Effect on bean genotypes (*Phaseolus vulgaris* L. cv. Harvester & Romano Italian)

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

Crop: Bean (Phaseolus vulgaris cv. Harvester & Romano Italian)
Stress 1: *Meloidogyne incognita*
Stress 2: *Macrophomina phaseolina*
Stage of plant: At sowing

The table shows the impact of nematode and fungus alone and in combination on the pod weight and root weight of bean genotypes.

		Plant response to stress (reduction over control %) Type A parameters*	
	Treatment	**Pod weight**	**Root fresh weight**
Harvester	*Meloidogyne incognita (14000 eggs)*	2.3 ⬇	41.2 ⬇
	Macrophomina phaseolina (500 sclerotia/g soil)	-0.2 ⬆	48.7 ⬇
	Meloidogyne incognita (14000 eggs) + Macrophomina phaseolina (500 sclerotia/g soil) simultaneous stress	4.8 ⬇	48.1 ⬇
	Meloidogyne incognita (14000 eggs)+ Macrophomina phaseolina (500 sclerotia/g soil) (2weeks later) Sequential stress	44.9 ⬇	49.9 ⬇
	Macrophomina phaseolina (500 sclerotia/g soil)+ Meloidogyne incognita (14000 eggs) (2weeks later) sequential stress	17.6 ⬇	25.1 ⬇

	Meloidogyne incognita (14000 eggs)	70.9⬇	38.6⬇
	Macrophomina phaseolina (500 sclerotia/g soil)	51.7⬇	62.4⬇
	Meloidogyne incognita (14000 eggs) + Macrophomina phaseolina (500 sclerotia/g soil) simultaneous stress	67.7⬇	60.3⬇
Romano Italian	*Meloidogyne incognita (14000 eggs)+ Macrophomina phaseolina (500 sclerotia/g soil) (2weeks later) Sequential stress*	60.3⬇	62.8⬇
	Macrophomina phaseolina (500 sclerotia/g soil)+ Meloidogyne incognita (14000 eggs) (2weeks later) sequential stress	57.7⬇	50.0⬇

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

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

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.*

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

The table shows the effect of fungal pathogen on nematode induced root knot and effect of nematode on fungus induced root-rot disease under combined stress treatment

		Response to combined stress** Type B parameters*
	Treatment	

		Root rot index	Root knot index
Harvester	*Meloidogyne incognita (14000 eggs)*	0	4.16
	Macrophomina phaseolina (500 sclerotia/g soil)	1.5	0
	Meloidogyne incognita (14000 eggs) + Macrophomina phaseolina (500 sclerotia/g soil) simultaneous stress	2.33	4.33
	Meloidogyne incognita (14000 eggs)+ Macrophomina phaseolina (500 sclerotia/g soil) (2weeks later) Sequential stress	3.16	3.66
	Macrophomina phaseolina (500 sclerotia/g soil)+ Meloidogyne incognita (14000 eggs) (2weeks later) sequential stress	1.83	2.33
Romano Italian	*Meloidogyne incognita (14000 eggs)*	0	3.66
	Macrophomina phaseolina (500 sclerotia/g soil)	1.83	0
	Meloidogyne incognita (14000 eggs) + Macrophomina phaseolina (500 sclerotia/g soil) simultaneous stress	2.38	2.5
	Meloidogyne incognita (14000 eggs)+ Macrophomina phaseolina (500 sclerotia/g soil) (2weeks later) Sequential stress	3.33	4.16
	Macrophomina phaseolina (500 sclerotia/g soil)+ Meloidogyne incognita (14000 eggs) (2weeks later) sequential stress	1.83	2.5

For raw data – Click here (.xlsx file)

Reference- Al-Hazmi AS (1985) Interaction of Meloidogyne incognita and Macrophomina phaseolina in a Root-Rot Disease Complex of French Bean. Phytopath.Z 113:311-316

Note:

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

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

Inference From the study: Al-Hazmi AS (1985) studied *Meloidogyne incognita* and *Macrophomina phaseolina* on two cultivars of french bean. Simultaneous and sequential inoculation of both pathogens were studied, but only in sequential inoculation where *M. incognita* was inoculated prior to fungus showed a higher reduction in pod weight in cultivar harvester. However, cultivar Romano Italian did not show reduction in pod weight but did show reduction in root weight. Root-rot index was also high in sequential inoculation where *M. incognita* was inoculated prior to fungus, in both cultivars. Thus it can be said that nematode inoculation helped fungus to cause a severe rot compared to when inoculated singly. Whereas root-knot was high in the simultaneous inoculation of both pathogens in harvester and in Romano Italian when inoculated sequentially. **Therefore, an additive reduction in this stress combination was only observed when *M.incognita* was inoculated prior to fungus.**