



## Stress Combination and their Interaction in Plants (SCIP) Database

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

Effect on barley genotypes (*Hordeum vulgare* L.)

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

Stress 1: Inducer isolates-*Bipolaris maydis* and *Septoria nodorum*  
 Stress 2: Challenger isolates- *Drechslera* f. *teres*, *Bipolaris sorokiniana*, *Erysiphe graminis* f. sp. *hordei*, *Rhynchosporium secalis*  
 Stage of plant: 14 days old plant

The table shows the effect of non-barley pathogens *B. maydis* and *S. nodorum* (inducer) on barley pathogens *D. teres*, *R. secalis*, *B. sorokiniana* and *E. graminis* (challenger) on percentage reduction of disease score and percentage reduction of lesion length in barley cultivar Canor Carlsberg

Effect of inducer inoculation on subsequent infection by <i>D. teres</i> on second developed leaf					
Cultivar	Treatment	Response under combined stress (Type B parameter*)			
		Mean disease Score	Reduction of disease score (%)	Average lesion length (mm)	Reduction of lesion length (%)
Canor Carlsberg	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.3	43.5	1.4	48.1
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.7	26.1	2.4	11.1
	<i>D. teres</i> (400 conidia/mL)	2.3	--	2.7	--
Lenka	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.2	53.8	1.3	27.8
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.3	50	1.3	27.8
	<i>D. teres</i> (400 conidia/mL)	2.6	--	1.8	--
Effect of inducer inoculation on subsequent infection by <i>D. teres</i> on fourth developed leaf					
Cultivar	Treatment	Mean disease Score	Reduction of disease score (%)		
Canor Carlsberg	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.5	65.1		
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.5	41.9		

	<i>D. teres</i> (400 conidia/mL)	43	--
Lenka	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1	69.7
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.5	54.5
	<i>D. teres</i> (400 conidia/mL)	3.3	--
Ermo	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2	50
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.5	37.5
	<i>D. teres</i> (400 conidia/mL)	4	--
Frost	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1	56.5
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.8	21.7
	<i>D. teres</i> (400 conidia/mL)	2.3	--

**Effect of low concentration of the inducers on *D. teres* infection on second developed leaf**

Cultivar	Treatment	Mean Disease Score	Reduction of disease score (%)
Canor Carlsberg	<i>B. maydis</i> ( $10^3$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	4.9	0
	<i>B. maydis</i> ( $7.5 \times 10^3$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	3.6	26.5
	<i>B. maydis</i> ( $1.5 \times 10^4$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	3	38.8
	<i>S. nodorum</i> ( $10^5$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.3	46.5
	<i>S. nodorum</i> ( $7.5 \times 10^5$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.7	37.2
	<i>S. nodorum</i> ( $1.5 \times 10^6$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.5	65.1
	<i>B. maydis</i> (0 conidia/mL) + <i>D. teres</i> (400 conidia/mL)	4.9	--
	<i>S. nodorum</i> (0 conidia/mL) + <i>D. teres</i> (400 conidia/mL)	4.3	--
Lenka	<i>B. maydis</i> ( $10^2$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	6.5	8.5
	<i>B. maydis</i> ( $7.5 \times 10^3$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.9	59.2
	<i>B. maydis</i> ( $1.5 \times 10^4$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.3	67.6
	<i>S. nodorum</i> ( $10^5$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.8	34.9
	<i>S. nodorum</i> ( $7.5 \times 10^5$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.3	46.5
	<i>S. nodorum</i> ( $1.5 \times 10^6$ conidia/mL) + <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.8	58.1
	<i>B. maydis</i> (0 conidia/mL) + <i>D. teres</i> (400 conidia/mL)	7.1	--
	<i>S. nodorum</i> (0 conidia/mL) + <i>D. teres</i> (400 conidia/mL)	4.3	--

**Effect of different inducer incubation periods on *D. teres* infection on second developed leaf**

Cultivar	Treatment	Mean disease	Reduction of
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		Score	disease score (%)
Canor Carlsberg	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 2 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.5	30.55
	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 8 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.8	50
	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 24 hr.+ <i>D. teres</i> (Sequential stress)	1.5	58.33
	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 54 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.8	50
	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 78 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	1.8	50
	<i>D. teres</i> (400 conidia/mL)	3.6	--
	<i>S. nodorum</i> ( $2 \times 10^4$ conidia/mL) incubated for 2 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	3.5	0
	<i>S. nodorum</i> ( $2 \times 10^4$ conidia/mL) incubated for 8 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	5	0
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) incubated for 24 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	3	11.76
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) incubated for 54 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.5	26.47
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) incubated for 78 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.5	26.47
	<i>D. teres</i> (400 conidia/mL)	3.4	--
	Lenka	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 2 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)	2.5
<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 8 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)		2.4	48.93
<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 24 hr.+ <i>D. teres</i> (Sequential stress)		1.3	72.34
<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 54 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)		1.3	72.34
<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) incubated for 78 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)		1.4	70.21
<i>D. teres</i> (400 conidia/mL)		4.7	--
<i>S. nodorum</i> ( $2 \times 10^4$ conidia/mL) incubated for 2 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)		2.5	40.47
<i>S. nodorum</i> ( $2 \times 10^4$ conidia/mL) incubated for 8 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)		4.5	0
<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) incubated for 24 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)		2.8	33.34
<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) incubated for 54 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)		2.3	45.23
<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) incubated for 78 hr.+ <i>D. teres</i> (400 conidia/mL) (Sequential stress)		1.8	57.14
<i>D. teres</i> (400 conidia/mL)		4.2	--
<b>Effect of inducer inoculation on subsequent infection by barley pathogens <i>B. sorokiniana</i>, <i>E. graminis</i> and <i>R. secalis</i> on second developed leaf</b>			
<b>Cultivar</b>	<b>Treatment</b>	<b>Mean disease Score</b>	<b>Reduction of disease score (%)</b>

Canor Carlsberg	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>B. sorokiniana</i> ( $4 \times 10^3$ conidia/mL) (Sequential stress)	10.3	22.6
	<i>S. nodorum</i> ( $5.4 \times 10^6$ conidia/mL) + <i>B. sorokiniana</i> ( $4 \times 10^3$ conidia/mL) (Sequential stress)	10.5	21.1
	<i>B. sorokiniana</i> ( $4 \times 10^3$ conidia/mL)	13.3	--
	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>E. graminis</i> (8 conidia/mm <sup>2</sup> ) (Sequential stress)	8.3	23.1
	<i>S. nodorum</i> ( $5.4 \times 10^6$ conidia/mL) + <i>E. graminis</i> (8 conidia/mm <sup>2</sup> ) (Sequential stress)	10.5	2.8
	<i>E. graminis</i> (8 conidia/mm <sup>2</sup> )	10.8	--
	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>R. secalis</i> ( $10^4$ conidia/mL) (Sequential stress)	4.3	69.3
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) + <i>R. secalis</i> ( $10^4$ conidia/mL) (Sequential stress)	3.8	72.9
	<i>R. secalis</i> ( $10^4$ conidia/mL)	14	--
Lenka	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>B. sorokiniana</i> ( $4 \times 10^3$ conidia/mL) (Sequential stress)	9.3	47.8
	<i>S. nodorum</i> ( $5.4 \times 10^6$ conidia/mL) + <i>B. sorokiniana</i> ( $4 \times 10^3$ conidia/mL) (Sequential stress)	10.5	41
	<i>B. sorokiniana</i> ( $4 \times 10^3$ conidia/mL)	17.8	--
	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>E. graminis</i> (8 conidia/mm <sup>2</sup> ) (Sequential stress)	8.5	29.2
	<i>S. nodorum</i> ( $5.4 \times 10^6$ conidia/mL) + <i>E. graminis</i> (8 conidia/mm <sup>2</sup> ) (Sequential stress)	10.8	10
	<i>E. graminis</i> (8 conidia/mm <sup>2</sup> )	12	--
	<i>B. maydis</i> ( $2 \times 10^4$ conidia/mL) + <i>R. secalis</i> ( $10^4$ conidia/mL) (Sequential stress)	8.5	48.5
	<i>S. nodorum</i> ( $2 \times 10^6$ conidia/mL) + <i>R. secalis</i> ( $10^4$ conidia/mL) (Sequential stress)	10	39.4
	<i>R. secalis</i> ( $10^4$ conidia/mL)	16.5	--

(Disease scoring scale: 0=0%, 1= 0 to 5%, 2= 5 to 10%, 3=10 to 15%....20=95 to 100% necrotic symptoms on leaf)

For raw data – Click here (.xlsx file)

Reference– Jorgensen LHJ, Andresen H, Peterson SV (1996) Control of *Drechslera teres* and other barley pathogens by pre inoculation with *Bipolaris maydis* and *Septoria nodorum*. *Phytopath.* **86**:602-607

**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:** Jorgensen *et al.*, 1986 studied the effect of pre-inoculation of two non-barley pathogens *B. maydis* from maize and *S. nodorum* from wheat (inducers) over the barley pathogen *D. teres*, *B. sorokiniana*, *E. graminis* and *R. secalis* (challengers) on barley cultivars Canor Carlsberg, Lenka, Ermo and Frost. **Overall, the pre inoculation of non-barley pathogen reduced the disease level of barley pathogens *D. teres*, *R. secalis*, *B. sorokiniana* and *E. graminis* associated with reduced lesion size and percentage reduction of disease score. Hence, the host resistance is getting activated by pre inoculating the non-barley pathogens *B. maydis* and *S. nodorum*, which is involved in the suppression of barley pathogen *D. teres*, *R. secalis*, *B. sorokiniana*, and *E. graminis*.**