Effect on rice cultivars (*Oryza sativa cv.* Palawan, IR881413-BB-75-4)

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

Crop: Rice (*Oryza sativa* cv. Palawan, IR881413-BB-75-4)
Stress 1: *Meloidogyne graminicola*
Stress 2: *Pythium arrhenomanes*
Stage of plant: At sowing

The table shows the impact of nematode and oomycete alone and in combination on grain weight in rice plants.

	Treatment	Plant response to stress (reduction over control %) Type A parameters*
		Grain weight
Palawan	*Meloidogyne graminicola (6000 J2/pot)*	-11.1↑
	Pythium arrhenomanes (1:40 ratio soil)	75.0↓
	Meloidogyne graminicola (6000 J2/pot) + Pythium arrhenomanes (1:40 ratio soil) (Simultaneous stress)	47.2↓
	Meloidogyne graminicola (6000 J2/pot) + Pythium arrhenomanes (1:40 ratio soil) 6 days later (Sequential stress)	22.2↓
	Pythium arrhenomanes (1:40 ratio soil) + Meloidogyne graminicola (6000 J2/pot) 5 days later (Sequential stress)	41.7↓
IR881413-BB-75-4	*Meloidogyne graminicola (6000 J2/pot)*	10.1↓
	Pythium arrhenomanes (1:40 ratio soil)	-7.6↑

	Meloidogyne graminicola (6000 J2/pot) + Pythium arrhenomanes (1:40 ratio soil) (Simultaneous stress)	17.7⬇
	Meloidogyne graminicola (6000 J2/pot) + Pythium arrhenomanes (1:40 ratio soil) 6 days later (Sequential stress)	-10.1⬆
	Pythium arrhenomanes (1:40 ratio soil) + Meloidogyne graminicola (6000 J2/pot) 5 days later (Sequential stress)	-8.9⬆

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 parameter classification, please refer to the 'methodology' tab.*

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

The table shows the effect of the oomycete pathogen on nematode induced root gall and nematode population under combined stress treatment

	Treatment	**Response to combined stress** Type B parameters***	
		No. of galls/ root system	**No. of nematodes/ root system**
Palawan	*Meloidogyne graminicola (6000 J2/pot)*	25	59
	Pythium arrhenomanes (1:40 ratio soil)	N/A	N/A

	Meloidogyne graminicola (6000 J2/pot) + Pythium arrhenomanes (1:40 ratio soil) (Simultaneous stress)	12	24
	Meloidogyne graminicola (6000 J2/pot) + Pythium arrhenomanes (1:40 ratio soil) 6 days later (Sequential stress)	15	32
	Pythium arrhenomanes (1:40 ratio soil) + Meloidogyne graminicola (6000 J2/pot) 5 days later (Sequential stress)	5	10
IR881413-BB-75-4	*Meloidogyne graminicola (6000 J2/pot)*	31	109
	Pythium arrhenomanes (1:40 ratio soil)	N/A	N/A
	Meloidogyne graminicola (6000 J2/pot) + Pythium arrhenomanes (1:40 ratio soil) (Simultaneous stress)	13	29
	Meloidogyne graminicola (6000 J2/pot) + Pythium arrhenomanes (1:40 ratio soil) 6 days later (Sequential stress)	11	23
	Pythium arrhenomanes (1:40 ratio soil) + Meloidogyne graminicola (6000 J2/pot) 5 days later (Sequential stress)	12	21

For raw data – Click here (.xlsx file)

Reference - Verbeek REM, Banaay CGB, Sikder M, De Waele D, Vera Cruz CM, Gheysen G, Höfte M, Kyndt T (2016) Interactions between the oomycete *Pythium arrhenomanes* and the rice rootknot nematode *Meloidogyne graminicola* in aerobic Asian rice varieties. Rice (N Y) 9(1):36.

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: Verbeek REM (2016) studied the interaction of *Meloidogyne graminicola* with *Pythium arrhenomanes* in two rice cultivars Palawan and IR881413-BB-75-4. Pathogens were inoculated singly, sequentially, and simultaneously. Plants were then analyzed for their grain weight. Cultivar Palawan did not show an additive reduction under simultaneous or sequential inoculation of pathogens, but cultivar IR881413-BB-75-4 showed and additive

reduction under combined stress conditions. , The number of galls and the number of nematode population was less under combined stress. **Thus, this pathogen combination act synergistically to reduce plant growth or form a complex disease phenotype in cultivar IR881413-BB-75-4.**