

## PATHOGENIC VARIABILITY IN *COLLETOTRICHUM CAPSICI* TO SAFED MUSLI GENOTYPES IN NORTH UTTAR PRADESH

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The pathogenic variability in five isolates of *Colletotrichum capsici*, causing blight of safed musli (*Chlorophytum borivilianum*), in north Uttar Pradesh was studied. The amount of disease produced in different genotypes was different and disease severity caused by different isolates of pathogens on same genotype also differed. On the basis of reaction of isolates on safed musli genotypes, they were grouped into four pathotypes.

**Keywords :** *Chlorophytum borivilianum*; *Colletotrichum capsici*; Safed Musli genotypes.

### Introduction

*Chlorophytum borivilianum* sant Fern, an Indian medicinal wonder herb, commonly known as Safed Musli, is an endangered medicinal plant valued for its dried fasciculated storage roots which possess immunomodulatory and aphrodisiac properties which form an important ingredient of herbal tonics. A virulent blight disease caused by *Colletotrichum capsici* (Syd) Butler and Bisby has been noticed on Safed Musli crop during its cultivation in rainy season in almost all the musli farms growing in Uttar Pradesh resulting into damage of foliage and roots. The stabilization of production of roots by reducing genetic vulnerability to this blight disease has been a major breeding objective in Safed Musli crop improvement programme. *C. capsici* is highly unspecialized parasite attacking a large number of plants<sup>1</sup>. The pathogen has been reported to possess a high degree of pathogenic variability<sup>2</sup>. It is well recognised that pathogenic variability poses difficulty in development and deployment of effective host resistance which is a dependable and economic means of disease management<sup>3</sup>. To select the variety of Safed Musli for different areas, it is utmost necessary to have the knowledge of existence of physiological races or pathotypes of *C. capsici* present in the cropping ecosystem of the areas. No work has so far been done on this aspect.

### Material and Method

Plants of Safed Musli infected with blight disease were collected from Agriculture University, Kanpur, CIMAP Lucknow, Musli farms Bhagwanpur (Kannauj), G.B. Plant University, Pant Nagar and Musli farm at Unnao and used for isolation of pathogen (*C. Capsici*). These isolates were designated as CC-1 to CC-5, respectively. The pathogen was obtained from single spore isolation through serial

dilution method on PDA and incubated at 25±1°C. The experiment was conducted under glass house conditions. The inoculums were prepared by harvesting acervuli from sporulating culture in distilled water and filtered through muslin. The conidial suspension was diluted (1x10<sup>5</sup>ml). Fifty plants of five genotypes of Safed Musli were sown in pots filled with sterilized soil @ one root per pot. The 30 days old seedlings were sprayed with conidial suspension. Seedlings sprayed with sterilized distilled water served as control. Reaction to Safed Musli genotypes against test isolates were scored using 0-5 scale.

### Results and Discussion

The knowledge of variation within pathogen population is essential to develop resistant varieties<sup>4</sup>. *Colletotrichum capsici* possess a high degree of physiological specialization<sup>2</sup>. During present investigation, the virulence pattern of different races of *C. capsici* were studied on genotypes of Safed Musli (Table 1). Host Parasite interaction in terms of parasitic fitness revealed that the isolates showed differences in reaction. The observations revealed that disease intensity produced by pathogen isolates were different on genotypes. Moreover severity of blight disease caused by the isolates on the same genotype also differed. In fact, the differences in reaction showed aggressiveness/virulence of isolates.

Leaf blight disease was minimum (4.3%) on Safed Musli genotype MCB-405 against isolate CC-4 but at the same time, severity on the same genotype (MCB-405) was recorded 25.3% against the isolate CC-5. However, maximum severity of blight disease (26.8%) was recorded on genotype MCB-414 against isolate CC-5. Mean disease severity against all the genotypes revealed that the isolates were least aggressive on genotype MDB-13 showing mean disease severity of 12.44% and

**Table 1.** Pathogenic variation of *Colletotrichum capsici* isolates.

Isolates	Disease intensity in varieties of Safed Musli					Mean severity against isolates
	MCB-405	MCT-505	MDB-13	MDB-14	MCB-414	
CC-1	13.9	13.7	0.8	14.9	18.9	12.44
CC-2	22.2	23.9	24.8	14.6	22.2	21.54
CC-3	9.8	11.6	4.6	9.0	12.1	9.42
CC-4	4.3	6.8	8.2	8.1	7.1	6.90
CC-5	25.3	24.4	23.8	22.7	26.8	24.60
Mean Severity against genotypes	15.10	16.08	12.44	13.86	17.42	-

0.0 (Immune); 0.1 - 10 (Resistant); 10.1-20 (Moderately Resistant); 20.1 - 30 (Susptible)

30.1 - 100 (Highly Susceptible)

CD (P=0.05) Disease intensity 0.87  
 Genotypes 1.98  
 Interaction 3.74

**Table 2.** Classification of *Colletotrichum capsici* isolates into pathogenic groups.

Isolates	Reaction Type (Varieties)					Pathotype
	MCB-405	MCT-505	MDB-13	MDB-14	MCB-414	
CC-1	+	+	-	+	+	I
CC-2 and CC-5	+	+	+	+	+	II
CC-3	-	+	-	-	+	III
CC-4	-	-	-	+	-	IV

+ Susceptible; - Resistant

maximum aggressive to MCB-414 showing 17.42% disease severity. Mean severity against all the isolates indicated that genotypes were least susceptible to isolate CC-4 (disease severity 6.90%) and highly susceptible towards isolate CC-5 (disease severity 24.60%).

Differentiation of pathogenic races is well demonstrated in the host-pathogen systems where the genes for resistance are known and in several of these cases, Mandelian inheritance of virulence is established<sup>5</sup>. In the present study, the safed musli lines used clearly

differentiated the isolates, based on disease reactions. The isolates in the present study were grouped into four pathotypes on the basis of their reaction types on different genotypes of Safed Musli. The isolates found virulent on same lines were grouped in one pathotype. Based on differential reaction, the isolates were grouped in following pathotypes. Isolate CC-1 was able to infect four lines but was avirulent on MDB-13 and represented Pathotype-I. Isolates CC-2 and CC-5 attacked all the five lines and so formed Pathotype II. Isolate CC-3 was able to infect only

two out of five lines and so formed Pathotype III. Isolate CC-4 attacked only MDB-14 and did not attack any other line and so formed Pathotype IV (Table 2).

Occurrence of four pathotypes in *C. capsici*, based on reactions on different varieties of Safed Musli, showed a high degree of variability within pathogen population in North Uttar Pradesh. The isolates were distinct pathotypes and behaved as heterogeneous populations providing pathogenic variants. The climatological variations as well as topography of the state may be responsible for generation of variation in the pathogen population. Tu<sup>6</sup> demonstrated the existence of several pathotypes in the population of phytopathogens, and their influence on their survival and pathogenic fitness. Existence of races in *C. capsici* (causing chilli fruit rot) has been reported by Jeyalakshmi and Seetharaman<sup>7</sup>. Pathogenic variability in different species of *Collectotrichum* have been reported by Manandhar *et al.*<sup>8</sup>, Sharma and Kaushal<sup>9</sup>, Sharma *et al.*<sup>2</sup> and Gupta *et al.*<sup>4</sup>. The results obtained in present study may be of great importance to develop resistant varieties of Safed Musli.

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