

# Morphological and pathological variations in rapeseed and mustard isolates of *Sclerotinia sclerotiorum* from Rajasthan

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## Abstract

The studies were conducted to compare the morphological and pathological variations among 38 isolates of *Sclerotinia sclerotiorum*, derived from single lesion / sclerotium on rapeseed and mustard, collected from different locations of 14 districts of Rajasthan. All the isolates showed variation in their morphological traits i.e., colony colour and shape, and sclerotial number, size, position and pattern when grown on PDA. According similarities, they put in a group and thus 9 groups (G<sub>1</sub> to G<sub>9</sub>) of 38 isolates were established. Pathogenic variability of these isolates (representative of each group) was evaluated by inoculation at 30 days after sowing on 10 different rapeseed and mustard genotypes in potted conditions. Subsequently, disease incidence was recorded up to the survival of the crop. All the groups were virulent on all the 10 genotypes tested for virulence, except G<sub>2</sub> on GM-1 and G<sub>9</sub> on RN-393, Rohini and SEJ-2. Among these groups, G<sub>6</sub> was the most virulent causing maximum disease incidence (82.44%) followed by G<sub>1</sub> (77.50%) and G<sub>8</sub> (75.01%) while G<sub>9</sub> had minimum average disease incidence (11.08%).

## Introduction

*Sclerotinia* rot of Indian mustard (*Brassica juncea*) caused by *Sclerotinia sclerotiorum* (Lib.) de Bary has been reported from major rapeseed and mustard growing areas of the world. The disease was of minor importance till few years back, but recently it has assumed a serious proportion in major rapeseed and mustard growing areas in the country. The disease is capable of causing significant economic losses. In severe cases, it caused seed yield losses upto 74 per cent in Rajasthan as well as in other parts of the country (Chouhan *et al.*, 1992; Shivpuri *et al.*, 2000). Use of resistant varieties is one of the important alternatives to overcome this problem and for breeding resistant varieties, knowledge of variability in the pathogen is essential. Little information on morpho- and patho-genic variability in *Sclerotinia sclerotiorum* of rapeseed and mustard is available from other countries (Morrall *et al.*, 1972) but negligible from India. Keeping in view the variations in disease incidence in different areas and on different varieties, the studies have been conducted to ascertain the morphological, cultural and pathogenic variations among different isolates of *Sclerotinia sclerotiorum* from different areas of Rajasthan.

## Materials and Methods

**Morphological and cultural variability:** Thirty eight isolates of *Sclerotinia sclerotiorum* were established from infected plant materials of rapeseed and mustard collected from various districts of Rajasthan during survey in rabi (post-rainy season) 2000-01 and 2001-02. These isolates were maintained on potato dextrose agar (PDA) medium slants at 25±1°C and subcultured after every month. To ascertain the variability among these 38 isolates of *S. sclerotiorum*, morphological and cultural studies were conducted on PDA. The shape, colour and size of colony; and colour, size, position and development pattern of sclerotia within Petri plates were recorded after 5- and 15-days of incubation, respectively. Based on the similar growth characters, the isolates were placed into a group and thus nine groups were established.

**Pathogenic variability:** For pathogenic variability a trial was arranged in a completely randomized design with 3 replications. Seeds of 10 rapeseed and mustard genotypes namely, T-59, Bio-902, Laxmi, SEJ-2, GM-1, Rohini, Pusa bold, RH-30, PCR-10 and RN-393 having different degree of resistance / susceptibility to *S. sclerotiorum*, were sown in mid-October, 2002 in 30 cm diameter earthen pots. Thirty days after sowing, 20 g inoculum of each group (a representative isolate of each group was multiplied separately on sterilized sorghum grains for 20 days) was mixed carefully in to the upper 4 cm soil of the each pot. Ten plants were maintained in each pot and disease was assessed in mid-January, 2003. Per cent disease incidence (PDI) was calculated from counts of presence or absence of *Sclerotinia* rot lesions on all plant / plant parts as [(number of diseased plants / total number of plants)×100]. The reaction of different genotypes was categorized as resistant (PDI < 1), moderately resistant (PDI 1-10%), moderately susceptible (PDI > 10-20%), susceptible (PDI > 20-50%) and highly susceptible (PDI > 50%).

## Results and Discussion

**Morphological and Cultural variability:** All the isolates of *S. sclerotiorum* obtained from different fields / localities were grouped into nine groups (G<sub>1</sub> - G<sub>9</sub>) on the basis of various growth characters like raised, smooth, zonated, whitish greyish colony and sclerotial size (less than 3 mm as small, 3.1 - 5.0 mm as medium and more than 5 mm as large), colour (white, dull black and black), number (less than 8 as less, 9-20 as several and more than 20 as abundant) and their arrangements (scattered over colony, at inner periphery, at outer periphery and at centre). The isolates of G<sub>6</sub> were the most dominant (23.68% frequency). Groups G<sub>1</sub>, G<sub>2</sub>, G<sub>4</sub>, G<sub>5</sub>, G<sub>7</sub> and G<sub>9</sub> are distributed almost equally and their frequency were 7.89, 13.16, 7.89, 5.26

and 10.53 per cent, respectively. The results are in the accordance with the findings of Morrall *et al.* (1972), who grew 115 isolates of *Sclerotinia* spp. collected from 23 hosts in Saskatchewan on a glucose-salt agar medium. They noted large variations in numbers, shape, size and texture of sclerotia and six other characteristics. Such wide local differences undoubtedly explained the variability of morphological and physiological characteristics.

**Pathogenic Variability:** The inoculation with groups of isolates (representative of each group) on different genotypes of rapeseed and mustard under pot conditions revealed their differential pathogenic behaviour. The data recorded in terms of per cent disease incidence. Different groups caused varying degree of incidence on different genotypes. G<sub>1</sub>, G<sub>3</sub>, G<sub>4</sub>, G<sub>6</sub>, G<sub>7</sub> and G<sub>8</sub> groups were found more virulent producing higher disease among all varieties (except PCR-10), which ranged from 53.01 - 90.06 per cent. Their average incidence varied from 48.60 - 70.73 per cent on different genotypes. The average disease incidence was the highest (70.73%) on T-59 and the lowest on variety PCR-10 (24.26%). The average disease incidence of different groups varied from 11.08 - 82.44 per cent on all the genotypes. It was highest in group G<sub>6</sub> (82.44%) followed by G<sub>1</sub> (77.50%), G<sub>8</sub> (75.01%), G<sub>3</sub> (70.92%), G<sub>4</sub> (68.71%) and G<sub>7</sub> ((66.47%). It was 18.18 and 14.90 percent was in case of groups G<sub>5</sub> and G<sub>2</sub>, respectively. The lowest average disease incidence of 11.08 percent was recorded for G<sub>9</sub>. The groups G<sub>6</sub>, G<sub>1</sub>, G<sub>8</sub>, G<sub>2</sub>, G<sub>4</sub> and G<sub>7</sub> were more virulent on all the genotypes (except PCR-10) as they produced higher disease as compared to other groups.

Based on per cent disease incidence (PDI), different genotypes were found to show different behaviour against different groups of isolates. They were categorized into different reaction types i.e., resistant (PDI < 1), moderately resistant (PDI 1-10), moderately susceptible (PDI > 10-20), susceptible (PDI > 20-50) and highly susceptible (PDI > 50). From this study, it is apparent that ten genotypes / varieties viz., Bio-902, GM-1, Laxmi, PCR-10, Pusa Bold, RH-30, RN-393, Rohini, SEJ-2 and T-59 showed measurable variation in disease reaction with different groups of isolates, indicating pathogenic variability among the test groups of isolates. Based on the host-pathogen interaction, group G<sub>6</sub> was rated to be most virulent as it caused 82 per cent disease incidence on all the test genotypes / varieties (except genotype PCR-10) whereas group G<sub>9</sub> was rated least virulent, exhibiting 11.08 per cent disease incidence.

The present study indicated the prevalence of pathogenic variation in *S. sclerotiorum* isolates warranting the need for development of rapeseed and mustard cultivars with broad based resistance to the prevalent pathogenic isolate. So, only with a known highly virulence / aggressive isolate used in resistance experiments, the success of the experiments can be guaranteed. This means that breeders need to cooperate with plant pathologists in a very early stage of resistance breeding as this research is crucial to breeders trying to produce resistant and high yielding new cultivars. The findings of the present investigation clearly revealed that morphological and pathogenic variability did exist in *Sclerotinia sclerotiorum* isolates collected from different locations of Rajasthan.

### Acknowledgements

We are grateful to Indian Council of Agricultural Research, New Delhi for funding.

### References

- Chauhan LS, Singh J, Chandra DR. 1992. Proc. National Symposium on Management of Microbes in Service of Mankind. Nov. 19-21 at Univ. of Allahabad, Allahabad, 65-66 pp. (Abstr.).
- Morrall RAA, Duczek LJ, Sheard JW. 1972. Canadian Journal of Botany **50**: 767-786.
- Shivpuri A, Sharma KB, Chhipa HP. 2000. J. Mycol. Pl. Pathol. **30**: 268 (Abstr.)