Table S1

Physical characteristics of the soil under the experiments, conducted in Piracicaba/SP. Granulometric composition (Clay, Sand, Silt), bulk density (BD), air dry soil, lower limit or permanent wilting point at −15 bar (LL15), drained upper limit or field capacity (DUL), saturated soil limit (SAT), oats lower limit (OatsLL), oats water extraction coefficient (OatsKL).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Depth | Clay | Sand | Silt | BD | Air dry | LL15 | DUL | SAT | OatsLL | OatsKL |
| unit| m | % | | | g cm-3 | mm mm-1 | | | | | d-1 |
| 0 - 0.10 | 46.2 | 32.2 | 21.5 | 1.35 | 0.15 | 0.16 | 0.37 | 0.46 | 0.16 | 0.060 |
| 0.10 - 0.20 | 46.2 | 32.2 | 21.5 | 1.43 | 0.20 | 0.22 | 0.36 | 0.46 | 0.22 | 0.060 |
| 0.20 - 0.30 | 57.4 | 24.9 | 17.7 | 1.46 | 0.24 | 0.26 | 0.37 | 0.46 | 0.26 | 0.060 |
| 0.30 - 0.40 | 57.4 | 24.9 | 17.7 | 1.46 | 0.30 | 0.31 | 0.38 | 0.46 | 0.31 | 0.060 |
| 0.40 - 0.50 | 57.4 | 24.9 | 17.7 | 1.43 | 0.31 | 0.31 | 0.41 | 0.47 | 0.31 | 0.050 |
| 0.50 - 0.60 | 57.4 | 24.9 | 17.7 | 1.38 | 0.32 | 0.33 | 0.41 | 0.47 | 0.33 | 0.025 |
| 0.60 - 0.70 | 56.8 | 24.4 | 18.8 | 1.30 | 0.31 | 0.31 | 0.38 | 0.47 | 0.31 | 0.025 |
| 0.70 - 0.80 | 56.8 | 24.4 | 18.8 | 1.31 | 0.29 | 0.31 | 0.33 | 0.43 | 0.31 | 0.020 |
| 0.80 - 0.90 | 56.8 | 24.4 | 18.8 | 1.39 | 0.29 | 0.29 | 0.32 | 0.42 | 0.29 | 0.020 |
| 0.90 - 1.50 | 54.0 | 26.1 | 20.3 | 1.39 | 0.29 | 0.29 | 0.32 | 0.42 | 0.29 | 0.010 |

Table S2

Initial chemical characteristics of the soil under Experiment 1, conducted in 2018, in Piracicaba/SP. Nitrate (NO3), ammonium (NH4), pH (water), electrical conductivity (EC), and organic carbon content (OC).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Depth | NO3 | NH4 | pH | EC | OC |
| unit | m | ppm | ppm |  | dS m-1 | % |
| 0 - 0.20 | 49.00 | 84.00 | 5.60 | 0.38 | 1.30 |
| 0.20 - 0.40 | 46.00 | 60.00 | 5.86 | 0.32 | 0.90 |
| 0.40 - 0.60 | 60.00 | 130.00 | 6.35 | 0.34 | 0.70 |
| 0.60 - 0.80 | 53.00 | 49.00 | 6.92 | 0.35 | 0.60 |

Table S3

Date of start and end, average incoming solar radiation (Rs), average maximum temperature (Tmax), average minimum temperature (Tmin), average wind speed (u), accumulated rainfall (R), and accumulated irrigation (I), for each growth cycle in Experiment 1 and 2 conducted in Piracicaba/SP. The \* represent cycles with only rainfed system.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Cycles | Date | Rs | Tmax | Tmin | u | R | I |
| (start - end) | MJ m-2 d-1 | °C | °C | m s-1 | mm | mm |
| Experiment 1 (04/28/ to 11/18 the 2018) | | | | | | | |
| 1 | 04/28 to 06/14 | 13,6 | 27,7 | 13,5 | 1,4 | 21,8 | 79,33 |
| 2 | 06/15 to 07/16 | 13,2 | 27,8 | 11,5 | 1,4 | 0,0 | 91,40 |
| 3 | 07/17 to 08/17 | 13,5 | 26,4 | 11,6 | 1,6 | 97,5 | 41,71 |
| 4 | 08/18 to 09/18 | 17,3 | 27,9 | 12,8 | 1,7 | 24,1 | 69,93 |
| 5 | 09/19 to 10/18 | 17,7 | 30,0 | 18,0 | 1,5 | 141,2 | 29,03 |
| 6\* | 10/19 to 11/18 | 19,6 | 29,2 | 17,7 | 1,9 | 125,0 | -- |
| Experiment 2 (04/27 to 11/01 in 2019) | | | | | | | |
| 1 | 04/27 to 06/13 | 13,6 | 27,2 | 14,6 | 1,3 | 42,4 | 114,36 |
| 2 | 06/14 to 07/18 | 13,7 | 26,4 | 11,2 | 1,5 | 52,0 | 91,67 |
| 3 | 07/19 to 08/19 | 15,7 | 27,6 | 11,4 | 1,7 | 2,4 | 122,51 |
| 4 | 08/20 to 09/24 | 18,0 | 30,3 | 15,0 | 1,9 | 39,5 | 129,50 |
| 5\* | 09/25 to 10/24 | 21,1 | 31,7 | 16,7 | 1,9 | 50,5 | 62,57 |
| 6\* | 10/25 to 11/01 | 25,8 | 35,2 | 18,8 | 1,9 | 81,8 | -- |

Table S4

Phenological phases and their initial and final stages for the APSIM-*Oats* model.

|  |  |  |  |
| --- | --- | --- | --- |
| **N** | **Phase name** | **Initial Stage** | **Final Stage** |
| 1 | Germinating | Sowing | Germination |
| 2 | Emerging | Germination | Emergence |
| 3 | Vegetative | Emergence | Terminal Spikelet |
| 4 | Stem Elongation | Terminal Spikelet | Flag Leaf |
| 5 | Early Reproductive | Flag Leaf | Flowering |
| 6 | Grain Development | Flowering | Start Grain Fill |
| 7 | Grain Filling | Start Grain Fill | End Grain Fill |
| 8 | Maturing | End Grain Fill | Maturity |
| 9 | Ripening | Maturity | Harvest Ripe |
| 10 | Ready for Harvesting | Harvest Ripe | - |