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SCREENING OF CAULIFLOWER GERMPLASM AGAINST *SCLEROTINIA* ROT

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ABSTRACT

The technique used in screening of different lines/varieties involved placing of equal bits of infected leaves of the susceptible variety on the host plant along with a drop of water. The technique was modified by first initiating the infection on a known susceptible variety, Pusa Snowball K-1, in order to maintain equal inoculation load. Sixty nine varieties/lines were screened against *Sclerotinia* rot. Winter cauliflowers, namely, Janavon, EC 103576, EWAWH and EC 177283 were found to be resistant and can be used as donors in resistance breeding.

Key words: Cauliflower, screening, *Sclerotinia* rot, resistant donors.

The flourishing seed industry of cauliflower in India has a set back due to *Sclerotinia* rot caused by *Sclerotinia sclerotiorum* (Lib) de Bary. In recent years, the average seed yield of temperate cauliflower has sharply dropped from 400 to 125 kg/ha in Himachal Pradesh. The disease, which was considered to be a disease of temperate climate, has been observed in severe form around Delhi in early and midseason cauliflower. In epidemic years, the crop loss is complete.

In cauliflower the disease was first noticed in the Kulu Valley in the seed crop of Snowball-16 during the early 1970s. The disease appears at curd and flowering stages under natural conditions. Once the infection has set in, it is not possible to control the disease fully. Purdy [1] reported an extremely wide host range for the pathogen. It appears to be one of the most omnivorous, nonspecific and damaging plant pathogens. It infects 64 plant families, 225 genera, 361 species and 22 other cultivars etc. with a total of 383 species of plants. Besides, the fungus remains active in the wide temperature range of 0–32°C. In view of its seriousness, it was essential to find donors for resistance breeding.

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MATERIALS AND METHODS

Screening of cauliflower germplasm for locating sources of resistance to *Sclerotinia* rot was done during 1985–86 in the Division of Vegetable Crops, Indian Agricultural Research Institute, New Delhi, in which 69 entries of cauliflower germplasm represented all groups of cauliflower (Table 1). Four-week-old seedlings of different groups were grown in 10 cm diameter plastic pots filled with sterilized soil. Twenty five plants were observed in each variety/line, which were maintained as genetically pure lines.

The fungus for inoculation was obtained from the IARI Regional Station, Katrain, Kullu Valley (Himachal Pradesh) and multiplied on sterilized PDA medium. The inoculation technique developed by Kapoor et al. [2] was modified for screening the disease. The detached and dry petals of cauliflower were used to develop inoculum. The petals were sterilized in 0.02% $HgCl_2$ for about 1/2 min and washed in sterilized water until all chemical was removed. A disc of actively growing mycelium of *S. sclerotiorum* was placed aseptically in the centre of 9 cm diameter Petri dish having 20 ml sterilized PDA and incubated at 24 ± 1°C. After 48 h of radial growth of the fungus, the sterilized petals were aseptically

Table 1. Screening of cauliflower varieties and breeding lines for resistance to *Sclerotinia sclerotiorum*

Variety/line	Source	Disease score
October maturity group:		
328	IARI, New Delhi	4.14
Pusa Deepali	—Do—	4.18
Selected Kunwari	—Do—	4.38
Katki 823	—Do—	4.15
SN 754	—Do—	4.15
A-18-3-1	—Do—	4.07
First Crop	Sungrow Seeds Pvt. Ltd., New Delhi	4.22
Cauliflower J.	—Do—	4.44
Prem's selected Kunwari	Prem Seed Co., Hajipur, Bihar	3.36
First Crop Ageti	Century Seeds Pvt. Ltd., New Delhi	4.23
November maturity group:		
Improved Japanese	IARI, New Delhi	4.07
CC	—Do—	3.87
74-6C	—Do—	3.95
6-3-6-1-10	—Do—	3.74
9-1-3-15-9	—Do—	3.71
12C	—Do—	3.92
11-C	—Do—	4.12
260 x 328 (adv. gen. line)	—Do—	3.50
9-1-3-18-22	—Do—	4.37
9-1-3-18-9	—Do—	4.03
9-1-3-18-19	—Do—	3.64
9-1-3-18-15	—Do—	4.23
6-3-5-1-1	—Do—	4.35
9-1-3-18-14	—Do—	3.80
6-3-5-1-2	—Do—	4.16
Sprouting Broccoli	—Do—	4.28
Kale	—Do—	3.52
235-S	GBPUAT, Pantnagar	4.00
Prem's Agahani	Prem Seed Co., Hajipur, Bihar	4.33

(Contd.)

arranged in a circular manner around the rapidly growing mycelium. The petals were partially inoculated after 24 h of incubation. These petals were used for causing infection at the designated site by placing them on the leaf surface of the host plant along with a drop of water. The inoculated plants were placed in a dew chamber under 80–100% relative humidity. The plants were mist sprayed regularly to maintain a film of water. The infection spread both in acropetal and basipetal directions and disease symptoms started appearing on the third day after inoculation, while the typical symptoms became conspicuous on the sixth day.

To ensure uniform screening of the varieties/lines, these steps were followed: (1) The infection was first initiated on the known susceptible variety, Pusa Snowball K-1. The infected leaves were cut into equal parts and each part was then placed on one leaf of each seedling in the manner described above. This modified inoculation technique ensured uniform inoculum load on every

Table 1 (contd.)

Variety/line	Source	Disease score
December maturity group:		
294	IARI, New Delhi	4.40
263-1-3	—Do—	4.42
Pusa Synthetic	—Do—	4.23
Pusa Synthetic	NSC, New Delhi	4.01
Varao	IARI, New Delhi	4.07
Novem hiuia	—Do—	4.00
Hamraj-6-1	IARI, New Delhi	3.71
HR-6-3	—Do—	3.69
Kibo Giant	Royal Sluis, Holland	3.78
CC (Gr. II) 89	IARI, New Delhi	4.28
267-6-9	—Do—	4.25
246-4	—Do—	4.64
330-5	—Do—	4.04
244-3-4	—Do—	4.31
452-10	—Do—	4.56
MGS-3-9	—Do—	4.21
Snowball group:		
J. Highly susceptible	Sungro Seeds Pvt. Ltd., New Delhi	4.50
Pusa Snowball-1	IARI Regional Station, Katrain	4.09
MGS 2-4	—Do—	4.13
Early Winter Adam's White	—Do—	1.76
Sel-7	—Do—	4.38
Kt-86	—Do—	4.50
EC 103576	—Do—	1.56
Janavon	—Do—	1.80
EC 131592	—Do—	2.16
Sn 445	—Do—	4.32
Kt-16	—Do—	4.04
Kt-1	—Do—	3.81
Sel-12	—Do—	3.58
Kt-9	—Do—	3.87
Snowball-16	—Do—	4.35
EC 177281	Bejo Zaden Noordschar-wjbde, Holland	2.88
EC 177282	—Do—	2.04
EC 177283	—Do—	1.77
Snowball-16	Nepal	3.81
Acc. 841	Sothern Cross, Victoria, Australia	3.54
Acc. b 842 (Snowcap)	Asmer Seeds Ltd., Leicester, U.K.	3.83
Acc. 843 (Harmia)	—Do—	2.95
Snowball-16	Sluis and Groot Enkhuizen, Holland	3.95
Amarkantak	NSC, New Delhi	3.84

seedling. (2) Leaves of similar size and age were used in each seedling to ensure uniformity of infection and disease scoring.

The observations were recorded six days after inoculation. The disease scoring was done visually with the following ratings:

0	No spread beyond the site of inoculation
1	25% of the leaf surface infected
2	26–50% of the leaf surface infected
3	51–75% of the leaf surface infected
4	76–100 of the leaf surface infected
5	disease spread to the stem through petiole

Disease score of 0 to 2 was considered as resistant and 3 and above as susceptible.

RESULTS AND DISCUSSION

All screening was done at seedling stage. In nature, the disease is prevalent after curd initiation till the pods are set. The primary infection occurs through ascospores. The infected plants give a silvery white appearance from a distance. In the diseased plants, the branches droop and the stalk is filled with sclerotia of irregular size. However, the symptoms are different under artificial screening. The leaf tissue starts rotting at the site of inoculation and the infection progresses both in acropetal and basipetal directions and passes over to the stem through petiole.

Sixty nine varieties/lines of cauliflower were tested for reaction to the disease. All Indian cauliflower lines/varieties were found to be susceptible. The varieties of October, November and December maturity had a mean disease score of more than 2, with 32 and 13 varieties showing a disease score 4 and 3 or more, respectively. In the Snowball group, 20 varieties showed disease score > 2 while 4 varieties had a score of < 2. Thus, resistance was found only in winter cauliflowers. High degree of resistance was exhibited by germplasm strain EC 103576 (1.56), followed by Early Winter Adam's White Head (EWAWH) (1.76), EC 177283 (1.77) and Janavon (1.80) during the first screening (Table 1). On subsequent checking, variety Janavon showed higher resistance than EC 103576. The

relative instability of disease reaction and the variability observed for infection in these true breeding genotypes suggests that the disease reaction is quantitatively inherited. Further studies confirmed this belief. The detection of these donors of resistance are probably the first in cauliflower and can be used in resistance breeding against sclerotinia rot in cauliflower.

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