Supplement of

The effect of static chamber base on N₂O flux in drip irrigation

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\[ F_{W}, \text{ the denitrification response factor to soil WFPS, is defined as:} \]

\[ \text{If WFPS} < 0.62, \quad F_{W} = 0 \]

\[ \text{Eq. S1} \]

\[ \text{If WFPS} \geq 0.62, \quad F_{W} = \left( \frac{\text{WFPS} - 0.62}{0.38} \right)^{1.74} \]

\[ F_{N}, \text{ the denitrification response factor to soil nitrate content} \ [\text{NO}_3^-] \ (\text{mg-N kg}^{-1} \text{ soil}) \text{ is defined as:} \]

\[ \text{Eq. S2} \]

\[ F_{N} = \frac{[\text{NO}_3^-]}{(K_m)_1 + [\text{NO}_3^-]} \]

Where \([\text{NO}_3^-] \) is nitrate concentration (mg-N kg\(^{-1}\) soil) and \((K_m)_1 = 22 \) (mg-N kg\(^{-1}\) soil) (Hénault and Germon, 2000).

\[ F_T, \text{ the denitrification response factor to soil temperature, corresponding to two different biological reaction rates: one for temperature} \ (t) \text{ below and one for above} \ 11^\circ \text{C, as follows:} \]

\[ \text{Eq. S3} \]

\[ F_{T} = \exp \left[ \frac{(t - 11)\ln(89) - \ln(2.1)}{10} \right], \quad t < 11^\circ \text{C} \]

\[ F_{T} = \exp \left[ \frac{(t - 20) - \ln(2.1)}{10} \right], \quad t \geq 11^\circ \text{C} \]

Table S1. Simulation results: Average ratios between ammonium \((\text{NH}_4^+\text{-N})\) and nitrate \((\text{NO}_3^-\text{-N})\) concentrations (mgL\(^{-1}\)), nitrous oxide emissions (mg-N m\(^2\) d\(^{-1}\)), and water-filled pore space (WFPS) at 10, 20, and 30 cm below chambers with a dripper at their bases \((\text{In})\) and under a standard representative dripper with no base \((\text{No})\).

| Fertilizer | Depth | NH\(_4\)-N\(_{\text{In}}\)/NH\(_4\)-N\(_{\text{No}}\) | NO\(_3\)-N\(_{\text{In}}\)/NO\(_3\)-N\(_{\text{No}}\) | N\(_2\)O-N\(_{\text{In}}\)/N\(_2\)O-N\(_{\text{No}}\) | WFPS\(_{\text{In}}\)/WFPS\(_{\text{No}}\) |
|------------|-------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Yes        | 10cm  | 185±9%                          | 97±4%                           | 97±4%                           | 100±0%                          |
| Yes        | 20cm  | 179±9%                          | 100±4%                          | 98±4%                           | 100±0%                          |
| Yes        | 30cm  | 189±10%                         | 101±4%                          | 101±4%                          | 102±0%                          |
| No         | 10cm  | 209±10%                         | 81±5%                           | 78±6%                           | 99±0%                           |
| No         | 20cm  | 205±11%                         | 84±6%                           | 83±5%                           | 98±0%                           |
| No         | 30cm  | 220±13%                         | 84±6%                           | 85±5%                           | 99±0%                           |
| \(p^*\)    | 10cm  | 0.085                           | 0.017                           | 0.013                           | 0.017                           |
| \(p^*\)    | 20cm  | 0.063                           | 0.025                           | 0.018                           | 0.005                           |
| \(p^*\)    | 30cm  | 0.060                           | 0.024                           | 0.026                           | 0.005                           |
'represents the $p$ value of the t-test between the In/No ratios at all the measuring days with and without fertilizer application.

**Table S2.** Simulation results: Correlations between N$_2$O-N fluxes and ammonium-N (NH$_4^+$-N) and nitrate-N (NO$_3^-$-N) concentrations in the top soil (0 – 10cm) under bases of variable sizes (i.e., no-base, 20, 30, and 40 cm internal diameter, ID) with a dripper at their centers.

| Base ID | N$_2$O-N/NO$_3$-N | N$_2$O-N/NH$_4$-N |
|---------|-------------------|-------------------|
|         | $R^2$  | $p$   | $R^2$  | $p$   |
| No-base | 0.996  | >0.001| 0.298  | >0.001|
| 20-cm  | 0.996  | >0.001| 0.001  | 0.796 |
| 30-cm  | 0.997  | >0.001| 0.006  | 0.527 |
| 40-cm  | 0.999  | >0.001| 0.111  | 0.004 |

**Table S3.** Simulation results: Correlations ($R^2$) between N$_2$O-N fluxes and the water-filled pore-space (WFPS), ammonium-N (NH$_4^+$-N), and nitrate-N (NO$_3^-$-N) concentrations at depths of 10, 20 and 30 cm below the base of a static chamber, with a dripper at its center (In), and under a dripper without a base (No).

|        | N$_2$O-N/WFPS | N$_2$O-N/NH$_4$-N | N$_2$O-N/NO$_3$-N |
|--------|---------------|-------------------|-------------------|
|        | $R^2$  | $p$   | $R^2$  | $p$   | $R^2$  | $p$   |
| 10cm-In| 0.000  | 0.951 | 0.0001 | 0.944 | 0.972  | 0.000 |
| 20cm-In| 0.001  | 0.845 | 0.0039 | 0.599 | 0.983  | 0.000 |
| 30cm-In| 0.004  | 0.598 | 0.0117 | 0.363 | 0.996  | 0.000 |
| 10cm-No| 0.093  | 0.009 | 0.2249 | 0.000 | 0.995  | 0.000 |
| 20cm-No| 0.104  | 0.005 | 0.1884 | 0.000 | 0.993  | 0.000 |
| 30cm-No| 0.117  | 0.003 | 0.1999 | 0.000 | 0.992  | 0.000 |
**Fig. S1.** (A) Schematic representation of the simulated subplot that includes two adjacent drip irrigated tree rows on ridges, located 6m apart, with four trees, located 3.5m apart, along each row. (B) Blowup of the ridge, and the boundary conditions used in the simulations. Boundary conditions are indicated by different border lines, acronyms, and fillings.