



## Effect on tomato cultivars (*Solanum lycopersicum* L. cv. G. Maofen 802, Zhongza 09)

### 1. The net impact of individual and combined stress on plant growth

Crop: Tomato (*Solanum lycopersicum* L. cv. G. Maofen 802, Zhongza 09)  
 Stress 1: *Meloidogyne incognita*  
 Stress 2: *Fusarium oxysporum* f. sp. *lycopersici*  
 Stage of plant: 30 day old Seedling

The table shows the impact of nematode and fungus alone and in combination on total fresh biomass, total dry weight, shoot length, proline and MDA in tomato cultivars.

|               | Treatment   | Plant response to stress<br>(reduction over control %)<br>Type A parameters* |                   |                   | Response to<br>combined stress**<br>Type C parameters* |   |
|---------------|---|--|-------------------|-------------------|--|---|
|               |   | Total fresh biomass  | Total dry weight  | Shoot length      | Proline $\mu\text{g}/\text{FW}$                        | MDA ( $\mu\text{mol}/\text{g}$ FW leaves) |
| G. maofen 802 | <i>Meloidogyne incognita</i> (1500 J2/plant)  | -12.6 $\uparrow$   | 32.0 $\downarrow$ | 22.1 $\downarrow$ | 133.6  | 20.7                                      |
|               | <i>Fusarium oxysporum</i> ( $10^5$ CFU/ml)  | 12.1 $\downarrow$  | 4.0 $\downarrow$  | 13.6 $\downarrow$ | 28.5   | 5.9                                       |
|               | <i>Meloidogyne incognita</i> (1500 J2/plant) + <i>Fusarium oxysporum</i> (105 CFU/ml)<br>Simultaneous stress            | 54.1 $\downarrow$  | 56.0 $\downarrow$ | 32.9 $\downarrow$ | 179.7  | 22.7                                      |
|               | <i>Fusarium oxysporum</i> (105 CFU/ml) + <i>Meloidogyne incognita</i> (1500 J2/plant)<br>7 days later Sequential stress | N/A  | N/A               | N/A               | N/A  | N/A                                       |
|               | <i>Meloidogyne incognita</i> (1500 J2/plant) + <i>Fusarium oxysporum</i> (105 CFU/ml) 7 days later Sequential stress    | N/A  | N/A               | N/A               | N/A  | N/A                                       |
| Zhongza 09    | <i>Meloidogyne incognita</i> (1500 J2/plant)  | -8.1 $\uparrow$  | 33.3 $\downarrow$ | 18.5 $\downarrow$ | 108.7  | 17  |
|               | <i>Fusarium oxysporum</i> ( $10^5$ CFU/ml)  | 1.9 $\downarrow$   | 3.7 $\downarrow$  | 9.6 $\downarrow$  | 25.8   | 4   |
|               | <i>Meloidogyne incognita</i> (1500 J2/plant) + <i>Fusarium oxysporum</i> (105 CFU/ml)<br>Simultaneous stress            | 19.1 $\downarrow$  | 33.3 $\downarrow$ | 19.1 $\downarrow$ | 140  | 19.3                                      |

|  |     |     |     |     |     |
|--|-----|-----|-----|-----|-----|
| <i>Fusarium oxysporum</i> (105 CFU/ml) +<br><i>Meloidogyne incognita</i> (1500 J2/plant)<br>7 days later Sequential stress | N/A | N/A | N/A | N/A | N/A |
| <i>Meloidogyne incognita</i> (1500 J2/plant)<br>+ <i>Fusarium oxysporum</i> (105 CFU/ml) 7<br>days later Sequential stress | N/A | N/A | N/A | N/A | N/A |

**Note:** Values presented in the table were calculated using the formula described below.

$$\text{Reduction over control (\%)} = \frac{(\text{Value}_{\text{Control}} - \text{Value}_{\text{Stress}})}{\text{Value}_{\text{Control}}} \times 100$$

1) '↓' - indicates plant parameters affected by stress that lead to high susceptibility (higher the value more the damage).

2) '↑' - indicates plant parameters less/not affected by stress leading to improved resistance (higher the value lesser the damage).

'\*' - For more information on parameters classification, please refer to 'methodology' tab.

'\*\*' - Values are presented as it is from the source article without subjecting to the calculation.

## 2. The interaction between nematode and fungal pathogen under combined stress at plant interface

The table shows the effect of the fungal pathogen on nematode population, galling index and eggs/g root and effect of nematode on fungus induced disease intensity under combined stress treatment

|               | Treatment  | Response to combined stress** |                    |               |   |
|---------------|--|-------------------------------|--------------------|---------------|---|
|               |  | Type B parameters*            |                    |               |   |
|               |  | Disease intensity %           | No. of eggs/g root | Galling index | No. of Juveniles/ 250cm <sup>3</sup> soil |
| G. maofen 802 | <i>Meloidogyne incognita</i> (1500 J2/plant)       | 0                             | 11445              | 5             | 644                                       |
|               | <i>Fusarium oxysporum</i> (10 <sup>5</sup> CFU/ml) | 0                             | 0                  | 0             | 0   |

|            |  |      |     |   |     |
|------------|--|------|-----|---|-----|
|            | <i>Meloidogyne incognita</i> (1500 J2/plant) + <i>Fusarium oxysporum</i> (10 <sup>5</sup> CFU/ml) Simultaneous stress            | 100  | 870 | 3 | 538 |
|            | <i>Fusarium oxysporum</i> (10 <sup>5</sup> CFU/ml) + <i>Meloidogyne incognita</i> (1500 J2/plant) 7 days later Sequential stress | 85.4 | 755 | 2 | 480 |
|            | <i>Meloidogyne incognita</i> (1500 J2/plant) + <i>Fusarium oxysporum</i> (10 <sup>5</sup> CFU/ml) 7 days later Sequential stress | 95.1 | 875 | 3 | 541 |
| Zhongza 09 | <i>Meloidogyne incognita</i> (1500 J2/plant)   | 0    | 957 | 3 | 558 |
|            | <i>Fusarium oxysporum</i> (10 <sup>5</sup> CFU/ml)   | 0    | 0   | 0 | 0   |
|            | <i>Meloidogyne incognita</i> (1500 J2/plant) + <i>Fusarium oxysporum</i> (10 <sup>5</sup> CFU/ml) Simultaneous stress            | 8.5  | 675 | 2 | 492 |
|            | <i>Fusarium oxysporum</i> (10 <sup>5</sup> CFU/ml) + <i>Meloidogyne incognita</i> (1500 J2/plant) 7 days later Sequential stress | 3.1  | 564 | 1 | 409 |
|            | <i>Meloidogyne incognita</i> (1500 J2/plant) + <i>Fusarium oxysporum</i> (10 <sup>5</sup> CFU/ml) 7 days later Sequential stress | 7.6  | 683 | 2 | 490 |

For raw data – Click here (.xlsx file)

Reference – Maqsood A, Wu H, Kamran M, Altaf H, Mustafa A, Ahmar S, Thang Hong NT, Tariq K, He Q, Chen JT (2020) Variations in Growth, Physiology, and Antioxidative Defense Responses of Two Tomato (*Solanum lycopersicum* L.) Cultivars after Co-Infection of *Fusarium oxysporum* and *Meloidogyne incognita*. *Agronomy* 10:159-184

**Note:**

‘\*\*\*’ - Values are presented as it is from the source article without subjecting to the calculation.

‘\*’ - For more information on parameter classification, please refer to the ‘methodology’ tab.

**Inference From the study:** Maqsood A et.al.2020 studied interaction of *Meloidogyne incognita* and *Fusarium oxysporum* in two tomato cultivar G. Maofen 802 and Zhongza 09. Pathogens were inoculated singly, sequentially, and simultaneously. Plants were then analysed for their fresh biomass dry shoot weight and shoot length. An additive reduction in all growth parameters was observed under simultaneous stress. Also, proline and MDA levels were high under combined stress treatment. However, this reduction was more in cultivar G. Maofen 802. Nematode population reduced under combined stress, but disease intensity increased upon simultaneous and sequential inoculation of pathogens. Also, disease intensity was high in cultivar G. Maofen 802. **Thus, this pathogen combination works synergistically to reduce growth in tomato cultivar G. Maofen 802 and forms a severe disease complex. Cultivar G. Maofen 802 is susceptible, whereas cultivar Zhongza 09 is resistant.**