**Supplementary date**

Fig. S1. The average rainfall and air temperature among observation period (2018–2019) at Yu Zhong station.

Fig. S2. Effects of plastic film mulching and intercropping on soil water content of maize and faba bean strips (0-100 cm) in the two growing seasons of 2018-2019.

Fig. S3. Leaf area index (a), chlorophyll content (b), and photosynthetic rate (c) of maize at different growth stages in relation to cropping treatments, and film mulching in the two growing seasons of 2018-2019.

Fig.S4. Principle component analysis of the two cropping systems under film mulching (a) and absence of mulching (b). Arrow length indicates the loading of each trait onto PCA axes. Symbols represent the position of treatments along the PCA 1 and 2.

Abbreviations, KA: Kernel abortion; K: maximum biomass; R: Intrinsic growth rate; Imax: maximum growth rate; KW: kernel weight; DTA: dry matter transfer amount; GY: grain yield; DTR: dry matter transfer rate; GCR: grain contribution rate；Loss1: fertilization failure rate; Loss2: failure grain filling rate.

Table S1: Effects of plastic film mulching and intercropping on soil water storage (SWS), ET, yield, WUE, and LER of maize and faba bean strips (0-100cm) in the two growing seasons of 2018-2019.

Table S2: Dry matter translocation and contribution rate to grain yield of every organ in maize in relation to cropping treatments and film mulching in 2018-2019.

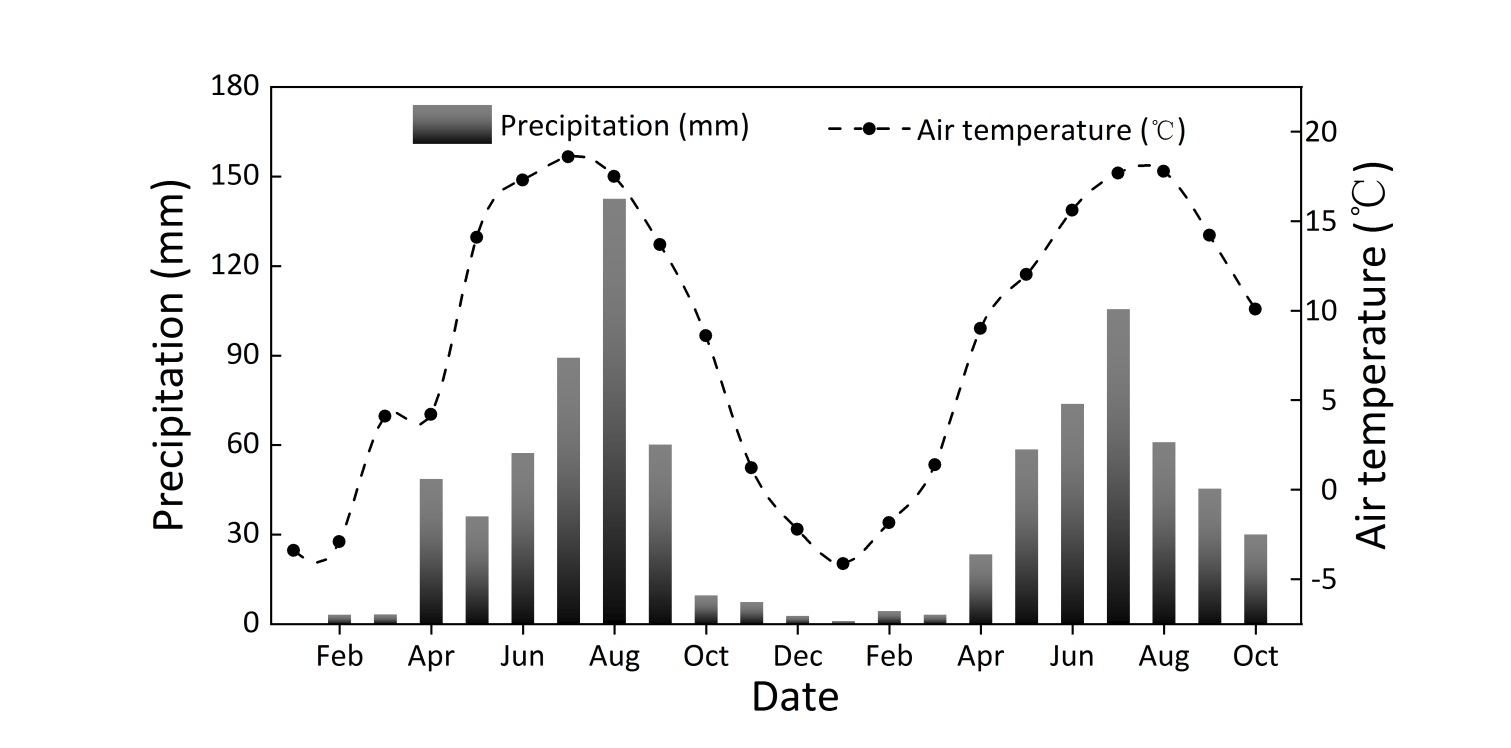
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Fig. S1. The average rainfall and air temperature among observation period (2018–2019) at Yu Zhong station.

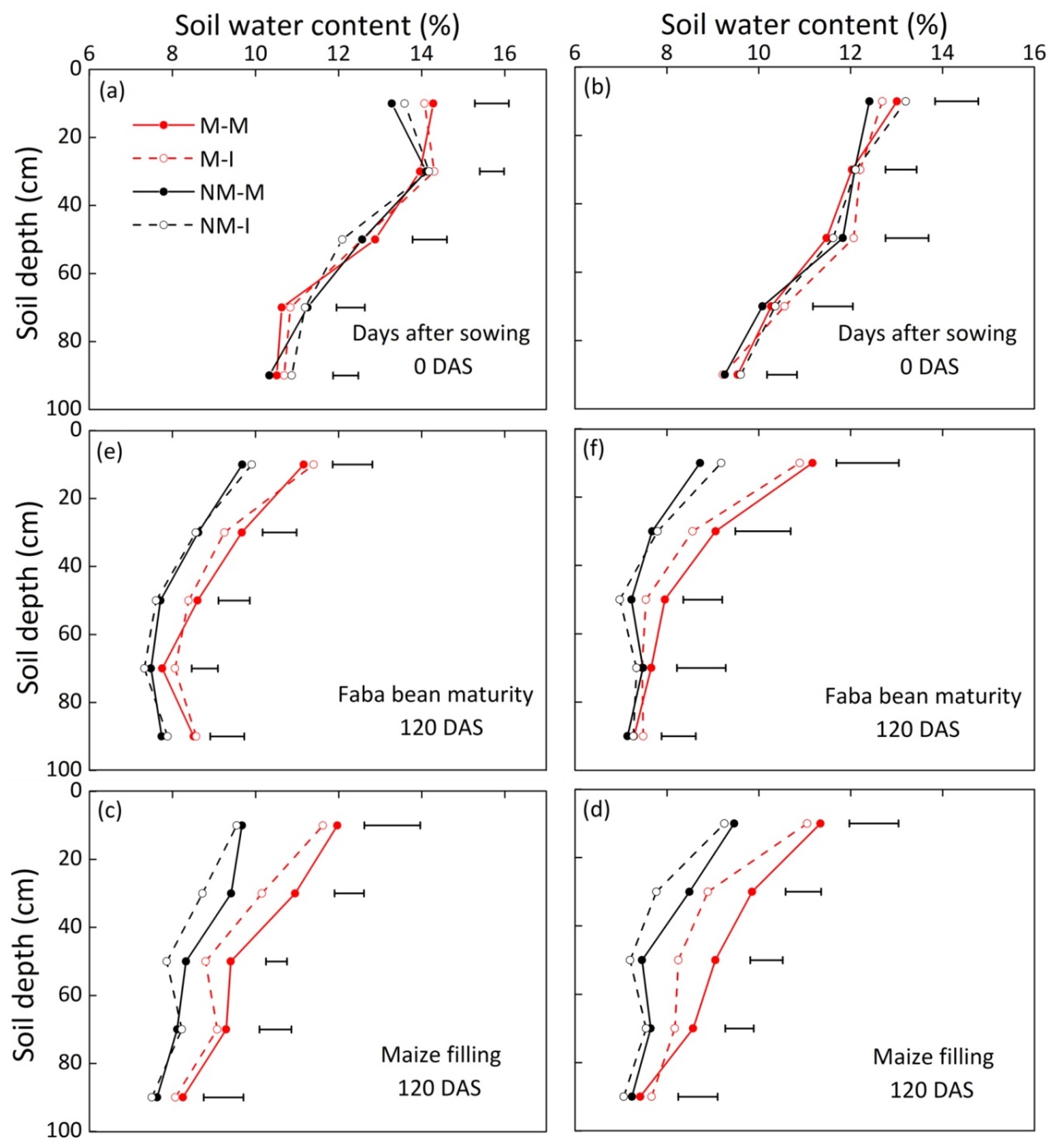
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Fig. S2. Effects of plastic film mulching and intercropping on soil water content of maize and faba bean strips (0-100 cm) in the two growing seasons of 2018-2019.

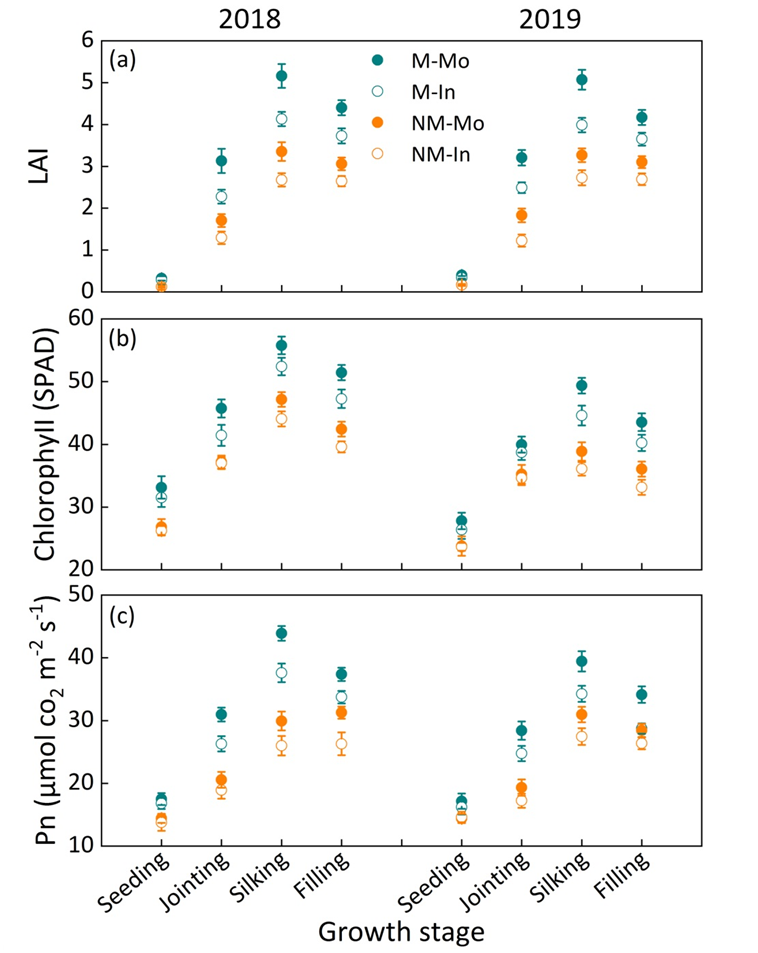
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Fig. S3. Leaf area index (a), chlorophyll content (b), and photosynthetic rate (c) of maize at different growth stages in relation to cropping treatments, and film mulching in the two growing seasons of 2018-2019.

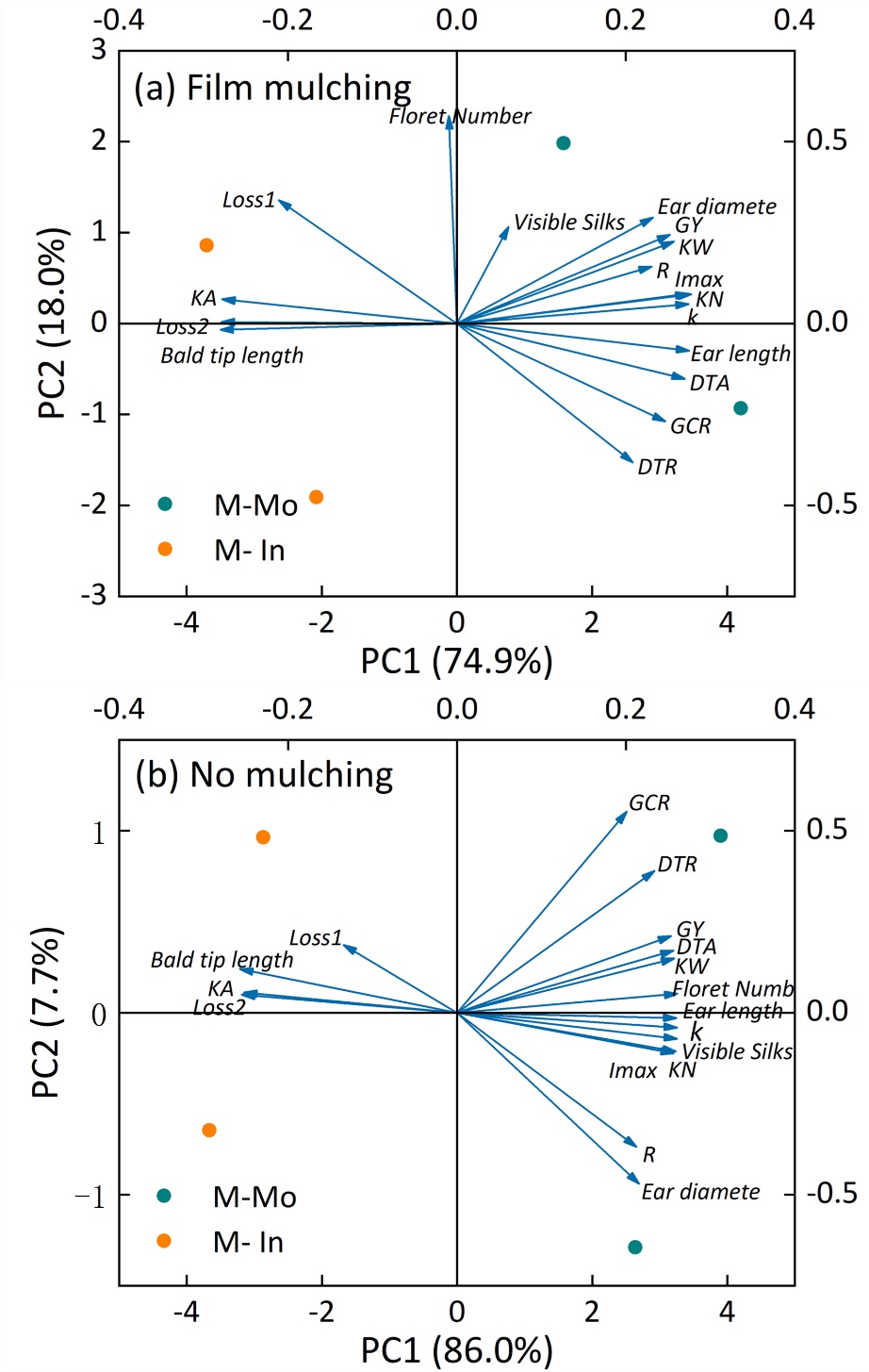
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Fig.S4. Principle component analysis of the two cropping systems under film mulching (a) and absence of mulching (b). Arrow length indicates the loading of each trait onto PCA axes. Symbols represent the position of treatments along the PCA 1 and 2.

Abbreviations, KA: Kernel abortion; K: maximum biomass; R: Intrinsic growth rate; Imax: maximum growth rate; KW: kernel weight; DTA: dry matter transfer amount; GY: grain yield; DTR: dry matter transfer rate; GCR: grain contribution rate；Loss1: fertilization failure rate; Loss2: failure grain filling rate.

Table S1: Effects of plastic film mulching and intercropping on soil water storage (SWS), ET, yield, WUE, and LER of maize and faba bean strips (0-100cm) in the two growing seasons of 2018-2019.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | Treatments | SWSM (mm) | | | SWSF  (mm) | ETM  (mm) | ETF  (mm) | YieldM  (kg ha−1) | Yield F  (kg ha−1) | WUEM (kg ha−1mm−1) | WUEF (kg ha−1mm−1) | LER |
| Sowing | Filling | Maturity |
| 2018 | M-M | 181.1a | 146.4a | 124.2a | 134.0a | 569.2a | 511.0a | 14887.4a | 2411.6b | 26.2a | 4.7b | - |
| M-I | 180.5a | 137.6b | 106.4b | 132.1a | 551.4b | 510.1a | 12920.7b | 3176.4a | 23.7b | 6.2a | 1.14 |
| NM-M | 179.7a | 125.3c | 91.9c | 120.4b | 536.9c | 498.4b | 11554.3c | 1566.4d | 21.5c | 3.1d | - |
| NM-I | 179.4a | 119.8d | 86.9d | 119.8b | 531.9c | 497.8b | 9723.7d | 1931.3c | 18.3d | 3.9c | 1.08 |
| 2019 | M-M | 164.5a | 135.0a | 118.3a | 124.0a | 519.3a | 430.0a | 14819.6a | 2247.2b | 28.5a | 5.2b |  |
| M-I | 164.3a | 124.2b | 104.3b | 122.8a | 505.3b | 428.8a | 13322.3b | 3294.5a | 26.4b | 7.7a | 1.24 |
| NM-M | 162.4a | 115.6c | 85.6c | 112.2b | 486.6c | 418.2b | 10685.8c | 1434.0d | 22.0c | 3.4d |  |
| NM-I | 164.3a | 108.4d | 78.2d | 112.6b | 479.2d | 418.6b | 9217.5d | 1872.1c | 19.2d | 4.5c | 1.13 |
| Sig. |  |  |  |  |  |  |  |  |  |  |  |  |
|  | M | ns | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* |
|  | CS | ns | \*\*\* | \*\*\* | ns | \*\*\* | ns | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\* |
|  | M×CS | ns | \*\* | \*\* | ns | \*\* | ns | \*\* | \*\* | \* | \* | \* |

Table S2: Dry matter translocation and contribution rate to grain yield of every organ in maize in relation to cropping treatments and film mulching in 2018-2019.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | Treatments | Stem | | | Leaf | | | Sheath | | | Total | | |
|  | | DTA/kg | DTR/% | GCR/% | DTA/kg | DTR/% | GCR/% | DTA/kg | DTR/% | GCR/% | DTA/kg | DTR/% | GCR/% |
| 2018 | M-Mo | 3381a | 30.1a | 22.8a | 1593a | 26.5a | 10.8a | 1021a | 31.7a | 6.6a | 5995a | 31.3a | 40.2a |
| M-In | 2870b | 28.3b | 21.6b | 991b | 21.8b | 7.4bc | 743b | 27.8b | 5.8b | 4606b | 27.6b | 34.8b |
| NM-Mo | 2276c | 24.4c | 21.3b | 852bc | 18.9bc | 8.0b | 528c | 24.0c | 5.3b | 3656c | 23.7c | 34.5b |
| NM-In | 1663d | 20.0d | 18.1c | 573c | 13.7c | 5.9c | 346d | 19.1d | 4.6c | 2584d | 18.3d | 28.5c |
| 2019 | M-Mo | 2882a | 25.2a | 19.8a | 1092a | 20.5a | 7.5a | 980a | 27.6a | 6.9a | 4955a | 24.8a | 34.2a |
| M-In | 2213b | 22.1b | 17.4b | 895b | 18.9ab | 6.9b | 776b | 26.3a | 5.8b | 3884b | 22.3b | 30.1b |
| NM-Mo | 1896c | 19.4c | 16.4b | 768c | 17.4b | 6.7bc | 561c | 22.9b | 4.6c | 3226c | 19.7c | 27.7c |
| NM-In | 1349d | 15.2d | 13.9c | 490d | 12.1c | 5.1c | 419d | 19.3c | 3.6d | 2258d | 15.3d | 22.5d |
| Sig. |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | M | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* |
|  | C | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* | \*\*\* |
|  | M×C | ns | \* | ns | \* | \*\* | ns | \*\* | ns | \* | ns | \*\* | \* |