

SEED-BORNE INFECTION OF BLACK-ROT DISEASE OF COLE CROPS CAUSED BY *XANTHOMONAS CAMPESTRIS* PV.

CAMPESTRIS (PAMMEL) DOWSON

BY

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Study of seed pathology carried out using blotter paper technique showed that seeds of different varieties procured from reputed commercial farms contained varying percentages of seed borne infections ranging from 12.15% to 6.48% in cabbage and 10.79% to 7.66% in cauliflower. Through seed bacterization at 3.3×10^8 cells/ml concentration, seedlings infection could be induced after incubation for 3 weeks and highest percentage of infected plants (above 92% in cabbage) stabilized in around 9th week. The disease manifestation in cauliflower was similar with regard to time of appearance but the disease incidence was lower (79%).

INTRODUCTION

Black rot disease of cole crops caused by *Xanthomonas campestris* pv. *campestris* is a global problem. It has been reported from USA (Jorgensen and Walter, 1955; Williams, 1980); Romania (Vukovits, 1958); Panama (Toler *et al.*, 1959); Mexico (Teliz-ortiz, 1965); Italy (Mazzucchi, 1968); Belgium (Vanachter *et al.*, 1977); Fiji (Morwood, 1955) and India (Patwardhan, 1928). In West Bengal incidence of this disease was reported first by Chattopadhyay and Mukherji (1955). Patel and Kulkarni (1953) observed that the introduction of this major destructive pathogen took place through imported seeds. An investigation was taken up to find out the extent of seed borne infection and disease incidence under local conditions.

MATERIALS AND METHODS

The following cole crops were studied, namely cabbage (*Brassica oleracea* var. *capitata*) and cauliflower (*Brassica oleracea* var. *botrytis*) in respect of black rot disease caused by the bacterium *Xanthomonas campestris* pv. *campestris* at the Plant Pathology Laboratory of the Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal.

In first experiment the study of natural incidence of black rot disease was carried out on the seed stocks of six cultivated varieties each of cabbage and cauliflower.

Seed infections were scored following the blotter technique. Seeds were picked up at random (600 number for each variety) from the seed lots and were cleaned by sterile distilled water four to five times to remove the surface contaminant, washed seeds were then soaked in sterilised distilled water for 12 hour and then kept under moist aseptic condition inside sterile petri plates. The petriplates were maintained inside a BOD incubator at $28^{\circ}\text{C} \pm 1^{\circ}\text{C}$. Scoring was done eight to twelve days after incubation. The results are presented in Tables 1 and 2.

Table 1. *Data on seeds of cabbage showing seed-borne infection (Number of seeds tested in each case 600)*

Name of the Farm where from seeds were obtained	Name of the variety	No. of seeds germinated	No. of infected seeds	Percentage of infection on germinated seeds
M/s. Sutton and Sons, Calcutta	Pride of India	560	52	9.28
	Eclipse Drumhead	510	62	12.15
	Sutton's Express	523	39	7.45
M/s. P. Pocha and Sons, Poona	Goldren Acre	552	45	8.15
	Large Early Drumhead	561	42	7.48
	Copenhagen Market	571	37	6.48

Table 2. *Data on seeds of cauliflower showing seed-borne infection (Number of seeds tested in each case 600)*

Name of the Farm where from seed were obtained	Name of the variety	No. of seeds germinated	No. of infected seeds	Percentage of infection on germinated seeds
M/s. Sutton and Sons, Calcutta	Main crop			
	Banaras	553	51	9.22
	Snowball	528	57	10.79
M/s. P. Pocha and Sons, Poona	Early Market	547	47	8.59
	Patna Late	538	40	7.43
	Snowball Elite	544	48	8.82
Haryana Agricultural University, Hissar	Pratihari-82	548	42	7.66

In the second experiment 400 nos. of healthy seeds each of cabbage (variety—Eclipse Drumhead) and cauliflower (variety-Snowball) were soaked in cell suspensions of *X. campestris* pv. *campestris* (conc. 3.8×10^2 cells/ml) for 12 hours and then sown in earthen pots containing sterilized soil. Disease scoring was done at 7 days intervals after sowing. The results recorded upto the 9th week following sowing dates and have been presented in Tables 3 and 4. Control sets were maintained for both the varieties without inoculating the seeds.

Table 3. *Effect of artificial bacterization of seeds of cabbage (Variety-Eclipse Drumhead) on disease incidence*

Total number of seeds bacterized	No. of seeds germinated	Days after inoculation	No. of plants infected (Progressive total)	Percentage of infection	
				Based on total seed sown	Based on germinated seeds
400	343	7	Nil	0.00	0.00
		14	Nil	0.00	0.00
		21	Nil	0.00	0.00
		28	51	12.75	14.86
		35	203	50.75	59.18
		42	258	63.00	75.21
		49	277	69.25	80.75
		56	318	79.50	92.71
		63	318	79.50	92.71

Table 4. *Effect of artificial bacterization of seeds of cauliflower (Variety-Snowball) on disease incidence*

Total number of seeds bacterized	No. of seeds germinated	Days after inoculation	No. of plants infected (Progressive total)	Percentage of infection	
				Based on total seed sown	Based on germinated seeds
400	364	7	Nil	0.00	0.00
		14	Nil	0.00	0.00
		21	Nil	0.00	0.00
		28	67	16.75	18.40
		35	198	49.50	54.39
		42	254	63.50	69.78
		49	268	67.00	73.62
		56	291	72.75	79.94
		63	291	72.75	79.94

RESULTS AND DISCUSSION

When the naturally infected seeds lots were studied under blotter technique the diseased seedlings that came out exhibited symptoms of rotting of cotyledons and hypocotyles turning yellowish and pulpy. V-shaped lesions appeared on the margins of cotyledons as well as the true leaves (Figs. 1 and 2). Amongst the varieties of cabbages extent of infection was found to vary from 12.15% in Eclipse Drumhead to 6.48% in Copenhagen market. In case of cauliflower (Table 2) the

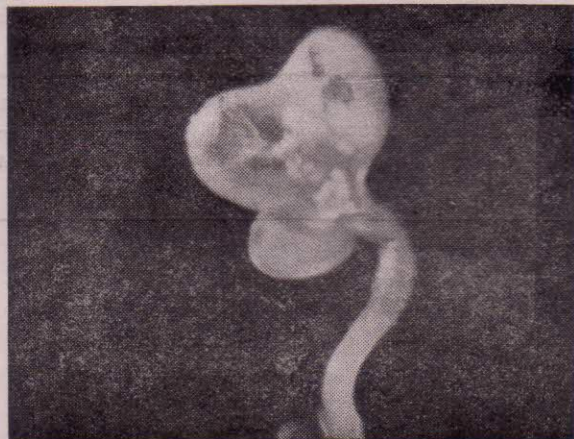


Fig. 1. Photograph showing symptoms of *Xanthomonas campestris* pv. *campestris* infection on cotyledonary leaves of cabbage.

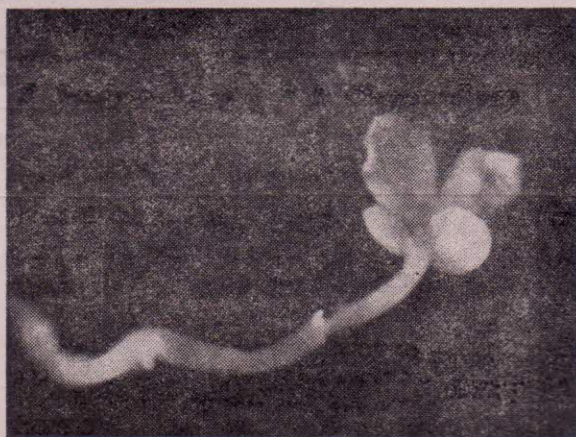


Fig. 2. Photograph showing symptoms of *Xanthomonas campestris* pv. *campestris* infection on cotyledonary leaves of cauliflower.

variety Snowball (10.79%) and Pratihari-82 (7.66%) showed the maximum and minimum rates of disease incidence respectively. The other four varieties showed intermediate values.

In the experiment on seed bacterization on cabbage (variety-Eclipse Drumhead) and cauliflower (var. Snowball) the symptoms began to appear three weeks after (Tables 3 and 4). The first group of plants manifesting the disease could be identified in the fourth week. The percentage of diseased plants increased with the advance of time and the disease population was found to be stabilised at 9th week. The percentage of disease plants were above 92% in case of cabbage and above 79% in case of cauliflower. Plants in control sets did not show any sign of infection.

In case of both cabbage and cauliflower all the tested varieties showed varying levels of seed borne infection though there was considerable differences amongst the varieties. Seed borne infection of black rot has drawn attention of a number of earlier investigators (Harding *et al.*, 1904 ; Patwardhan, 1928 ; Patel and Kulkarni, 1953).

In case of cauliflower however differences amongst the varieties were not so marked. Experiments with seed bacterization confirmed that the inoculum present on the seeds can bring about infection of seedlings and the extent may be high as 92% in cases of artificial inoculation. These experiments show that under Indian conditions, infected seeds constitute one of the primary sources of infection in black rot disease of cabbage and cauliflower.

REFERENCES

- Chattopadhyay, S. B. and Mukherji, K. (1955). Black vein disease of cabbage in West Bengal. *Sci. and Cult.* 21, 107-108.
- Harding, H. A., Stewart, F. C. and Prucha, M. J. (1-04). Vitality of the cabbage black rot germ on cabbage seed. *N. Y. Agr. Expt. Stat. Bull.* 251, 177-194.
- Jorgensen, M. C. and Walter, J. M. (1955). The out break of black rot at Ruskin. *Proc. Fla. Hort. Soc.* 67, 109-111.
- Mazzucchi, U. (1968). Vascular blackening of cultivated crucifers by *Xanthomonas campestris* *Inftore fitopatol.* 18, 1-4.
- Morwood, R. B. (1955). A preliminary list of plant disease in Fiji Department of Agriculture. *Mimeographed.* pp. 9.
- Patel, P. N. and Kulkarni, Y. S. (1953). A review of bacterial plant disease investigation of India. *Indian phytopath.* 6, 131-140
- Patwardhan, G. B. (1928). Field, Garden and Orchard Crops of the Bombay Presidency. *Bull. Dep. Agric. Bombay.*

- Telir-Ortiz, M. (1965). Varietal resistance in cabbage to black rot. *Agricultura tec. Mex.* 2(2), 50-52.
- Toler, R. W., Cuellar, R. and Ferrer, J. B. (1959). Preliminary survey of plant disease in the Republic of Panama. *Plant. Dis. Report.* 43(11), 1201-1203.
- Vanachter, A., Wambeke, E., Van, A. and Van, C. (1977). Twentyninth International Symposium on Phytopharmacy and Phytiatry. Part-II, pp. 1141-1149.
- Vukovits, G. (1958). On a heavy out break of black rot in cabbage. *Pflanzenarzt.* 11(3), 41-42.
- Williams, P. H. (1980). Black rot a continuing threat to World Crucifers. *Plant. Dis. Repr.* 64(8), 736-742.

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