

## Supplementary information

### **Effects of changes in straw chemical properties and alkaline soils on bacterial communities engaged in straw decomposition at different temperatures**

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**Figure S1.**  $^{13}\text{C}$ -NMR spectra of the decomposed wheat straw under different temperature and incubation time. L30: low temperature (15 °C) on day 30 (early stage of decomposition); M30: moderate temperature (25 °C) on day 30; H30: high temperature (35 °C) on day 30; L120: low temperature on day 120 (late stage of decomposition); M120: moderate temperature on day 120; H120: high temperature on day 120.

**Figure S2.** The proportional distributions of sequences and derived OTUs in each bacterial phylum detected in all straw samples.

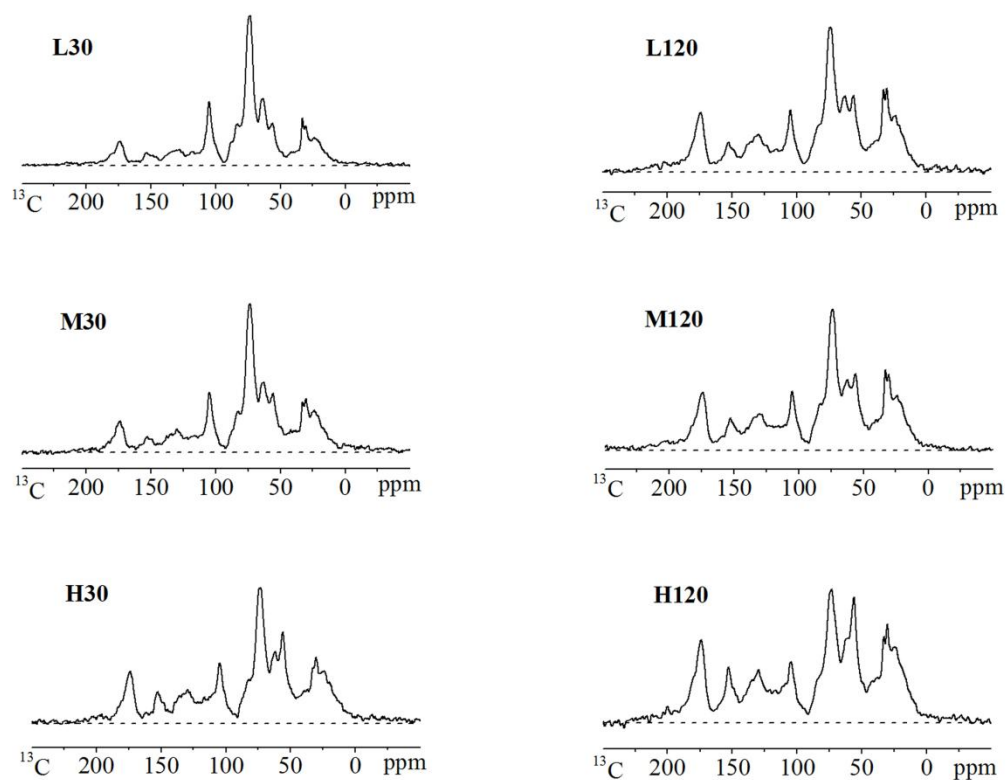
**Figure S3.** Non-metric multidimensional scaling (NMDS) of the bacterial communities based on Jaccard distances and symbols coded by treatments. L30: low temperature (15 °C) on day 30 (early stage of decomposition); M30: moderate temperature (25 °C) on day 30; H30: high temperature (35 °C) on day 30; L120: low temperature on day 120 (late stage of decomposition); M120: moderate temperature on day 120; H120: high temperature on day 120.

**Table S1.** List of straw samples and corresponding barcodes used in this study. L30: low temperature (15 °C) on day 30 (early stage of decomposition); M30: moderate temperature (25 °C) on day 30; H30: high temperature (35 °C) on day 30; L120: low temperature on day 120 (late stage of decomposition); M120: moderate temperature on day 120; H120: high temperature on day 120.

**Table S2.** Number of sequences and OTUs measured by QIIME processing in each sample. L30: low temperature (15 °C) on day 30 (early stage of decomposition); M30: moderate temperature (25 °C) on day 30; H30: high temperature (35 °C) on day 30; L120: low temperature on day 120 (late stage of decomposition); M120: moderate temperature on day 120; H120: high temperature on day 120.

**Table S3.** The factors that significant correlated with bacterial communities of decomposing wheat straw were list below. The correlations ( $r$ ) and significance ( $P$ ) were determined by Mantel analysis between the variables and the bacterial community composition.

**Table S4.** Direct and indirect effects of pathways of responses relative to bacterial community by path analysis.

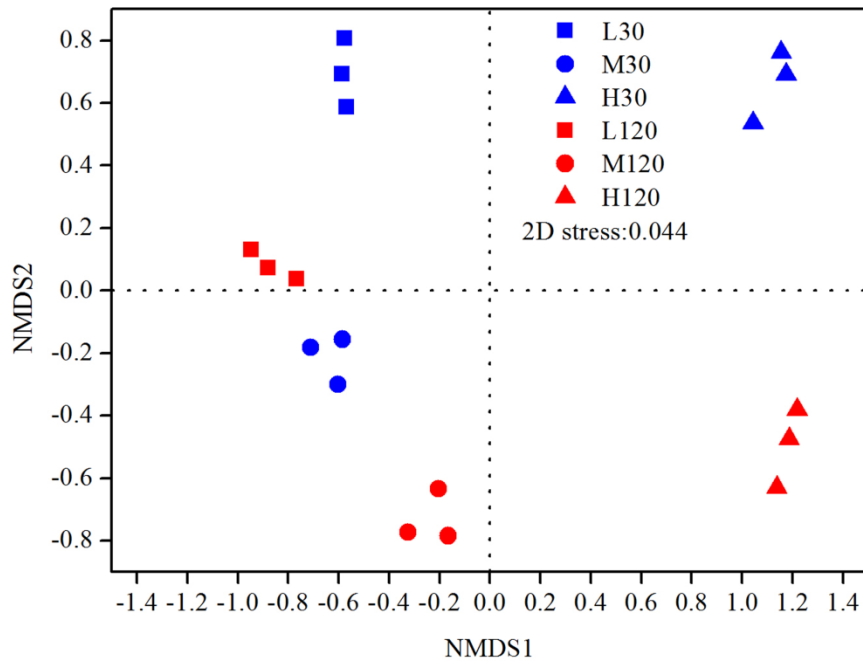


**Figure S1.**  $^{13}\text{C}$ -NMR spectra of the decomposed wheat straw under different temperature and incubation time. L30: low temperature (15 °C) on day 30 (early stage of decomposition); M30: moderate temperature (25 °C) on day 30; H30: high temperature (35 °C) on day 30; L120: low temperature on day 120 (late stage of decomposition); M120: moderate temperature on day 120; H120: high temperature on day 120.

| Taxonomy            | Sequences | OTUs |
|---------------------|-----------|------|
| Alphaproteobacteria | 76110     | 2251 |
| Betaproteobacteria  | 13075     | 279  |
| Deltaproteobacteria | 704       | 90   |
| Gammaproteobacteria | 20780     | 517  |
| Actinobacteria      | 22726     | 1029 |
| Bacteroidetes       | 30373     | 660  |
| Firmicutes          | 10441     | 346  |
| Planctomycetes      | 2246      | 212  |
| Chloroflexi         | 1383      | 118  |
| Gemmatimonadetes    | 144       | 32   |
| Acidobacteria       | 379       | 111  |
| Other               | 1199      | 573  |
| SUM                 | 179560    | 6218 |



**Figure S2.** The proportional distributions of sequences and derived OTUs in each bacterial phylum detected in all straw samples.



**Figure S3.** Non-metric multidimensional scaling (NMDS) of the bacterial communities based on Jaccard distances and symbols coded by treatments. L30: low temperature (15 °C) on day 30 (early stage of decomposition); M30: moderate temperature (25 °C) on day 30; H30: high temperature (35 °C) on day 30; L120: low temperature on day 120 (late stage of decomposition); M120: moderate temperature on day 120; H120: high temperature on day 120.

**Table S1.** List of straw samples and corresponding barcodes used in this study.

| Samples | Barcode      |
|---------|--------------|
| L30-1   | ACGA CACGTAT |
| L30-2   | ACGCGTCTA GT |
| L30-3   | ACGTACACA CT |
| M30-1   | AGTACGAGA GT |
| M30-2   | AGTACTACTAT  |
| M30-3   | AGTAGACGTCT  |
| H30-1   | CAGTACGTA CT |
| H30-2   | ACTCACTA GCT |
| H30-3   | ACTCTATATAT  |
| L120-1  | AGCGCACGA GT |
| L120-2  | AGCGTGTGCGT  |
| L120-3  | AGCTAGATACT  |
| M120-1  | ATCGCTCACGT  |
| M120-2  | ATCGTCA GTCT |
| M120-3  | ATCTCTCGTAT  |
| H120-1  | CACGCGA GTCT |
| H120-2  | CACGCTACGAT  |
| H120-3  | CACGTGTATAT  |

L30: low temperature (15 °C) on day 30 (early stage of decomposition); M30: moderate temperature (25 °C) on day 30; H30: high temperature (35 °C) on day 30; L120: low temperature on day 120 (late stage of decomposition); M120: moderate temperature on day 120; H120: high temperature on day 120.

**Table S2.** Number of sequences and OTUs measured by QIIME processing in each sample.

|        | Count     |      |
|--------|-----------|------|
|        | Sequences | OTUs |
| L30-1  | 6573      | 492  |
| L30-2  | 2920      | 409  |
| L30-3  | 3664      | 411  |
| M30-1  | 1100      | 272  |
| M30-2  | 4525      | 712  |
| M30-3  | 2236      | 409  |
| H30-1  | 1243      | 158  |
| H30-2  | 2028      | 184  |
| H30-3  | 1432      | 181  |
| L120-1 | 26906     | 1880 |
| L120-2 | 32910     | 1370 |
| L120-3 | 33987     | 1393 |
| M120-1 | 20903     | 1582 |
| M120-2 | 15678     | 1340 |
| M120-3 | 12089     | 1170 |
| H120-1 | 5574      | 685  |
| H120-2 | 3226      | 497  |
| H120-3 | 2566      | 455  |

L30: low temperature (15 °C) on day 30 (early stage of decomposition); M30: moderate temperature (25 °C) on day 30; H30: high temperature (35 °C) on day 30; L120: low temperature on day 120 (late stage of decomposition); M120: moderate temperature on day 120; H120: high temperature on day 120.



**Table S3.** The factors that significant correlated with bacterial communities of decomposing wheat straw were list below. The correlations (*r*) and significance (*P*) were determined by Mantel analysis between the variables and the bacterial community composition.

| Variable | <i>r</i> | <i>P</i> |
|----------|----------|----------|
| pH       | 0.513    | 0.001    |
| DON      | 0.591    | 0.001    |
| MBC      | 0.591    | 0.001    |
| Straw C  | 0.284    | 0.004    |
| Straw N  | 0.589    | 0.001    |
| Straw P  | 0.475    | 0.001    |

**Table S4.** Direct and indirect effects of pathways of responses relative to bacterial community by path analysis.

| Response         | Direct effect | Indirect effect |                 |                  |
|------------------|---------------|-----------------|-----------------|------------------|
|                  |               | Temperature     | Soil properties | Straw properties |
| Temperature      | -0.081        | --              | 0.142           | -0.130           |
| Soil properties  | 1.043         | -0.011          | --              | 0.014            |
| Straw properties | 0.179         | 0.059           | 0.083           | --               |