

**Supplementary Material to “Transcriptome sequencing and  
expression profiling of genes involved in the response to abiotic stress  
in *Medicago ruthenica*”**

**Table S4** - Functional enrichment analysis of GO terms using topGO for genes in the *Medicago ruthenica* response to abiotic stress.

| Group     | GO Terms   | Term Description                               | Total Transcripts | Significant Transcripts | P-value  |
|-----------|------------|--|-------------------|-------------------------|----------|
|           | GO:0046906 | tetrapy rrole binding                          | 650               | 32                      | 8.50E-09 |
|           | GO:0016209 | antioxidant activity                           | 207               | 17                      | 2.30E-08 |
|           | GO:0004601 | peroxidase activity                            | 183               | 16                      | 2.50E-08 |
|           | GO:0016684 | oxidoreductase activity,<br>acting on perox... | 183               | 16                      | 2.50E-08 |
|           | GO:0020037 | heme binding                                   | 621               | 30                      | 3.80E-08 |
|           | GO:0016757 | transferase activity,<br>transferring glyco... | 1001              | 40                      | 4.00E-08 |
|           | GO:0016758 | transferase activity,<br>transferring hexos... | 771               | 34                      | 4.30E-08 |
|           | GO:0016491 | oxidoreductase activity                        | 2767              | 79                      | 5.40E-08 |
|           | GO:0016762 | xyloglucan:xyloglucosyl<br>transferase acti... | 63                | 8                       | 5.00E-06 |
|           | GO:0009055 | electron carrier activity                      | 189               | 12                      | 3.60E-05 |
|           | GO:0003824 | catalytic activity                             | 16955             | 305                     | 6.00E-05 |
| <b>MF</b> | GO:0004553 | hydrolase activity,<br>hydrolyzing O-glycos... | 822               | 26                      | 0.00042  |
|           | GO:0016798 | hydrolase activity, acting on<br>glycosyl b... | 883               | 26                      | 0.00119  |
|           | GO:0000990 | core RNA polymerase<br>binding transcriptio... | 15                | 3                       | 0.00139  |
|           | GO:0000996 | core DNA-dependent RNA<br>polymerase bindin... | 15                | 3                       | 0.00139  |
|           | GO:0016987 | sigma factor activity                          | 15                | 3                       | 0.00139  |
|           | GO:0005507 | copper ion binding                             | 184               | 9                       | 0.00213  |
|           | GO:0004014 | adenosylmethionine<br>decarboxylase activit... | 5                 | 2                       | 0.00224  |
|           | GO:0015035 | protein disulfide<br>oxidoreductase activit... | 61                | 5                       | 0.00235  |
|           | GO:0015036 | disulfide oxidoreductase<br>activity           | 61                | 5                       | 0.00235  |
|           | GO:0030599 | pectinesterase activity                        | 96                | 6                       | 0.00351  |

| <b>Group</b> | <b>GO Terms</b> | <b>Term Description</b>                     | <b>Total Transcripts</b> | <b>Significant Transcripts</b> | <b>P-value</b> |
|--------------|-----------------|---|--------------------------|--------------------------------|----------------|
|              | GO:0001071      | nucleic acid binding transcription facto... | 1372                     | 34                             | 0.004          |
|              | GO:0003700      | sequence-specific DNA binding transcript... | 1372                     | 34                             | 0.004          |
|              | GO:0016746      | transferase activity, transferring acyl ... | 544                      | 17                             | 0.00447        |
|              | GO:0016759      | cellulose synthase activity                 | 71                       | 5                              | 0.00455        |
|              | GO:0016760      | cellulose synthase (UDP-forming) activit... | 71                       | 5                              | 0.00455        |
|              | GO:0004332      | fructose-bisphosphate aldolase activity     | 8                        | 2                              | 0.00607        |
|              | GO:0016705      | oxidoreductase activity, acting on paire... | 854                      | 23                             | 0.00647        |
|              | GO:0008171      | O-methyltransferase activity                | 78                       | 5                              | 0.00677        |
|              | GO:0016706      | oxidoreductase activity, acting on paire... | 307                      | 11                             | 0.00781        |
|              | GO:0016614      | oxidoreductase activity, acting on CH-OH... | 308                      | 11                             | 0.008          |
|              | GO:0052689      | carboxylic ester hydrolase activity         | 227                      | 9                              | 0.00831        |
|              | GO:0051213      | dioxygenase activity                        | 403                      | 13                             | 0.00939        |
|              | GO:0015979      | photosynthesis                              | 148                      | 16                             | 4.50E-09       |
|              | GO:0055114      | oxidation-reduction process                 | 2442                     | 77                             | 6.40E-08       |
|              | GO:0006979      | response to oxidative stress                | 282                      | 19                             | 3.70E-07       |
|              | GO:0006073      | cellular glucan metabolic process           | 205                      | 15                             | 2.20E-06       |
|              | GO:0044042      | glucan metabolic process                    | 205                      | 15                             | 2.20E-06       |
|              | GO:0005976      | polysaccharide metabolic process            | 267                      | 17                             | 3.20E-06       |
|              | GO:0019684      | photosynthesis, light reaction              | 58                       | 8                              | 5.50E-06       |
|              | GO:0009767      | photosynthetic electron transport chain     | 17                       | 5                              | 6.80E-06       |
| <b>BP</b>    | GO:0006950      | response to stress                          | 1697                     | 53                             | 1.10E-05       |
|              | GO:0044264      | cellular polysaccharide metabolic proces... | 241                      | 15                             | 1.60E-05       |
|              | GO:0009773      | photosynthetic electron transport in pho... | 11                       | 4                              | 2.40E-05       |
|              | GO:0051607      | defense response to virus                   | 13                       | 4                              | 5.00E-05       |
|              | GO:0006952      | defense response                            | 328                      | 16                             | 0.00015        |
|              | GO:0005975      | carbohydrate metabolic process              | 1522                     | 45                             | 0.00019        |
|              | GO:0002252      | immune effector process                     | 19                       | 4                              | 0.00025        |
|              | GO:0022900      | electron transport chain                    | 55                       | 6                              | 0.00031        |

| <b>Group</b> | <b>GO Terms</b> | <b>Term Description</b>                     | <b>Total<br/>Transcripts</b> | <b>Significant<br/>Transcripts</b> | <b>P-value</b> |
|--------------|-----------------|---|------------------------------|------------------------------------|----------------|
|              | GO:0044710      | single-organism metabolic process           | 5672                         | 126                                | 0.0004         |
|              | GO:0044262      | cellular carbohydrate metabolic process     | 400                          | 17                                 | 0.00049        |
|              | GO:0008152      | metabolic process                           | 17713                        | 334                                | 0.00061        |
|              | GO:0002376      | immune system process                       | 113                          | 8                                  | 0.00065        |
|              | GO:0006091      | generation of precursor metabolites and ... | 240                          | 12                                 | 0.00081        |
|              | GO:0009607      | response to biotic stimulus                 | 352                          | 15                                 | 0.001          |
|              | GO:0098542      | defense response to other organism          | 157                          | 9                                  | 0.00139        |
|              | GO:0042545      | cell wall modification                      | 129                          | 8                                  | 0.00155        |
|              | GO:0009615      | response to virus                           | 77                           | 6                                  | 0.00188        |
|              | GO:0071555      | cell wall organization                      | 166                          | 9                                  | 0.00205        |
|              | GO:0019318      | hexose metabolic process                    | 167                          | 9                                  | 0.00213        |
|              | GO:0043207      | response to external biotic stimulus        | 309                          | 13                                 | 0.00236        |
|              | GO:0051707      | response to other organism                  | 309                          | 13                                 | 0.00236        |
|              | GO:0045229      | external encapsulating structure organiz... | 172                          | 9                                  | 0.0026         |
|              | GO:0006597      | spermine biosynthetic process               | 5                            | 2                                  | 0.00272        |
|              | GO:0008215      | spermine metabolic process                  | 5                            | 2                                  | 0.00272        |
|              | GO:0008216      | spermidine metabolic process                | 5                            | 2                                  | 0.00272        |
|              | GO:0008295      | spermidine biosynthetic process             | 5                            | 2                                  | 0.00272        |
|              | GO:0030244      | cellulose biosynthetic process              | 90                           | 6                                  | 0.00412        |
|              | GO:0010150      | leaf senescence                             | 20                           | 3                                  | 0.00433        |
|              | GO:0010260      | organ senescence                            | 20                           | 3                                  | 0.00433        |
|              | GO:0071554      | cell wall organization or biogenesis        | 257                          | 11                                 | 0.00436        |
|              | GO:0030243      | cellulose metabolic process                 | 93                           | 6                                  | 0.00484        |
|              | GO:0009699      | phenylpropanoid biosynthetic process        | 21                           | 3                                  | 0.00499        |
|              | GO:0009806      | lignan metabolic process                    | 21                           | 3                                  | 0.00499        |
|              | GO:0009807      | lignan biosynthetic process                 | 21                           | 3                                  | 0.00499        |
|              | GO:0016052      | carbohydrate catabolic process              | 159                          | 8                                  | 0.00558        |
|              | GO:0006595      | polyamine metabolic process                 | 7                            | 2                                  | 0.00558        |
|              | GO:0006596      | polyamine biosynthetic process              | 7                            | 2                                  | 0.00558        |
|              | GO:0033993      | response to lipid                           | 194                          | 9                                  | 0.00572        |
|              | GO:0009250      | glucan biosynthetic process                 | 134                          | 7                                  | 0.00761        |
|              | GO:0006006      | glucose metabolic process                   | 136                          | 7                                  | 0.00823        |

| Group | GO Terms   | Term Description                            | Total Transcripts | Significant Transcripts | P-value  |
|-------|------------|---|-------------------|-------------------------|----------|
|       | GO:0009698 | phenylpropanoid metabolic process           | 26                | 3                       | 0.00917  |
|       | GO:0048589 | developmental growth                        | 108               | 6                       | 0.00986  |
|       | GO:0044436 | thylakoid part                              | 330               | 28                      | 7.50E-13 |
|       | GO:0009579 | thylakoid                                   | 358               | 29                      | 9.20E-13 |
|       | GO:0042651 | thylakoid membrane                          | 262               | 25                      | 1.00E-12 |
|       | GO:0034357 | photosynthetic membrane                     | 300               | 26                      | 3.20E-12 |
|       | GO:0005618 | cell wall                                   | 355               | 27                      | 2.50E-11 |
|       | GO:0030312 | external encapsulating structure            | 355               | 27                      | 2.50E-11 |
|       | GO:0009534 | chloroplast thylakoid                       | 237               | 20                      | 1.80E-09 |
|       | GO:0031976 | plastid thylakoid                           | 237               | 20                      | 1.80E-09 |
|       | GO:0031984 | organelle subcompartment                    | 237               | 20                      | 1.80E-09 |
|       | GO:0009535 | chloroplast thylakoid membrane              | 207               | 18                      | 7.30E-09 |
|       | GO:0055035 | plastid thylakoid membrane                  | 207               | 18                      | 7.30E-09 |
|       | GO:0044434 | chloroplast part                            | 603               | 31                      | 1.30E-08 |
|       | GO:0044435 | plastid part                                | 630               | 31                      | 3.50E-08 |
|       | GO:0009523 | photosystem II                              | 55                | 9                       | 2.10E-07 |
|       | GO:0009507 | chloroplast                                 | 2129              | 65                      | 2.20E-07 |
|       | GO:0009536 | plastid                                     | 2187              | 65                      | 5.90E-07 |
| CC    | GO:0009654 | photosystem II oxygen evolving complex      | 35                | 7                       | 1.20E-06 |
|       | GO:0009521 | photosystem                                 | 88                | 10                      | 1.50E-06 |
|       | GO:0048046 | apoplast                                    | 128               | 11                      | 7.20E-06 |
|       | GO:0019898 | extrinsic component of membrane             | 50                | 7                       | 1.40E-05 |
|       | GO:0005576 | extracellular region                        | 221               | 14                      | 1.50E-05 |
|       | GO:0009505 | plant-type cell wall                        | 81                | 8                       | 4.80E-05 |
|       | GO:1990204 | oxidoreductase complex                      | 96                | 8                       | 0.00016  |
|       | GO:0016020 | membrane                                    | 5642              | 120                     | 0.00018  |
|       | GO:0071944 | cell periphery                              | 1496              | 42                      | 0.00028  |
|       | GO:0009570 | chloroplast stroma                          | 226               | 12                      | 0.00031  |
|       | GO:0009543 | chloroplast thylakoid lumen                 | 41                | 5                       | 0.00049  |
|       | GO:0031978 | plastid thylakoid lumen                     | 41                | 5                       | 0.00049  |
|       | GO:0009532 | plastid stroma                              | 255               | 12                      | 0.00092  |
|       | GO:0031977 | thylakoid lumen                             | 57                | 5                       | 0.00221  |
|       | GO:0010598 | NAD(P)H dehydrogenase complex (plastoqui... | 5                 | 2                       | 0.0025   |
|       | GO:0031012 | extracellular matrix                        | 21                | 3                       | 0.00443  |