4_Sca31A</b>  |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp03132            |    | 1  | sr15068            |    | 2                                   | sr15068    |         | 2  | NA              |    | UHOR_06275 |            | 2  |      | um04185         |    | 1    | um04185    |    | 1    |  |
| mp03086            |    | 1  | NA                 |    | sr10429.2, sr10430.2                |            | 1       |    | NA              |    | NA         |            |    |      | um01298.2       |    |      | um01298.2  |    | 1, 1 |  |
| mp03981            |    | 1  | sr15071            | NS | NS                                  | NA         |         |    | UHOR_06277      | NS | NS         | NA         |    |      | um04187         | NS | NS   | NA         |    |      |  |
| mp03087            |    | 1  |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| <b>Mp4_Sca37A</b>  |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp03406            |    | 2  | sr16757            |    | 1                                   | sr16757    |         | 1  | UHOR_08685      |    | 1          | UHOR_08685 |    | 1    | um06120         |    | 3    | um06120    |    | 3    |  |
| mp03432            |    | 1  | sr16758            |    | 1                                   | sr16758    |         | 1  | NA              |    | NA         |            |    |      | um06119         |    | 1    | um06119    |    | 1    |  |
| mp03407            |    | 1  | sr16762            |    | 2                                   | sr16762    |         | 2  | UHOR_08684      |    | 1          | UHOR_08684 |    | 1    | um06118         |    | 2    | um06118    |    | 2    |  |
| mp03408            |    | 1  | NA                 |    | sr16760                             |            | 1       |    | NA              |    | UHOR_08680 |            | 1  |      | um06116         |    |      | um06116    |    | 1    |  |
| <b>Mp4_Sca4A</b>   |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp04115            |    | 3  | sr12866            |    | 2                                   | sr12866    |         | 2  | UHOR_02660      | NS | 2          | UHOR_02660 | NS | 2    | um01788         |    | 1    | um01788    |    | 1    |  |
| mp04138            |    | 2  | sr12867            | NS | 2                                   | NA         |         |    | UHOR_02662      | NS | 4          | NA         |    |      | um01789         | NS | 2    | NA         |    |      |  |
| mp04116            | NS | 5  | sr12868            | NS | NS                                  | sr12868    | NS      | NS | UHOR_02663      | NS | NS         | UHOR_02663 | NS | NS   | um01790         | NS | NS   | um01790    | NS | NS   |  |
| <b>Mp4_Sca6A</b>   |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp04983            | NS | 1  | sr10629            |    | 1, 2                                | sr15239    |         | 2  | UHOR_02822      |    | 1, 2       | UHOR_06804 |    | 1, 2 | um04353         | NS | 1, 1 | um04353    | NS | 1    |  |
| mp04926            |    | 2  | sr15240            |    | 3                                   | sr15240    |         | 3  | UHOR_06805      |    | 1          | UHOR_06805 |    | 1    | um04354         |    | 1    | um04354    |    | 1    |  |
| mp04927            |    | 3  | sr15241            |    | 2                                   | sr15241    |         | 2  | UHOR_06806      |    | 4          | UHOR_06806 |    | 4    | um04355         |    | 2    | um04355    |    | 2    |  |
| <b>Mp4_Sca74A</b>  |    |    |                    |    |                                     |            |         |    |                 |    |            |            |    |      |                 |    |      |            |    |      |  |
| mp05161            |    | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp05160            |    | 1  | NA                 |    | NA                                  |            |         |    | NA              |    | NA         |            |    |      | NA              |    | NA   |            |    |      |  |
| mp05143            | NS | 5  | sr10769            | NS | 5                                   | sr10769    | NS      | 5  | UHOR_03615      | NS | NS         | UHOR_03615 | NS | NS   | um10070         | NS | 2    | um10070    | NS | 2    |  |



| Mp4_Sca91A  |    |   |                                    |    |       |         |    |    |                            |            |            |            |                      |            |            |           |         |         |           |    |         |    |    |
|-------------|----|---|------------------------------------|----|-------|---------|----|----|----------------------------|------------|------------|------------|----------------------|------------|------------|-----------|---------|---------|-----------|----|---------|----|----|
| mp05747     |    | 2 | NA                                 |    | NA    |         | NA |    | NA                         |            | NA         |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp05726     |    | 3 | NA                                 |    | NA    |         | NA |    | NA                         |            | NA         |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp05727     |    | 2 | NA                                 |    | NA    |         | NA |    | NA                         |            | NA         |            |                      |            |            |           |         |         |           |    |         |    |    |
| Mp4_Sca10I  |    |   |                                    |    |       |         |    |    |                            |            |            |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp00268     |    | 1 | NA                                 |    | NA    |         | NA |    | NA                         |            | NA         |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp00267     |    | 5 | Sr11239.2<br>[sr11240,<br>sr11237] | NS | 1, 1] | sr11238 |    | 1  | UHOR_07319<br>[UHOR_08139] |            | 1[1]       | NA         | um03752<br>[um03753] |            | 2          | [1]       | NA      |         | NS        | NS |         |    |    |
| mp00223     |    | 2 | sr11242                            | NS | NS    | sr11242 |    | NS | NS                         | UHOR_05719 | NS         | NS         | UHOR_05719           | NS         | NS         | um03755   | NS      | NS      | um03755   | NS | NS      |    |    |
| Mp4_Sca219I |    |   |                                    |    |       |         |    |    |                            |            |            |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp02313     | NS | 3 | sr10556                            | NS | 2     | sr10556 |    | NS | 2                          | UHOR_02759 | NS         | 4          | UHOR_02759           | NS         | 4          | um01856   | NS      | 4       | um01856   | NS | 4       |    |    |
| mp02317     |    | 4 | NA                                 |    | NA    |         | NA |    | NA                         |            | 1          | UHOR_02756 |                      | 1          | UHOR_02756 |           | 1       | um01858 |           | 1  | um01858 |    | 1  |
| mp02316     | NS | 2 | sr10561                            | NS | 3     | sr10561 |    | NS | 3                          | UHOR_02754 | NS         | 3          | UHOR_02754           | NS         | 3          | um01860   | NS      | 4       | um01860   | NS | 4       |    |    |
| Mp4_Sca23I  |    |   |                                    |    |       |         |    |    |                            |            |            |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp02475     | NS | 4 | sr11072                            |    | 1     | sr11072 |    |    | 1                          | UHOR_04902 |            | 1          | UHOR_04902           |            | 1          | Um03140.2 | NS      | 1       | um03140.2 | NS | 1       |    |    |
| mp02498     |    | 4 | NA                                 |    | NA    |         | NA |    | NA                         |            | NA         |            | NA                   |            | NA         | NA        |         | NA      |           | NA |         | NA |    |
| mp02476     | NS | 1 | sr11076                            | NS | 1     | sr11076 |    | NS | 1                          | UHOR_04959 | NS         | 1          | UHOR_04959           | NS         | 1          | um10380   | NS      | 1       | um10380   | NS | 1       |    |    |
| Mp4_Sca4I   |    |   |                                    |    |       |         |    |    |                            |            |            |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp04147     |    | 1 | sr12850                            |    | 2     | sr12850 |    |    | 2                          | UHOR_02636 |            | 1          | UHOR_02636           |            | 1          | um01772   |         | 1       | um01772   |    | 1       |    |    |
| mp04107     |    | 2 | sr12852                            |    | 1     | sr12852 |    |    | 1                          | UHOR_02638 |            | 1          | UHOR_02638           |            | 1          | um01774   |         | 2       | um01774   |    | 2       |    |    |
| mp04108     | NS | 4 | sr12853                            | NS | 5     | sr12853 |    | NS | 5                          | UHOR_02640 | NS         | 5          | UHOR_02640           | NS         | 5          | um01775   | NS      | 5       | um01775   | NS | 5       |    |    |
| Mp4_Sca4II  |    |   |                                    |    |       |         |    |    |                            |            |            |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp04110     |    | 1 | NA                                 |    | NA    |         | NA |    | NA                         |            | UHOR_02651 | NS         | NS                   | UHOR_02647 |            | 2         | NA      |         | NA        |    | NA      |    |    |
| mp04143     | NS | 5 | sr12860                            | NS | NS    | NA      |    |    | NA                         |            | UHOR_02652 | NS         | 4                    | UHOR_02652 | NS         | 4         | um01782 | NS      | NS        | NA |         | NA |    |
| mp04141     | NS | 5 | sr12861                            | NS | NS    | sr12861 |    | NS | NS                         | NA         |            | UHOR_02652 | NS                   | 4          | UHOR_02652 | NS        | 4       | um01783 | NS        | NS | um01783 | NS | NS |
| Mp4_Sca53I  |    |   |                                    |    |       |         |    |    |                            |            |            |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp06224     | NS | 4 | NA                                 |    | NA    |         | NA |    | NA                         |            | UHOR_07793 |            | 3                    | NA         |            | NA        |         | NA      |           | NA |         | NA |    |
| mp04323     | NS | 4 | sr15760                            | NS | NS    | NA      |    |    | NA                         |            | NA         |            | NA                   |            | NA         |           | NA      |         | NA        |    | NA      |    |    |
| mp04322     |    | 1 | sr15758                            |    | 1     | sr15758 |    |    | 1                          | UHOR_07788 |            | 1          | UHOR_07788           |            | 1          | um12007   | NS      | 2       | um12007   | NS | 2       |    |    |
| Mp4_Sca9I   |    |   |                                    |    |       |         |    |    |                            |            |            |            |                      |            |            |           |         |         |           |    |         |    |    |
| mp05985     |    | 1 | sr14937                            |    | 1     | sr14937 |    |    | 1                          | UHOR_06098 |            | 1          | UHOR_06098           |            | 1          | um04032   | NS      | NS      | um04032   | NS | NS      |    |    |
| mp05984     | NS | 1 | sr14938                            | NS | 2     | sr14938 |    | NS | 2                          | UHOR_06097 | NS         | 2          | UHOR_06097           | NS         | 2          | um04031   | NS      | 1       | um04031   | NS | 1       |    |    |
| mp05983     |    | 1 | NA                                 |    | NA    |         | NA |    | NA                         |            | NA         |            | NA                   |            | NA         | NA        |         | NA      |           | NA |         | NA |    |

NS specifies the non-secreted protein coding genes  
NA specifies the absence of an orthologous gene  
Grey shade highlights the PSEPs genes  
SP and TP columns represent the SignalP v4 and TargetP v1.1 predicted PSEPs, respectively  
OrthoMCL and Inparanoid columns represent the orthologous genes predicted by OrthoMCL and Inparanoid tools respectively  
Gene ids in brackets are the gene ids of paralogous genes  
Pathogenicity cluster identifiers has been named according to this nomenclature: SpeciesName\_ChromosomeClusterNumber\_1  
Clusters having letter as cluster number have been predicted by both of the "Three direct Neighbour" and "3kb Window based" methods  
Clusters having Roman numerals as cluster number have been predicted by the "3kb Window based" method  
"\_1" has been added to cluster identifier to distinguish the ids from previously reported clusters

**Supplementary Table 7.** The 92 PSEP encoding genes that are not having any orthologous gene in *M. pennsylvanicum*, but are present in the other three smut genomes.

| Ortholog    | Orthologous genes |         |  |            |            |            |           |         |         |
|-------------|-------------------|---------|--|------------|------------|------------|-----------|---------|---------|
| Ortholog 1  | um00793           | um00792 | conserved hypothetical Ustilago-specific protein                       | UHOR_01209 | UHOR_01211 |            | sr12086   | sr12084 | sr12085 |
| Ortholog 2  | um02298           |         | hypothetical protein   | UHOR_03786 | UHOR_15110 |            | sr13495   |         |         |
| Ortholog 3  | um12216           |         | related to Mig1 protein  | UHOR_04922 | UHOR_04923 | UHOR_03787 | sr14222   |         |         |
| Ortholog 4  | um03202           | um10403 | conserved hypothetical Ustilago-specific protein                       | UHOR_04986 |            |            | sr11101   | sr11102 |         |
| Ortholog 5  | um02851           |         | putative protein   | UHOR_04494 |            | UHOR_04676 | sr13897   | sr13898 | sr13902 |
| Ortholog 6  | um03397           |         | hypothetical protein   | UHOR_05259 |            |            | sr14386   | sr14385 |         |
| Ortholog 7  | um00822           | um03112 | conserved hypothetical protein   | UHOR_04870 |            |            | sr14175   |         |         |
| Ortholog 8  | um03745           | um03750 | conserved hypothetical Ustilago-specific protein                       | UHOR_14478 |            |            | sr11231   |         |         |
| Ortholog 9  | um03923           |         | conserved hypothetical protein   | UHOR_05946 |            |            | sr14828   |         |         |
| Ortholog 10 | um11763           |         | related to acetylxlanyl esterase                                       | UHOR_06739 |            |            | sr15573   |         |         |
| Ortholog 11 | um06050           |         | conserved hypothetical protein   | UHOR_08590 |            |            | sr16674   |         |         |
| Ortholog 12 | um05097           |         | related to secreted aspartic protease 2                                | UHOR_03029 |            |            | sr12999   |         |         |
| Ortholog 13 | um05229           |         | related to Beta-mannosidase precursor                                  | UHOR_03214 |            |            | sr13138   |         |         |
| Ortholog 14 | um05306           |         | conserved hypothetical Ustilago-specific protein                       | UHOR_08128 |            |            | sr10059   |         |         |
| Ortholog 15 | um05312           |         | conserved hypothetical Ustilago-specific protein                       | UHOR_08134 |            |            | sr20014   |         |         |
| Ortholog 16 | um03749           |         | conserved hypothetical Ustilago-specific protein                       | UHOR_07107 |            |            | sr11234.2 |         |         |
| Ortholog 17 | um04309           |         | probable Alpha-L-arabinofuranosidase precursor                         | UHOR_06745 |            |            | sr15193   |         |         |
| Ortholog 18 | um10844           |         | conserved hypothetical protein   | UHOR_06776 |            |            | sr15215   |         |         |
| Ortholog 19 | um00795           |         | hypothetical protein   | UHOR_01210 |            |            | sr12087   |         |         |
| Ortholog 20 | um03201           |         | hypothetical protein   | UHOR_04984 |            |            | sr11100   |         |         |
| Ortholog 21 | um12215           |         | hypothetical protein   | UHOR_15214 |            |            | sr14221   |         |         |
| Ortholog 22 | um02212           |         | related to trehalase precursor   | UHOR_03641 |            |            | sr10799   |         |         |
| Ortholog 23 | um02229           |         | conserved hypothetical Ustilago-specific protein                       | UHOR_03665 |            |            | sr13418   |         |         |
| Ortholog 24 | um05928           |         | conserved hypothetical Ustilago-specific protein                       | UHOR_15327 |            |            | sr16551   |         |         |
| Ortholog 25 | um05930           |         | conserved hypothetical Ustilago-specific protein                       | UHOR_03426 |            |            | sr16553   |         |         |
| Ortholog 26 | um02071           |         | conserved hypothetical protein   | UHOR_03441 |            |            | sr13292   |         |         |
| Ortholog 27 | um02852           |         | conserved hypothetical Ustilago-specific protein                       | UHOR_04496 |            |            | sr13903   |         |         |
| Ortholog 28 | um12197           |         | putative protein   | UHOR_04531 |            |            | sr13927   |         |         |
| Ortholog 29 | um03223           |         | Mig1 protein, induced during biotrophic phase                          | UHOR_04675 |            |            | sr14220   |         |         |
| Ortholog 30 | um03065           |         | putative protein   | UHOR_04803 |            |            | sr14124   |         |         |
| Ortholog 31 | um03105           |         | hypothetical protein   | UHOR_04865 |            |            | sr14168   |         |         |
| Ortholog 32 | um02510           |         | probable PGU1 - Endo-polygalacturonase                                 | UHOR_04037 |            |            | sr10957   |         |         |
| Ortholog 33 | um11931           |         | conserved hypothetical protein   | UHOR_04400 |            |            | sr13816   |         |         |
| Ortholog 34 | um10268           |         | putative protein   | UHOR_02812 |            |            | sr10619   |         |         |
| Ortholog 35 | um01690           |         | hypothetical protein   | UHOR_02510 |            |            | sr12761   |         |         |
| Ortholog 36 | um11362           |         | putative protein   | UHOR_02538 |            |            | sr12780   |         |         |
| Ortholog 37 | um01553           |         | conserved hypothetical protein   | UHOR_02305 |            |            | sr12625   |         |         |
| Ortholog 38 | um00480           |         | transmembrane mucin involved in surface sensing via MAP-kinase cascade | UHOR_00748 |            |            | sr10165.2 |         |         |
| Ortholog 39 | um00534           |         | conserved hypothetical protein   | UHOR_03931 |            |            | sr11810   |         |         |

|             |         |         |  |            |  |           |
|-------------|---------|---------|--|------------|--|-----------|
| Ortholog 40 | um01422 |         | probable Lipase B precursor                      | UHOR_02134 |  | sr12489   |
| Ortholog 41 | um01297 |         | conserved hypothetical Ustilago-specific protein | UHOR_01944 |  | sr10429.2 |
| Ortholog 42 | um12127 |         | hypothetical protein                             | UHOR_01705 |  | sr12428   |
| Ortholog 43 | um02535 |         | conserved hypothetical Ustilago-specific protein | UHOR_12257 |  | sr10996.2 |
| Ortholog 44 | um02466 |         | hypothetical protein                             | UHOR_04028 |  | sr10906   |
| Ortholog 45 | um05295 |         | conserved hypothetical Ustilago-specific protein | UHOR_10021 |  | sr10050   |
| Ortholog 46 | um11002 |         | conserved hypothetical Ustilago-specific protein | UHOR_08915 |  | sr16823   |
| Ortholog 47 | um00609 | um03076 | conserved hypothetical protein                   | UHOR_00948 |  | sr14135   |
| Ortholog 48 | um06376 |         | probable GTP-binding protein SAR1                | UHOR_08907 |  | sr16818   |
| Ortholog 49 | um06431 |         | conserved hypothetical protein                   | UHOR_08983 |  | sr16874   |
| Ortholog 50 | um06440 |         | conserved hypothetical protein                   | UHOR_08989 |  | sr16877   |
| Ortholog 51 | um04514 |         | hypothetical protein                             | UHOR_06494 |  | sr15399   |
| Ortholog 52 | um06157 |         | related to Spherulin 4 precursor                 | UHOR_08725 |  | sr11263   |
| Ortholog 53 | um12330 |         | hypothetical protein                             | UHOR_08860 |  | sr16778   |
| Ortholog 54 | um04057 |         | related to dihydroflavonol reductase             | UHOR_06132 |  | sr14966   |
| Ortholog 55 | um04039 |         | hypothetical protein                             | UHOR_13428 |  | sr14946   |
| Ortholog 56 | um06116 |         | putative protein                                 | UHOR_08680 |  | sr16760   |
| Ortholog 57 | um12321 |         | conserved hypothetical protein                   | UHOR_08538 |  | sr16625   |
| Ortholog 58 | um04816 |         | related to Endoglucanase 1 precursor             | UHOR_07693 |  | sr15690   |
| Ortholog 59 | um05680 |         | putative protein                                 | UHOR_07344 |  | sr16013   |
| Ortholog 60 | um10742 |         | conserved hypothetical protein                   | UHOR_07373 |  | sr16032   |
| Ortholog 61 | um05290 |         | putative protein                                 | UHOR_08119 |  | sr10043   |
| Ortholog 62 | um05046 |         | conserved hypothetical protein                   | UHOR_07232 |  | sr15930   |
| Ortholog 63 | um05495 |         | conserved hypothetical protein                   | UHOR_07881 |  | sr16175   |
| Ortholog 64 | um05548 |         | related to L-ascorbate oxidase precursor         | UHOR_07954 |  | sr16230   |
| Ortholog 65 | um05562 |         | related to stress response protein rds1p         | UHOR_07974 |  | sr16247   |
| Ortholog 66 | um03747 |         | conserved hypothetical Ustilago-specific protein | UHOR_14481 |  | sr11233   |
| Ortholog 67 | um04407 |         | conserved hypothetical protein                   | UHOR_06885 |  | sr15295   |
| Ortholog 68 | um04422 |         | related to endo-1,4-beta-xylanase b              | UHOR_06909 |  | sr15309   |
| Ortholog 69 | um00781 |         | putative protein                                 | UHOR_01190 |  | sr12072   |
| Ortholog 70 | um03411 |         | probable endo-1,4-beta-xylanase                  | UHOR_05270 |  | sr14403   |
| Ortholog 71 | um05803 |         | related to acid phosphatase                      | UHOR_08281 |  | sr16428   |
| Ortholog 72 | um02254 |         | hypothetical protein                             | UHOR_03711 |  | sr13449   |
| Ortholog 73 | um12226 |         | putative protein                                 | UHOR_05232 |  | sr14368   |
| Ortholog 74 | um05964 |         | related to esterase                              | UHOR_08487 |  | sr16592   |
| Ortholog 75 | um11467 |         | conserved hypothetical protein                   | UHOR_03481 |  | sr13320   |
| Ortholog 76 | um02921 |         | conserved hypothetical protein                   | UHOR_04603 |  | sr13976   |
| Ortholog 77 | um02922 |         | probable sulfite reductase cys-4                 | UHOR_04604 |  | sr13977   |
| Ortholog 78 | um02597 |         | related to Rhizopuspepsin precursor              | UHOR_04152 |  | sr13637   |
| Ortholog 79 | um02652 |         | putative protein                                 | UHOR_04241 |  | sr13699   |
| Ortholog 80 | um11723 |         | related to ER glucosidase I                      | UHOR_04362 |  | sr13790   |
| Ortholog 81 | um02740 |         | probable Alpha-glucosidase precursor             | UHOR_04375 |  | sr13799   |

|             |           |  |            |           |
|-------------|-----------|--|------------|-----------|
| Ortholog 82 | um12175   | conserved hypothetical protein                     | UHOR_02828 | sr10635.2 |
| Ortholog 83 | um10274   | putative protein                                   | UHOR_02844 | sr10650   |
| Ortholog 84 | um10816   | conserved hypothetical protein                     | UHOR_02311 | sr12627   |
| Ortholog 85 | um10000   | conserved hypothetical protein                     | UHOR_00039 | sr06444   |
| Ortholog 86 | um10052   | conserved hypothetical protein                     | UHOR_00313 | sr11546   |
| Ortholog 87 | um00446   | probable beta-glucosidase                          | UHOR_00702 | sr10116   |
| Ortholog 88 | um00492   | conserved hypothetical protein                     | UHOR_00762 | sr10182   |
| Ortholog 89 | um01244   | conserved hypothetical protein                     | UHOR_01870 | sr10321   |
| Ortholog 90 | um00837.2 | related to Alpha-L-arabinofuranosidase I precursor | UHOR_01245 | sr12124   |
| Ortholog 91 | um01130   | conserved hypothetical protein                     | UHOR_01709 | sr12431   |
| Ortholog 92 | um03746   | conserved hypothetical Ustilago-specific protein   | UHOR_14479 | sr20008   |

**Supplementary Table 8.** The 248 orthologs of PSEP encoding genes that are present in all four smut genomes.

| Orthologs   | <i>U. maydis</i> ids | <i>U. maydis</i> ids | <i>U. maydis</i> gene annotation   | <i>Mp4</i> gene id | <i>Mp4</i> gene id | <i>S. reilianum</i> ids | <i>U. hordei</i> ids | <i>U. hordei</i> ids |
|-------------|----------------------|----------------------|--|--------------------|--------------------|-------------------------|----------------------|----------------------|
| Ortholog 1  | um03752              | um03753              | conserved hypothetical Ustilago-specific protein                                 | mp00267            | mp03415            | sr11237                 | UHOR_07319           | UHOR_08139           |
| Ortholog 2  | um05927              |                      | conserved hypothetical Ustilago-specific protein                                 | mp02910            | mp03261            | sr16550                 | UHOR_03684           |                      |
| Ortholog 3  | um02826              |                      | conserved hypothetical protein   | mp04181            | mp04842            | sr13869                 | UHOR_04456           |                      |
| Ortholog 4  | um04364              | um05550              | probable EXG1 - Exo-1,3-beta-glucanase precursor                                 | mp04978            |                    | sr15250                 | UHOR_06823           |                      |
| Ortholog 5  | um04557              |                      | conserved hypothetical protein   | mp01386            |                    | sr13615                 | UHOR_06553           | UHOR_08049           |
| Ortholog 6  | um10881              |                      | probable ribonuclease T1   | mp05498            |                    | sr12878                 | UHOR_03174           | UHOR_02675           |
| Ortholog 7  | um01149              |                      | glyoxaloxidase 3   | mp01033            |                    | sr12449                 | UHOR_01735           |                      |
| Ortholog 8  | um02465              |                      | related to Calcium influx promoting protein ehs1                                 | mp01039            |                    | sr10904                 | UHOR_04026           |                      |
| Ortholog 9  | um02475              |                      | hypothetical protein   | mp01043            |                    | sr10918.2               | UHOR_12209           |                      |
| Ortholog 10 | um04463              |                      | related to vesicular integral-membrane protein VIP36                             | mp01058            |                    | sr15350                 | UHOR_06967           |                      |
| Ortholog 11 | um10640              |                      | conserved hypothetical protein   | mp01067            |                    | sr11116                 | UHOR_05003           |                      |
| Ortholog 12 | um00326              |                      | conserved hypothetical protein   | mp00110            |                    | sr11677                 | UHOR_00505           |                      |
| Ortholog 13 | um11715              |                      | related to VPS13 - involved in regulating membrane traffic (N-terminal fragment) | mp01119            |                    | sr11032                 | UHOR_04092           |                      |
| Ortholog 14 | um10099              |                      | conserved hypothetical protein   | mp00111            |                    | sr11678                 | UHOR_00506           |                      |
| Ortholog 15 | um02523              |                      | related to Endoglucanase 1 precursor   | mp01151            |                    | sr10982                 | UHOR_04056           |                      |
| Ortholog 16 | um11407              |                      | conserved hypothetical protein   | mp01160            |                    | sr10958                 | UHOR_04038           |                      |
| Ortholog 17 | um01022              |                      | conserved hypothetical protein   | mp01171            |                    | sr12315                 | UHOR_01593           |                      |
| Ortholog 18 | um11341              |                      | related to ALG12 - alpha-1,6-mannosyltransferase                                 | mp00118            |                    | sr11692                 | UHOR_00523           |                      |
| Ortholog 19 | um11908              |                      | related to cathepsin d (lysosomal aspartyl protease)                             | mp01197            |                    | sr13260                 | UHOR_03396           |                      |
| Ortholog 20 | um11910              |                      | hypothetical protein   | mp01201            |                    | sr13265                 | UHOR_03402           |                      |
| Ortholog 21 | um03880              |                      | conserved hypothetical protein   | mp01221            |                    | sr14776                 | UHOR_05886           |                      |
| Ortholog 22 | um03381              |                      | conserved hypothetical protein   | mp01258            |                    | sr14380                 | UHOR_05247           |                      |
| Ortholog 23 | um03382              |                      | related to 3-phytase A precursor   | mp01259            |                    | sr14381                 | UHOR_05245           |                      |
| Ortholog 24 | um00330              |                      | related to UTR2 - cell wall protein  | mp00127            |                    | sr11681                 | UHOR_00509           |                      |
| Ortholog 25 | um11187              |                      | related to ROT1 - molecular chaperone in the endoplasmic reticulum               | mp01285            |                    | sr16435                 | UHOR_08289           |                      |
| Ortholog 26 | um02758              |                      | related to Chitinase A precursor   | mp01325            |                    | sr13813                 | UHOR_04393           |                      |
| Ortholog 27 | um02711              |                      | related to ADAM protease ADM-B   | mp01341            |                    | sr13768                 | UHOR_04336           |                      |
| Ortholog 28 | um03924              |                      | repellent protein 1 precursor  | mp01368            |                    | sr14829                 | UHOR_05948           |                      |
| Ortholog 29 | um05177              |                      | related to endosomal protein EMP70 precursor                                     | mp01379            |                    | sr13085                 | UHOR_03136           |                      |
| Ortholog 30 | um10186              |                      | putative protein   | mp00141            |                    | sr13060                 | UHOR_03101           |                      |
| Ortholog 31 | um11562              |                      | hydrophobin 2  | mp01444            |                    | sr15890                 | UHOR_07158           |                      |
| Ortholog 32 | um00309              |                      | conserved hypothetical protein   | mp01489            |                    | sr11661                 | UHOR_00478           |                      |
| Ortholog 33 | um00299              |                      | conserved hypothetical protein   | mp01501            |                    | sr11651                 | UHOR_00466           |                      |
| Ortholog 34 | um10091              |                      | conserved hypothetical protein   | mp01504            |                    | sr11646                 | UHOR_00459           |                      |
| Ortholog 35 | um11070              |                      | probable lipase precursor  | mp01523            |                    | sr14401                 | UHOR_05268           |                      |
| Ortholog 36 | um12298              |                      | conserved hypothetical protein   | mp00153            |                    | sr15940                 | UHOR_07245           |                      |
| Ortholog 37 | um03947              |                      | probable carboxypeptidase 2  | mp01581            |                    | sr14853                 | UHOR_05981           |                      |
| Ortholog 38 | um05604              |                      | putative protein   | mp01601            |                    | sr16292                 | UHOR_08034           |                      |
| Ortholog 39 | um11083              |                      | related to p24 protein, involved in membrane trafficking                         | mp01620            |                    | sr14476                 | UHOR_05364           |                      |
| Ortholog 40 | um11092              |                      | probable prohibitin PHB1   | mp01625            |                    | sr14494                 | UHOR_05388           |                      |
| Ortholog 41 | um12233              |                      | conserved hypothetical protein   | mp01628            |                    | sr14508                 | UHOR_14934           |                      |
| Ortholog 42 | um03487              |                      | putative protein   | mp01657            |                    | sr14475                 | UHOR_05362           |                      |
| Ortholog 43 | um11690              |                      | conserved hypothetical protein   | mp01671            |                    | sr12661                 | UHOR_02365           |                      |
| Ortholog 44 | um01957              |                      | related to Mannosyl-oligosaccharide alpha-1,2-mannosidase precursor              | mp01689            |                    | sr10711.2               | UHOR_02907           |                      |
| Ortholog 45 | um11253              |                      | conserved hypothetical protein   | mp00168            |                    | sr12139                 | UHOR_01276           |                      |

|             |         |  |         |           |            |
|-------------|---------|--|---------|-----------|------------|
| Ortholog 46 | um02035 | related to yellowish-green 1 (ayg1)  | mp01722 | sr13253   | UHOR_03383 |
| Ortholog 47 | um05987 | conserved hypothetical protein   | mp01751 | sr16607   | UHOR_08502 |
| Ortholog 48 | um11922 | related to Chitin deacetylase precursor  | mp01784 | sr13741   | UHOR_04296 |
| Ortholog 49 | um11927 | related to ROT1 - molecular chaperone in the endoplasmic reticulum                                 | mp01790 | sr13751   | UHOR_04309 |
| Ortholog 50 | um05769 | related to Dolichyl-diphosphooligosaccharide--protein glycosyltransferase 67 kDa subunit precursor | mp01848 | sr16101   | UHOR_07500 |
| Ortholog 51 | um00655 | probable Family 9 glycosyl hydrolase   | mp00186 | sr11936   | UHOR_00994 |
| Ortholog 52 | um05366 | conserved hypothetical protein   | mp01906 | sr16352   | UHOR_08198 |
| Ortholog 53 | um05352 | related to MPD1 - Disulfide isomerase related protein  | mp01917 | sr16335   | UHOR_08174 |
| Ortholog 54 | um00013 | conserved hypothetical protein   | mp01933 | sr06437   | UHOR_00031 |
| Ortholog 55 | um00041 | putative protein   | mp01946 | sr11371   | UHOR_00075 |
| Ortholog 56 | um00098 | related to YTP1  | mp01971 | sr11437   | UHOR_00159 |
| Ortholog 57 | um00102 | conserved hypothetical protein   | mp01975 | sr11441   | UHOR_00164 |
| Ortholog 58 | um00144 | putative protein   | mp01993 | sr11488   | UHOR_00224 |
| Ortholog 59 | um00235 | probable EXG1 - exo-beta-1,3-glucanase (I/II), major isoform                                       | mp02050 | sr11587   | UHOR_00370 |
| Ortholog 60 | um00159 | conserved hypothetical protein   | mp02087 | sr11505   | UHOR_00257 |
| Ortholog 61 | um10030 | putative protein   | mp02101 | sr11472   | UHOR_00204 |
| Ortholog 62 | um10024 | conserved hypothetical protein   | mp02112 | sr11447   | UHOR_00170 |
| Ortholog 63 | um00105 | iron transport multicopper oxidase   | mp02113 | sr11445   | UHOR_00168 |
| Ortholog 64 | um00104 | hypothetical protein   | mp02114 | sr11444   | UHOR_00167 |
| Ortholog 65 | um00081 | putative protein   | mp02123 | sr11416   | UHOR_00131 |
| Ortholog 66 | um00064 | related to pepsin precursor (aspartate protease)   | mp02133 | sr11394   | UHOR_00110 |
| Ortholog 67 | um00054 | putative protein   | mp02139 | sr11385   | UHOR_00093 |
| Ortholog 68 | um02865 | conserved hypothetical protein   | mp02217 | sr13917   | UHOR_04516 |
| Ortholog 69 | um03024 | related to subtilisin-like serine protease   | mp02285 | sr14076   | UHOR_04747 |
| Ortholog 70 | um03023 | related to Ribonuclease Trv  | mp02286 | sr14075   | UHOR_04748 |
| Ortholog 71 | um05988 | conserved hypothetical protein   | mp02301 | sr16608   | UHOR_08503 |
| Ortholog 72 | um05995 | related to Acid phosphatase precursor  | mp02365 | sr16616   | UHOR_08513 |
| Ortholog 73 | um01855 | conserved hypothetical protein   | mp02372 | sr10555   | UHOR_02752 |
| Ortholog 74 | um01854 | conserved hypothetical protein   | mp02373 | sr10554   | UHOR_02751 |
| Ortholog 75 | um03640 | conserved hypothetical protein   | mp02388 | sr14587   | UHOR_05576 |
| Ortholog 76 | um06434 | conserved hypothetical protein   | mp02446 | sr16876   | UHOR_08985 |
| Ortholog 77 | um11765 | related to 6-hydroxy-D-nicotine oxidase  | mp02522 | sr00094.2 | UHOR_06723 |
| Ortholog 78 | um11940 | putative protein   | mp02557 | sr17138   | UHOR_12242 |
| Ortholog 79 | um00538 | conserved hypothetical protein   | mp02666 | sr11817   | UHOR_00823 |
| Ortholog 80 | um04733 | related to phosphatidylglycerol/phosphatidylinositol transfer protein                              | mp02723 | sr15608   | UHOR_07579 |
| Ortholog 81 | um04807 | conserved hypothetical protein   | mp02765 | sr15680   | UHOR_07680 |
| Ortholog 82 | um06162 | conserved hypothetical protein   | mp02810 | sr11273   | UHOR_08738 |
| Ortholog 83 | um06190 | related to Chitinase   | mp02819 | sr11305   | UHOR_08772 |
| Ortholog 84 | um06218 | conserved hypothetical protein   | mp02844 | sr11346   | UHOR_08814 |
| Ortholog 85 | um06158 | probable glutaminase A   | mp02871 | sr11265   | UHOR_08730 |
| Ortholog 86 | um10861 | related to Reticuline oxidase precursor  | mp02891 | sr16576   | UHOR_08462 |
| Ortholog 87 | um02381 | conserved hypothetical protein   | mp02948 | sr13587   | UHOR_03898 |
| Ortholog 88 | um02430 | conserved hypothetical protein   | mp02959 | sr10848   | UHOR_03994 |
| Ortholog 89 | um10280 | related to vacuolar ATP synthase subunit H   | mp00295 | sr13633   | UHOR_04146 |
| Ortholog 90 | um10156 | probable proteine disulfate isomerase  | mp02991 | sr10870   | UHOR_03972 |
| Ortholog 91 | um04531 | conserved hypothetical protein   | mp03055 | sr15415   | UHOR_06515 |
| Ortholog 92 | um04926 | probable PEP4 - aspartyl protease  | mp00310 | sr15804   | UHOR_07037 |
| Ortholog 93 | um01377 | hypothetical protein   | mp03205 | sr10532   | UHOR_02067 |

|              |           |   |         |           |            |
|--------------|-----------|---|---------|-----------|------------|
| Ortholog 94  | um02293   | hypothetical protein  | mp03254 | sr13490   | UHOR_03765 |
| Ortholog 95  | um11403   | conserved hypothetical protein  | mp03275 | sr13484   | UHOR_03756 |
| Ortholog 96  | um01937   | related to acid sphingomyelinase  | mp03306 | sr10683   | UHOR_02879 |
| Ortholog 97  | um01987   | hypothetical protein  | mp03314 | sr12947   | UHOR_02965 |
| Ortholog 98  | um01976   | putative protein  | mp03321 | sr12936   | UHOR_02931 |
| Ortholog 99  | um01977   | hypothetical protein  | mp03322 | sr12937   | UHOR_02933 |
| Ortholog 100 | um01940   | conserved hypothetical protein  | mp03327 | sr10687   | UHOR_02882 |
| Ortholog 101 | um01945   | probable SUC2 - invertase (sucrose hydrolyzing enzyme)                                | mp03330 | sr10702   | UHOR_02888 |
| Ortholog 102 | um00395   | probable Rds1 protein   | mp00333 | sr11754   | UHOR_00616 |
| Ortholog 103 | um06120   | conserved hypothetical protein  | mp03406 | sr16757   | UHOR_08685 |
| Ortholog 104 | um06118   | related to Tripeptidyl-peptidase I precursor  | mp03407 | sr16762   | UHOR_08684 |
| Ortholog 105 | um06112   | hypothetical protein  | mp03409 | sr16735   | UHOR_08673 |
| Ortholog 106 | um06098   | related to extracellular elastolytic metalloproteinase precursor                      | mp03419 | sr16721   | UHOR_08654 |
| Ortholog 107 | um04630   | related to MUS81 - endonuclease involved in DNA repair and replication fork stability | mp03458 | sr15514   | UHOR_06657 |
| Ortholog 108 | um04641.2 | related to PRC1 - carboxypeptidase y, serine-type protease                            | mp03464 | sr15529   | UHOR_06682 |
| Ortholog 109 | um00688   | related to bacterial leucyl aminopeptidase precursor                                  | mp03503 | sr11975   | UHOR_01059 |
| Ortholog 110 | um00695   | putative exochitinase   | mp03509 | sr11983   | UHOR_01069 |
| Ortholog 111 | um00715   | hypothetical protein  | mp03519 | sr12002   | UHOR_01096 |
| Ortholog 112 | um15020   | conserved hypothetical protein  | mp03529 | sr12023   | UHOR_01125 |
| Ortholog 113 | um00723   | related to stress response protein rds1p  | mp03546 | sr12012   | UHOR_01109 |
| Ortholog 114 | um00692   | conserved hypothetical protein  | mp03561 | sr11979   | UHOR_01064 |
| Ortholog 115 | um05861   | related to FET5 - multicopper oxidase   | mp03586 | sr16482   | UHOR_15041 |
| Ortholog 116 | um12101   | conserved hypothetical protein  | mp03617 | sr13436   | UHOR_03691 |
| Ortholog 117 | um02243   | hypothetical protein  | mp03618 | sr13439   | UHOR_03695 |
| Ortholog 118 | um01632   | conserved hypothetical protein  | mp03725 | sr12700   | UHOR_02419 |
| Ortholog 119 | um11886   | conserved hypothetical protein  | mp03739 | sr12697   | UHOR_02413 |
| Ortholog 120 | um12205   | hypothetical protein  | mp03793 | sr14091   | UHOR_04758 |
| Ortholog 121 | um00904   | related to glucose regulated stress protein, HSP70-like                               | mp03820 | sr12201   | UHOR_01361 |
| Ortholog 122 | um00882   | related to PPN1 - vacuolar endopolyphosphatase  | mp03838 | sr12175   | UHOR_01332 |
| Ortholog 123 | um05731   | conserved hypothetical protein  | mp03850 | sr16064   | UHOR_07433 |
| Ortholog 124 | um11554   | related to Glucose oxidase  | mp03898 | sr15838   | UHOR_07094 |
| Ortholog 125 | um02611   | related to ribonuclease M   | mp03915 | sr13650   | UHOR_04170 |
| Ortholog 126 | um02620   | conserved hypothetical protein  | mp03930 | sr13680   | UHOR_04212 |
| Ortholog 127 | um02640   | conserved hypothetical protein  | mp03932 | sr13685   | UHOR_04217 |
| Ortholog 128 | um01295   | hypothetical protein  | mp03959 | sr10427.2 | UHOR_01941 |
| Ortholog 129 | um10676   | conserved hypothetical protein  | mp00396 | sr15597   | UHOR_07566 |
| Ortholog 130 | um01289   | related to AXL2 - required for axial pattern of budding                               | mp03985 | sr10416   | UHOR_01935 |
| Ortholog 131 | um05528   | conserved hypothetical protein  | mp03997 | sr16207   | UHOR_07931 |
| Ortholog 132 | um05539   | conserved hypothetical protein  | mp04010 | sr16221   | UHOR_07912 |
| Ortholog 133 | um05708   | conserved hypothetical protein  | mp04041 | sr16040   | UHOR_07386 |
| Ortholog 134 | um05704   | conserved hypothetical protein  | mp04048 | sr16037   | UHOR_07381 |
| Ortholog 135 | um01734   | hypothetical protein  | mp04084 | sr12809   | UHOR_02584 |
| Ortholog 136 | um01774   | conserved hypothetical protein  | mp04107 | sr12852   | UHOR_02638 |
| Ortholog 137 | um01788   | related to deacetylase  | mp04115 | sr12866   | UHOR_02660 |
| Ortholog 138 | um01802   | probable protein disulfide-isomerase precursor  | mp04122 | sr12879   | UHOR_02676 |
| Ortholog 139 | um01808   | related to ERV2 - Flavin dependent sulfhydryl oxidase                                 | mp04127 | sr12885   | UHOR_02684 |
| Ortholog 140 | um15089   | conserved hypothetical protein  | mp04132 | sr12886   | UHOR_02686 |
| Ortholog 141 | um01772   | related to Aldose 1-epimerase precursor   | mp04147 | sr12850   | UHOR_02636 |



|              |           |   |         |         |            |
|--------------|-----------|---|---------|---------|------------|
| Ortholog 142 | um01725   | conserved hypothetical protein  | mp04172 | sr12800 | UHOR_02571 |
| Ortholog 143 | um01705   | conserved hypothetical protein  | mp04177 | sr12778 | UHOR_02535 |
| Ortholog 144 | um01700   | related to ABC transporter protein  | mp04180 | sr12772 | UHOR_02527 |
| Ortholog 145 | um01898   | related to endo-1,3(4)-beta-glucanase   | mp04202 | sr10624 | UHOR_02820 |
| Ortholog 146 | um01888   | probable serine-type carboxypeptidase f precursor   | mp04217 | sr10607 | UHOR_02799 |
| Ortholog 147 | um01886   | related to carboxypeptidase   | mp04220 | sr10606 | UHOR_02798 |
| Ortholog 148 | um01871   | conserved hypothetical protein  | mp04223 | sr10586 | UHOR_02775 |
| Ortholog 149 | um06332   | endoglucanase I precursor (egl1)  | mp04237 | sr13229 | UHOR_03357 |
| Ortholog 150 | um10724   | probable MRPL19 - mitochondrial ribosomal protein, large subunit  | mp04285 | sr16007 | UHOR_07301 |
| Ortholog 151 | um05641   | related to palmitoyl-protein thioesterase 1   | mp04292 | sr15952 | UHOR_07260 |
| Ortholog 152 | um12007   | related to cellulase  | mp04322 | sr15758 | UHOR_07788 |
| Ortholog 153 | um06255   | hypothetical protein  | mp04373 | sr16785 | UHOR_08869 |
| Ortholog 154 | um10975.2 | conserved hypothetical protein  | mp04386 | sr16780 | UHOR_08862 |
| Ortholog 155 | um10972   | hypothetical protein  | mp04389 | sr16775 | UHOR_08856 |
| Ortholog 156 | um05227   | hypothetical protein  | mp04435 | sr13136 | UHOR_03212 |
| Ortholog 157 | um05223.2 | related to beta-1,6-glucanase precursor   | mp04456 | sr13131 | UHOR_03204 |
| Ortholog 158 | um05222   | putative protein  | mp04457 | sr13130 | UHOR_03203 |
| Ortholog 159 | um05217   | conserved hypothetical protein  | mp04460 | sr13125 | UHOR_03198 |
| Ortholog 160 | um10474.2 | conserved hypothetical protein  | mp04469 | sr14607 | UHOR_05606 |
| Ortholog 161 | um10484   | related to ALG7 - UDP-N-acetylglucosamine-1-phosphate transferase   | mp04479 | sr14627 | UHOR_05631 |
| Ortholog 162 | um03860   | related to pepsinogen precursor   | mp04515 | sr14762 | UHOR_05865 |
| Ortholog 163 | um03344   | conserved hypothetical protein  | mp04572 | sr14342 | UHOR_05194 |
| Ortholog 164 | um03355   | related to ERV25 - component of the COPII-coated vesicles   | mp04575 | sr14358 | UHOR_05209 |
| Ortholog 165 | um03352   | conserved hypothetical protein  | mp04578 | sr14351 | UHOR_05206 |
| Ortholog 166 | um03349   | conserved hypothetical protein  | mp04579 | sr14347 | UHOR_05202 |
| Ortholog 167 | um10823   | conserved hypothetical protein  | mp04614 | sr14269 | UHOR_05093 |
| Ortholog 168 | um01820   | hypothetical protein  | mp04620 | sr12897 | UHOR_02700 |
| Ortholog 169 | um01851   | conserved hypothetical protein  | mp04640 | sr12933 | UHOR_02748 |
| Ortholog 170 | um01829   | related to alpha-L-arabinofuranosidase I precursor  | mp04651 | sr12911 | UHOR_02718 |
| Ortholog 171 | um01823   | hypothetical protein  | mp04653 | sr12902 | UHOR_02707 |
| Ortholog 172 | um06370   | conserved hypothetical protein  | mp04694 | sr16813 | UHOR_08900 |
| Ortholog 173 | um01970   | hypothetical protein  | mp01073 | sr10728 | UHOR_02926 |
| Ortholog 174 | um03822   | putative protein  | mp04746 | sr14724 | UHOR_05809 |
| Ortholog 175 | um03818   | conserved hypothetical protein  | mp04748 | sr14720 | UHOR_05801 |
| Ortholog 176 | um03812   | probable NHX1 - Na <sup>+</sup> /H <sup>+</sup> exchanger of the prevacuolar compartment - involved in salt tolerance | mp04750 | sr14714 | UHOR_05791 |
| Ortholog 177 | um03807   | conserved hypothetical protein  | mp04751 | sr14709 | UHOR_05785 |
| Ortholog 178 | um10756   | conserved hypothetical protein  | mp04771 | sr16171 | UHOR_07876 |
| Ortholog 179 | um04248   | putative protein  | mp04785 | sr15138 | UHOR_06378 |
| Ortholog 180 | um01213   | conserved hypothetical protein  | mp04820 | sr10289 | UHOR_01836 |
| Ortholog 181 | um04433   | hydrophobin 3   | mp04854 | sr15320 | UHOR_06926 |
| Ortholog 182 | um12123   | related to Nuclease Le3   | mp00485 | sr12271 | UHOR_01473 |
| Ortholog 183 | um04171   | related to ROT1 - molecular chaperone in the endoplasmic reticulum  | mp04882 | sr15050 | UHOR_06248 |
| Ortholog 184 | um05036   | related to endo-1,3(4)-beta-glucanase   | mp04902 | sr15917 | UHOR_07211 |
| Ortholog 185 | um04354   | conserved hypothetical protein  | mp04926 | sr15240 | UHOR_06805 |
| Ortholog 186 | um04355   | related to Sel-1 homolog precursor  | mp04927 | sr15241 | UHOR_06806 |
| Ortholog 187 | um04368   | related to endo-1,3(4)-beta-glucanase   | mp04934 | sr15253 | UHOR_06828 |
| Ortholog 188 | um04383   | related to ERP2 - p24 protein involved in membrane trafficking  | mp04942 | sr15269 | UHOR_06847 |
| Ortholog 189 | um04400   | probable PRB1 - protease B, vacuolar  | mp04947 | sr15288 | UHOR_06878 |

|              |           |  |         |         |            |
|--------------|-----------|--|---------|---------|------------|
| Ortholog 190 | um00961   | conserved hypothetical protein   | mp00494 | sr12257 | UHOR_01439 |
| Ortholog 191 | um04405   | alpha-glucosidase II precursor   | mp04958 | sr15293 | UHOR_06883 |
| Ortholog 192 | um04342   | putative protein   | mp04988 | sr15229 | UHOR_06791 |
| Ortholog 193 | um10811   | related to ARL1 - ADP-ribosylation factor                                  | mp05081 | sr12614 | UHOR_02287 |
| Ortholog 194 | um02178   | related to aspartic protease   | mp05135 | sr10744 | UHOR_03590 |
| Ortholog 195 | um02204   | related to beta-galactosidase  | mp05149 | sr10781 | UHOR_03626 |
| Ortholog 196 | um10067   | hypothetical protein   | mp05162 | sr10759 | UHOR_03606 |
| Ortholog 197 | um02843   | probable KEX2 - endoproteinase of late golgi compartment                   | mp05221 | sr13888 | UHOR_04482 |
| Ortholog 198 | um04994   | related to WBP1 - oligosaccharyl transferase beta subunit precursor        | mp05249 | sr15876 | UHOR_07147 |
| Ortholog 199 | um04318   | related to Prenylcysteine oxidase precursor                                | mp05292 | sr15204 | UHOR_06756 |
| Ortholog 200 | um01512   | related to UDP-glucose:glycoprotein glucosyltransferase precursor          | mp05349 | sr12581 | UHOR_02240 |
| Ortholog 201 | um01495   | related to YIA6 - Pvruvate transporter of the mitochondrial inner membrane | mp05360 | sr12548 | UHOR_02218 |
| Ortholog 202 | um02356   | related to beta-galactosidase precursor                                    | mp05403 | sr13559 | UHOR_03846 |
| Ortholog 203 | um00598   | conserved hypothetical protein   | mp05426 | sr11876 | UHOR_00930 |
| Ortholog 204 | um00567   | related to B2-aldehyde-forming enzyme                                      | mp05443 | sr11845 | UHOR_00872 |
| Ortholog 205 | um12184   | conserved hypothetical protein   | mp00550 | sr13456 | UHOR_03722 |
| Ortholog 206 | um01018   | probable cyclophilin b   | mp05516 | sr12318 | UHOR_01544 |
| Ortholog 207 | um01014   | conserved hypothetical protein   | mp05536 | sr12321 | UHOR_01539 |
| Ortholog 208 | um12045   | related to alpha glucosidase II beta subunit                               | mp05546 | sr16880 | UHOR_08992 |
| Ortholog 209 | um05109   | related to ECM14 - involved in cell wall biogenesis and architecture       | mp05573 | sr13012 | UHOR_03039 |
| Ortholog 210 | um05173   | related to DnaJ homolog subfamily C member 3                               | mp00055 | sr13081 | UHOR_03131 |
| Ortholog 211 | um06071   | related to Para-nitrobenzyl esterase                                       | mp05606 | sr16698 | UHOR_08619 |
| Ortholog 212 | um06075   | related to beta-glucosidase  | mp05607 | sr16700 | UHOR_08622 |
| Ortholog 213 | um02134   | related to mixed-linked glucanase precursor MLG1                           | mp05657 | sr13360 | UHOR_03533 |
| Ortholog 214 | um10055   | related to gamma-glutamyltransferase                                       | mp05677 | sr13345 | UHOR_03512 |
| Ortholog 215 | um02111   | related to triacylglycerol lipase precursor                                | mp05680 | sr13333 | UHOR_03500 |
| Ortholog 216 | um04259   | conserved hypothetical protein   | mp05759 | sr15151 | UHOR_06392 |
| Ortholog 217 | um10424.2 | related to PTM1 - member of the major facilitator superfamily              | mp05763 | sr15160 | UHOR_06403 |
| Ortholog 218 | um03449   | septin 3   | mp00577 | sr14440 | UHOR_05319 |
| Ortholog 219 | um11266   | probable lysophospholipase (lpl)   | mp05800 | sr12339 | UHOR_01564 |
| Ortholog 220 | um01695   | hypothetical protein   | mp05871 | sr12767 | UHOR_02518 |
| Ortholog 221 | um02006   | conserved hypothetical protein   | mp05885 | sr12968 | UHOR_02981 |
| Ortholog 222 | um02021   | conserved hypothetical protein   | mp05895 | sr12983 | UHOR_03005 |
| Ortholog 223 | um02019   | probable Chitin deacetylase  | mp05896 | sr12981 | UHOR_03000 |
| Ortholog 224 | um02011   | putative protein   | mp05899 | sr12972 | UHOR_02986 |
| Ortholog 225 | um11062   | hypothetical protein   | mp05944 | sr14948 | UHOR_06104 |
| Ortholog 226 | um04044   | related to Glucose oxidase   | mp05980 | sr14951 | UHOR_06109 |
| Ortholog 227 | um11627   | conserved hypothetical protein   | mp06037 | sr12097 | UHOR_01220 |
| Ortholog 228 | um04145   | conserved hypothetical Ustilago-specific protein                           | mp06133 | sr14084 | UHOR_04742 |
| Ortholog 229 | um10536   | related to FPR2 - FK506/rapamycin-binding protein of the ER                | mp06196 | sr15342 | UHOR_06956 |
| Ortholog 230 | um05774   | related to metalloprotease MEP1  | mp00626 | sr16106 | UHOR_07510 |
| Ortholog 231 | um05781.2 | hypothetical protein   | mp00630 | sr16113 | UHOR_07519 |
| Ortholog 232 | um02560   | related to EMP24 protein precursor   | mp06347 | sr11038 | UHOR_04099 |
| Ortholog 233 | um05780   | hypothetical protein   | mp00642 | sr16112 | UHOR_07521 |
| Ortholog 234 | um01143   | related to chitin deacetylase precursor                                    | mp00716 | sr12442 | UHOR_01725 |
| Ortholog 235 | um01082   | putative protein   | mp00747 | sr12380 | UHOR_01635 |
| Ortholog 236 | um03246   | related to versicolorin b synthase   | mp00777 | sr14242 | UHOR_05050 |
| Ortholog 237 | um10649   | conserved hypothetical protein   | mp00784 | sr14231 | UHOR_05039 |

|              |           |  |         |           |            |
|--------------|-----------|--|---------|-----------|------------|
| Ortholog 238 | um04282   | related to 3-phytase A precursor   | mp00078 | sr15174   | UHOR_06430 |
| Ortholog 239 | um05733   | conserved hypothetical protein   | mp00843 | sr16066   | UHOR_02041 |
| Ortholog 240 | um12313   | conserved hypothetical protein   | mp00849 | sr16075   | UHOR_07445 |
| Ortholog 241 | um10565   | hypothetical protein   | mp00857 | sr12163   | UHOR_01315 |
| Ortholog 242 | um00876   | related to SPR1 - exo-1,3-beta-glucanase precursor                                       | mp00859 | sr12165   | UHOR_01319 |
| Ortholog 243 | um11839.2 | hypothetical protein   | mp00862 | sr12171   | UHOR_01328 |
| Ortholog 244 | um03615   | related to Glucose oxidase   | mp00910 | sr11165   | UHOR_05546 |
| Ortholog 245 | um03574   | putative protein   | mp00929 | sr14569   | UHOR_05488 |
| Ortholog 246 | um03614   | conserved hypothetical protein   | mp00948 | sr11163.2 | UHOR_05545 |
| Ortholog 247 | um03551   | related to Glucose oxidase   | mp00974 | sr14544   | UHOR_05461 |
| Ortholog 248 | um01204   | related to PRY1 - strong similarity to the plant PR-1 class of pathogen related proteins | mp04826 | sr10279   | UHOR_01820 |

**Supplementary Table 9.** Data information: Data sources of genomic, protein sequences and other information used in the analysis.

| <b>Species</b>               | <b>Upload date</b> | <b>Source</b>   | <b>Reference</b>          |
|------------------------------|--------------------|---|---------------------------|
| <i>Ustilago maydis</i>       | Sept, 2011         | <a href="ftp://ftpmips.gsf.de/ustilago/">ftp://ftpmips.gsf.de/ustilago/</a>   | (Kämper, et al. 2006)     |
| <i>Sporisorium reilianum</i> | Feb, 2011          | <a href="ftp://ftpmips.gsf.de/fungi/Sporisorium_reilianum/">ftp://ftpmips.gsf.de/fungi/Sporisorium_reilianum/</a>                 | (Schirawski, et al. 2010) |
| <i>Ustilago hordei</i>       | June, 2011         | <a href="ftp://ftpmips.gsf.de/MUHDB/">ftp://ftpmips.gsf.de/MUHDB/</a>   | (Laurie, et al. 2012)     |
| <i>Malassezia globosa</i>    | Not mentioned      | <a href="http://genome.jgi.doe.gov/Malg11/Malg11.download.ftp.html">http://genome.jgi.doe.gov/Malg11/Malg11.download.ftp.html</a> | (Xu, et al. 2007)         |