



Stress Combination and their Interaction in Plants (SCIP) Database

Website link: <http://www.nipgr.res.in/scipdb.php>

Effect on wheat cultivars (*Triticum aestivum* L.)

The interaction between the fungal pathogens under combined stress at plant interface

Stress 1: *Zymoseptoria tritici*
 Stress 2: *Blumeria graminis*
 Stage of plant: 14 days old seedlings

The table shows the effect of fungus *Z. tritici* on *B. graminis* in wheat cultivars Flame and Longbow in relation to the germination of spores, colony area, conidiophore quantity and DNA sample of *B. graminis* on leaves

Effect of decreasing concentrations of <i>Z. tritici</i> on <i>B. graminis</i> colonies				
Cultivar	Treatment	Response under combined stress (Type B parameters*)		
		Mean mildew colonies/leaf		
Longbow	<i>Z. tritici</i> IPO323 (10^7 spores/mL) + 4 days interval + <i>B. graminis</i> (Sequential stress)	36.76		
	<i>Z. tritici</i> IPO323 (10^6 spores/mL) + 4 days interval + <i>B. graminis</i> (Sequential stress)	36.25		
	<i>Z. tritici</i> IPO323 (10^5 spores/mL) + 4 days interval + <i>B. graminis</i> (Sequential stress)	57.70		
	<i>Z. tritici</i> IPO323 (10^4 spores/mL) + 4 days interval + <i>B. graminis</i> (Sequential stress)	77.10		
	<i>Z. tritici</i> IPO323 (10^3 spores/mL) + 4 days interval + <i>B. graminis</i> (Sequential stress)	82.72		
Early development of <i>B. graminis</i> on preinoculation with <i>Z. tritici</i>				
Cultivar	Treatment	Germinated spores (%)		
		Hours after inoculation		
		8	24 (Appressoria)	48 (ESH)
Flame	<i>Z. tritici</i> IPO323 (10^7 spores/mL) + 1-day interval + <i>B. graminis</i> (Sequential stress)	74.39	58.26	26.20
	<i>Z. tritici</i> (10^7 spores/mL) + 1-day interval + <i>B. graminis</i> (Sequential stress) Mock	69.19	51.79	40.68
	<i>Z. tritici</i> IPO323 (10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress)	61.90	49.94	7.93
	<i>Z. tritici</i> (10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress) Mock	72.83	58.72	18.27
Longbow	<i>Z. tritici</i> IPO323 (10^7 spores/mL) + 1-day interval + <i>B. graminis</i> (Sequential stress)	74.9	46.24	44.5
	<i>Z. tritici</i> (10^7 spores/mL) + 1-day interval + <i>B. graminis</i> (Sequential stress) Mock	60.34	59.19	42.41
	<i>Z. tritici</i> IPO323 (10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress)	71.8	42.54	13.4
	<i>Z. tritici</i> (10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress) Mock	76.99	52.71	21.03

Later development of <i>B. graminis</i> on preinoculation with <i>Z. tritici</i>									
Cultivar	Treatment	Colony Area (Sqrt) μm				Conidiophore quantity			
		Days after inoculation				Days after inoculation			
		5	6	8	9	5	6	8	9
Longbow	<i>Z. tritici</i> IPO323 (10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress)	29.68	39.21	55.33	51.69	No effect	0.09	1.2	2.2
	<i>Z. tritici</i> (10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress) Mock	31.60	43.48	65.72	76.66	No effect	0.02	1.9	3.3

DNA quantification to determine *B. graminis* biomass on preinoculation with *Z. tritici*

Cultivar	Treatment	<i>B. graminis</i> DNA (pg/50ng sample DNA)	
		Days after inoculation	
		5	10
Flame	<i>Z. tritici</i> IPO323(10^7 spores/mL) + 1-day interval + <i>B. graminis</i> (Sequential stress)	0.68	3.68
	<i>Z. tritici</i> (10^7 spores/mL) + 1-day interval + <i>B. graminis</i> (Sequential stress) Mock	0.87	15.22
	<i>Z. tritici</i> IPO323(10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress)	0.36	0.64
	<i>Z. tritici</i> (10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress) Mock	1.25	7.05
Longbow	<i>Z. tritici</i> IPO323 (10^7 spores/mL) + 1-day interval + <i>B. graminis</i> (Sequential stress)	0.68	3.68
	<i>Z. tritici</i> (10^7 spores/mL) + 1-day interval + <i>B. graminis</i> (Sequential stress) Mock	0.87	15.22
	<i>Z. tritici</i> IPO323 (10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress)	0.36	0.64
	<i>Z. tritici</i> (10^7 spores/mL) + 6 days interval + <i>B. graminis</i> (Sequential stress) Mock	1.25	7.05

(IPO323- compatible strain of *Z. tritici*; Mock- inoculated with an incompatible strain of *Z. tritici*; ESH- Elongated secondary hyphae; pg- pictogram; ng- nanogram)

For raw data – Click here (.xlsx file)

Reference– Orton ES, Brown James KM (2016) Reduction of growth and reproduction of the biotrophic fungus *Blumeria graminis* in the presence of a necrotrophic pathogen. *Front. Plant Sci.* **44**: 173-182

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

The inference from the study: Orton and Brown, 2016 have studied the interaction between the *B. graminis* (causal agent of powdery mildew) and *Z. tritici* (causal agent of *Septoria tritici* blotch) in wheat. The studies performed on two cultivars Flame and Longbow revealed that the preinoculation of *Z. tritici* on leaves reduced the germination, quantity, and size of virulent *B. graminis* mildew colonies. Thus, the predisposition of *Z. tritici* around the infection site has reduced the susceptibility of the leaf to *B. graminis*. **The overall observations lead to the conclusion that the effect of *Z. tritici* induced on *B. graminis* is either takes place between both the pathogens or mediated by host plants.**