

## Studies on variability in pathogen isolates

### Pathogenic variability in *F. oxysporum* f. sp. *carthami* isolates and identification of races

Fifty-four representative isolates of *F. oxysporum* f. sp. *carthami* isolated from different safflower growing areas were selected for pathogenic variability tests. All isolates were inoculated to 5 safflower line viz., A1, DSF 4, DSF 5, DSF-6 and 96-508-2-90. A1 and DSF 5 were susceptible to all isolates and 96-508-2-90 was immune to all the isolates. The lines DSF 4 and DSF 6 showed differential reaction to the isolates. Based on the reaction of these 5 lines to pathogen isolates, 4 races were identified (Table 1).

**Table 1: Pathogenic variability studies of *Fusarium oxysporum* f. sp. *carthami* and identification of races**

Safflower differential line	Reaction of isolates			
	Race 1	Race 2	Race 3	Race 4
96-508-2-90	R	R	R	R
A1	S	S	S	S
DSF 4	R	R	R	R
DSF 6	R	S	S	R

### Pathogenic variability in *Macrophomina phaseolina* isolates

Twenty four isolates of *M. phaseolina* isolated from infected safflower roots were subjected to pathogenicity test against A1 variety of safflower using the soil cup technique. *M. phaseolina* 4 (MS-4) was found more virulent with 80% root rot incidence over control (Table 2) compared to other isolates. Microsclerotia level was found high in MS-4 compared to other isolates

**Table 2. Twenty four *M. phaseolina* isolates, their different level of aggressiveness groups (AG) based % root rot incidence on safflower cultivars**

Aggressiveness groups (AG)	cv. A 1	cv. NARI 6
AG 1 (< 25%)	K 1, AP 2, AP 3, MS 10, AP 11, AP 12, K 14, MS 15, MS	K 1, AP 2, AP 3, MS 6, MS 10, AP 11, AP 12, K 14, MS 15, MS 16, MS 18, K 20, AP 21,

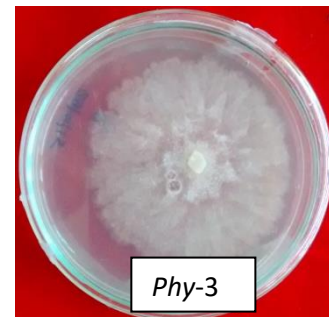
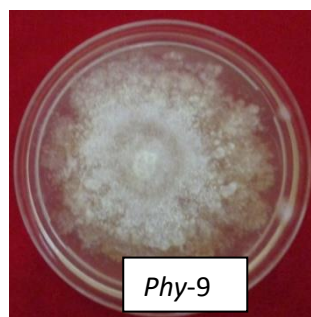
	16, MS 18, MS 19, K 20, AP 21, AP 22, AP 25, AP 26.	AP 22, K 23, AP 25, AP 26, AP 27
AG 2 (25-50%)	MS 6, AP 7, MS 13, MS 17, K 23, AP 24, AP 27,	AP 7, MS 17, MS 19, AP 24, MS 13
AG 3 (> 50%)	MS 4	MS 4

### Pathogenic variability in *Phytophthora nicotianae* isolates

Total 9 *Phytophthora nicotianae* isolates were tested for their pathogenic variability in 5 different safflower genotypes Bhima, PBNS-12, SSF-708, SSF-658 & Phule Kusuma cultivars. Two isolates of *Phytophthora nicotianae* viz., Phy-3 collected from Andhra Pradesh and Phy-9 collected from Kerala were highly virulent. PBNS 12, SSF 658 & Phule Kusuma (Table 3) were highly susceptible to *Phytophthora nicotianae* leaf blight.

**Table 3: Pathogenic variability in *Phytophthora nicotianae***

<i>Phytophthora</i> Isolates	% Disease severity				
	Bhima	PBNS-12	SSF-658	SSF-708	Phule Kusuma
Phy-1	30.0	80.0	60.0	60.0	40.0
Phy-2	35.0	85.0	55.0	50.0	45.0
Phy-3	35.0	90.0	80.0	55.0	75.0
Phy-4	30.0	85.0	55.0	60.0	40.0
Phy-5	30.0	80.0	50.0	55.0	45.0
Phy-6	35.0	85.0	50.0	50.0	40.0
Phy-7	40.0	70.0	45.0	55.0	45.0
Phy-8	35.0	70.0	50.0	55.0	50.0
Phy-9	45.0	90.0	75.0	60.0	80.0



**Fig:** Susceptible safflower cultivar PBNS-12 Highly virulent *Phytophthora nicotianae* isolates Phy-9 and Phy-3