**Supplementary Information：**
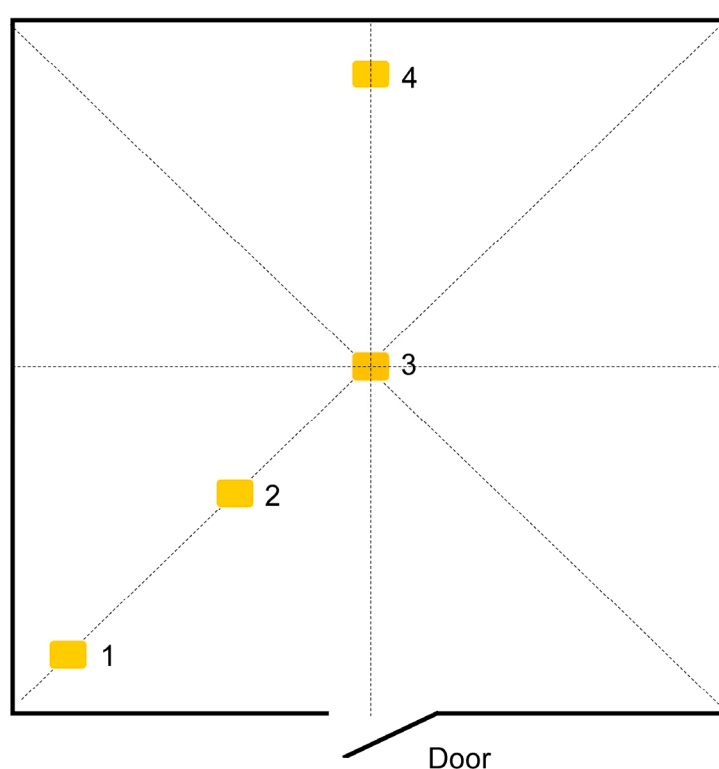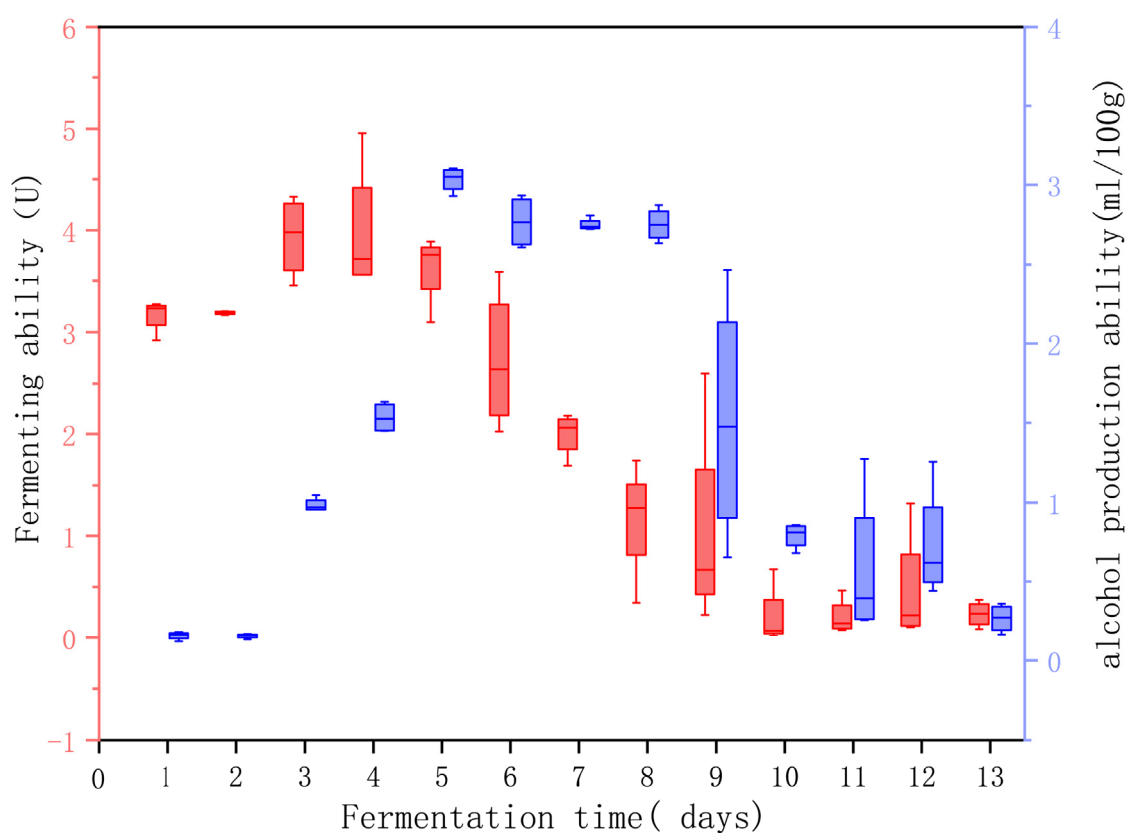
**Table S1.** Functional community and environmental factor permutation test.
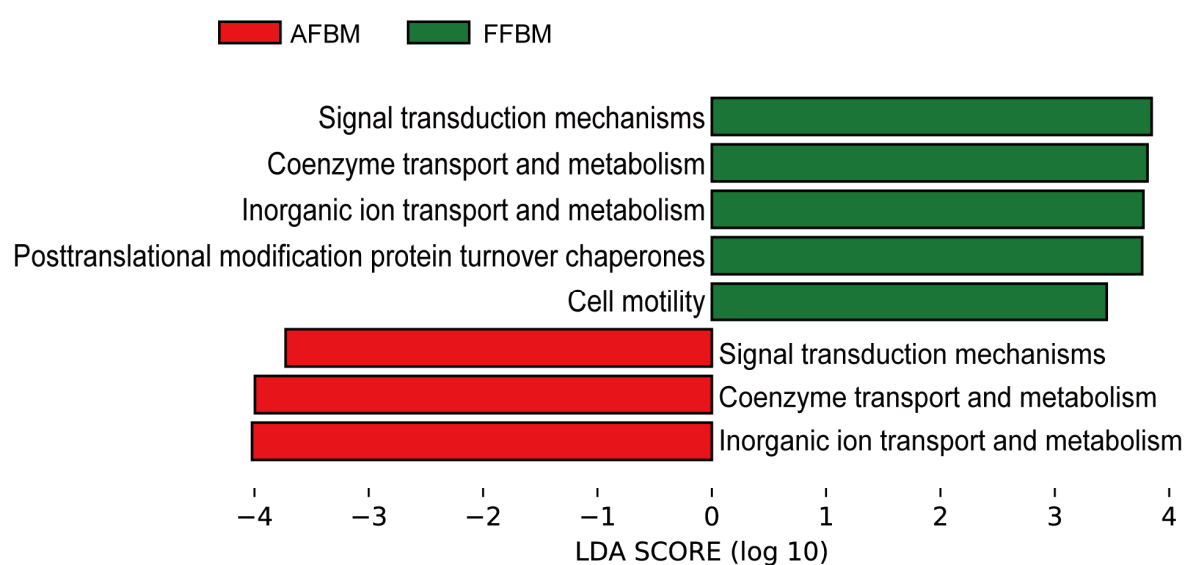
| permutation test | AFBM | | AFFM | | FFBM | | FFFM | |
|---|---|---|---|---|---|---|---|---|
| | r2 | Pr(>r) | r2 | Pr(>r) | r2 | Pr(>r) | r2 | Pr(>r) |
| temporary | 0.24 | 0.04 | 0.83 | 0.01 | 0.08 | 0.43 | 0.75 | 0.01 |
| humidity | 0.37 | 0.01 | 0.85 | 0.01 | 0.38 | 0.01 | 0.84 | 0.01 |
| O2 | 0.43 | 0.01 | 0.50 | 0.01 | 0.43 | 0.01 | 0.54 | 0.01 |
| Moisture | 0.60 | 0.01 | 0.65 | 0.01 | 0.61 | 0.01 | 0.67 | 0.01 |
| acidity | 0.45 | 0.01 | 0.78 | 0.01 | 0.43 | 0.01 | 0.79 | 0.01 |



**Figure S1.** Sampling points of Daqu in the Qu-room.

**Figure S2.** Variations in the fermentation ability and alcohol production ability. Red represents fermentation ability, blue represents alcohol production ability.



**Figure S3.** Functional differences between FFBM and AFBM. Red represents the differential metabolic pathways in AFBM, green represents the differential metabolic pathways in FFBM. (Function prediction based on COG).