

Effect on wheat cultivars (*Triticum aestivum* L.)
The interaction between the fungal pathogens under combined stress at plant interface

 Stress 1: *Erysiphe graminis* f.sp. *tritici*
 Stress 2: *Puccinia triticina*

The table shows the effect of fungus *E. graminis* f. sp. *tritici* on the reactions of wheat cv. Malakoff to *P. triticina* in relation to the disease reaction type, percentage of spores and chlorosis

August 1950 (High natural light intensity and high temperature)				
Cultivar	Treatment	Response under combined stress (Type B parameters*)		
		Reaction type	<i>P. tritici</i> (%)	<i>E. graminis</i> (%)
Malakoff	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	II - III	6	33.3
	<i>P. triticina</i>	III	8	--
	<i>E. graminis</i>	III	--	33.3
Democrat	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	N/A	N/A	N/A
	<i>P. triticina</i>	N/A	N/A	N/A
	<i>E. graminis</i>	N/A	N/A	N/A
Mediterranean	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I	3.5	58.3
	<i>P. triticina</i>	I	4	--
	<i>E. graminis</i>	I	--	55
Hussar	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	III	15.7	21.7
	<i>P. triticina</i>	III	28.8	--
	<i>E. graminis</i>	III	--	60
Webster	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I-II	9	45
	<i>P. triticina</i>	II	3.8	--
	<i>E. graminis</i>	II	--	52.5
October 1950 (Low external temperatures and low light intensity)				
Cultivar	Treatment	Reaction type	<i>P. tritici</i> (%)	<i>E. graminis</i> (%)
Malakoff	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I	5	40
	<i>P. triticina</i>	0	0	--
	<i>E. graminis</i>	0	--	50
Democrat	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	0-I	6.3	50
	<i>P. triticina</i>	0-I	0.1	--



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	<i>E. graminis</i>	0-I	--	60	
Mediterranean	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I	7.2	50	
	<i>P. triticina</i>	0-I	7	--	
	<i>E. graminis</i>	0-I	--	56.7	
Hussar	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I-II	10.8	50	
	<i>P. triticina</i>	I-II ⁺	15	--	
	<i>E. graminis</i>	I-II ⁺	--	50	
Webster	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I-II	0	66.6	
	<i>P. triticina</i>	0 ⁺	0.1	--	
	<i>E. graminis</i>	0 ⁺	--	20	
November 1950 (Low external temperatures and low light intensity)					
Cultivar	Treatment	Reaction type	Chlorosis (%)	<i>P. tritici</i> (%)	<i>E. graminis</i> (%)
Malakoff	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	0	5.5	0	21.7
	<i>P. triticina</i>	0	0	0	--
	<i>E. graminis</i>	0	0	--	20
Democrat	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	0-I ⁺	10	0.5	13.3
	<i>P. triticina</i>	0-I	1	1	--
	<i>E. graminis</i>	0-I	1	--	20
Mediterranean	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	0	7.5	0	33.3
	<i>P. triticina</i>	0	0	0	--
	<i>E. graminis</i>	0	0	--	20
Hussar	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I		5	20
	<i>P. triticina</i>	0	5	5	--
	<i>E. graminis</i>	0	5	--	23
Webster	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	0	5	0	35
	<i>P. triticina</i>	0	0.1	0.1	--
	<i>E. graminis</i>	0	0.1	--	10
February 1951 (Low external temperatures and low light intensity)					



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Cultivar	Treatment	Reaction type	Chlorosis (%)	<i>P. tritici</i> (%)	<i>E. graminis</i> (%)
Malakoff	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I		5	40
	<i>P. triticina</i>	0-I	11.7	3	<i>Pt</i>
	<i>E. graminis</i>	0-I	11.7	--	45
Democrat	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I+	45	15	0
	<i>P. triticina</i>	I	50	13.6	--
	<i>E. graminis</i>	I	50	--	50
Mediterranean	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I-II	0	5	33.3
	<i>P. triticina</i>	I	5	2.3	--
	<i>E. graminis</i>	I	5	--	30
Hussar	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	II	0	4.5	45
	<i>P. triticina</i>	I	60	2.2	--
	<i>E. graminis</i>	I	60	--	50
Webster	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	I	0	0	70
	<i>P. triticina</i>	I	0	0.1	--
	<i>E. graminis</i>	I	0	---	60
April 1951 (Fairly good light intensity and increased temperature) Effect of mildew attack on the distribution of <i>P. triticina</i> on leaf					
Cultivar	Treatment	Rust (%)		Mildew (%)	
		Upper surface	Lower surface		
Democrat	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	4	4	75	
	<i>P. triticina</i>	5	1	--	
Mediterranean	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	10	13	40	
	<i>P. triticina</i>	18	15	--	



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Hussar	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	1	8	55
	<i>P. triticina</i>	10	15	--
Webster	<i>P. triticina</i> + <i>E. graminis</i> (Simultaneous stress)	1	4	33
	<i>P. triticina</i>	10	10	--

For raw data – Click here (.xlsx file)

Reference– Manner JG, Gandy DG (1954) A study of the effect of mildew infection on the reaction of wheat varieties to brown rust. *Ann. appl. Biol.* **41(3)**:393-404

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: Manners and Gandy, 1954 studied the effect of *E. graminis-tritici* on the reactions of wheat to *P. triticina*. The five wheat cultivars Democrat, Hussar, Mediterranean, Webster, and Malakoff, susceptible to *E. graminis* (causal agent of mildew) and semi-resistant to *P. triticina* (causal agent of rust) were used for the study. The observation made during the experiments revealed that the mildew colonies were abundant in all the cultivars, and the presence of mildew colony increased the rust pustules. **Hence, it concludes the susceptibility of wheat cultivars to *P. triticina* in the presence of *E. graminis* and symbiotic relationships among both the pathogens.**