From this study, it could be summarised that the the crop morphology is altered by the variations in the weather parmeters. The crop sown in summer season accumulated higher dry matter than the other seasons. Favourable weather prevailing during the summer season accelerated the growth plant height, number of branches and leaves which leads to bushy growth and higher dry matter production. The crop duration was reduced in winter sowings because of its quantitatively short day nature.

REFERENCES.

AKINOLA, J.O. AND WHITEMAN, P.C. 1974. Agronomic studies on pigeonpea. I.Field resonse to sowing time. Aust. J. Agri. Res., 26: 43-56.

ANONYMOUS, 1982. ICRISAT, Annual Report, Hyderabad, India.

CHAUHAN, Y.S., VENKATERAMAN, N. AND SHELDRAKE, A.R., 1982. Pulse physiology progress report 1981-1982. part I Pigeonpea Physiology, ICRISAT, Hyderabad. P.92.

LAXMAN SINGH AND PANDEY, R.C., 1974. Genetic analysis of some quantitative characters in pigeonpea. Himachal. J. Agric.Res., 2: 1-3

NARAYANAN, A., SAXENA, N.P. AND SHELDRAKE, A.R. 1981. Varietal differences in seed size and seedling growth of pigeonpea and chilepea. Indian J.Agric. Sci., 383-393.

RIOLLANO, A., PEREZ, A. AND ROMES, C. 1962. Effect of planting date, variety and plant population on the flowering and yield of pigeonpea. J.Agri. Univ. Puerto Rico., 46: 127-134.

RIVERA, E AND IRIZARY, H. 1983. Pigeonpea yield as influenced by planting date and pruning. J.Agri. Univ. Puerto Rico. 67: 173- 177.

SAXENA, K.B., BYTH, D.E., WALLIS, E.S. AND DELACY, I.H. 1980. Genetic analysis of a diallel cross early flowering pigeonpea line. IN.Proc. In. Workshop on pigeonpeas. Volume. 1: 15-19 December, 1980. ICRISAT. Hyderbad, India P. 81-92.

https://doi.org/10.29321/MAJ.10.A01931

Madras Agric. J. 77(3 & 4): 137-142 Mar-Apr. 1990

SEED-PLANT TRANSMISSION AND CONTROL OF ALTERNARIA SPP. IN LAHI (*BRASSICA NAPUS* L.) IN KUMAUN HILLS, INDIA

A.P. DHYANI, M.C. SATI AND R.D. KHULBE

Seed Pathology Lab., Department of Botany, Kumaun University, Nainl Tal.

ABSTRACT

Alternaria alternata, A. brassicae, A. brassicicola, A.radicina, A. raphani and A. tenuissima were detected from storage and field seeds of Brassica napus grown under different agroclimatic conditions of Kumaun Himalaya. Of them, A. alternata, A. brassicae and A. raphani were fequently isolated from seeds, seedlings, leaves and pods and found to be responsible for seed and seedling infection. These species also caused necrosis of leaves and pods in later stages. The pathogenicity tests under glass house conditions proved the serious pathogenic behaviour of these species. Thiram, Captafol, Dithane M-45 and Vitavax were found most satisfactory chemicals to control the infection of Alternaria spp. in seeds and other organs of Brassica napus.

KEY WORDS: *Brassica napus*, Alternaria, Seed transmission, Chemical control.

Alternaria species are well known fungal pathogens of cruciferous crops grown under tropical and temperate conditions. In India, seed-borne fungi of *Brassica napus* has been studied by Chahal (1981), Chahal and Kang (1979) and Randhawa and Aulakh (1981). But their work was confined to warmer conditions of subhimalayan region. Kumaun Himalaya yield this crop in large amount in valleys and lower hills, but no work has yet been done on the seed-borne fungi. During a course of study on fungal diseases in hills from 1984 to 1986, *Alternaria alternata, A. brassicae, A.brassicicola, A. raphani* and *A. tenuissima* were found to be frequently with storage and fresh seeds, seedlings infected leaves and pods of *Brassica napus*. The present paper deals with the pathogenic behaviour of *Alternaria* spp. in *Brassica napus* under different agroclimatic conditions of Kumaun.

MATERIALS AND METHODS

The seed samples, infected seedlings, leaves and pods of *Brassica napus* were collected in fresh polythene bags from different areas and brought to the laboratory. In laboratory, several fungal species were directly isolated under stereobinocular and compound microscopes. Some infected materials were treated by NaoCl solution. The treated parts were than washed in sterilized water, dried and inoculated into sterile agar plates (P.D.A.). After 7 days of incubation at 20 C±2°C, those plates were observed for the growth and identification of fungi. The fungal species were identified with the help of standard literature (Rangel, 1945, Changsri & Weber, 1963 and Ellis, 1971).

Pathogenicity tests of three common pathogens i.e. *Alternaria, alternaria, A. brassicae* and *A. raphani* were conducted. For this, healthy surface sterilized (by NaoCl solution with 1% available chlorine for 10 minutes) seeds were washed by sterilized water and dried. The fungal isolates were inoculated by infestation of the seeds over actively sporulating culture following the method of Suryanarayana and Bhombe (1961). These infested seeds were sown in sterilized soil under glass house conditions (average temperature 18 ±2°C and soil moisture ranged from 40 - 60%). Twenty seeds per pot of 24 cm in diameter were taken. For control, surface sterilized seeds were sown under similar conditions without fungal infestation. Regular observations were made for pathogenic lesions on seeds and seedlings.

In chemical control experiment, Lahi seeds were surface sterilized by NaoCl solution for 10 minutes. The treated seeds were washed by sterilized water and dried. These seeds were rolled over actively sporulating cultures of selected pathogens. Such infested seeds were placed in sterilized moist blotter plates for 48 hours at 15 (± 2)°C for the establishment of pathogens in seeds. These seeds were then dressed by seven fungicides, namely Bavistin, Brassicol, Captafol, Dithane M-45, Thiram, Topsin and Vitavax at the concentration of 0.3% of seed weight. Such seeds were directly placed on moist blotter plates (5 replicates each of 20 seeds in 7.5 cm diameter petriplates) and incubated for 14 days at 20 (±2)°C in an incubation chamber adopting the methods of Kadian and Suryanarayana (1971). For each pathogen, 100 seeds were plated, while 100 seeds in 5 replicates of 20 seeds were plated without fungicidal dressing to compare the effects of fungicides. After 14 days of incubation, these seeds were observed for per cent seed in-

fection, seed germination, seed rotting and seedling blight.

RESULTS AND DISCUSSION

A total of 5 species of *Alternaria* viz., *A. alternata, A. brassicae, A. brassicicola, A. radicina* and *A. raphani* were isolated from stored and fresh seeds of Lahi grown in Kumaun Hills. *A. tenuissima* was associated with fresh seeds only. Of these species, *A. alternata* was most common under different agroclimatic conditions, while *A. brassicae, A. raphani, A. brassicicola, A. radicina* and *A. tenuissima* were less distributed.

The results of present study reveal that *Alternaria* species are pathogenic to cruciferous crops under different climatic conditions (average temperature from 22 - 30°C and moisture 40 - 60%). Infection of *Alternaria* spp. was found in higher percentages in seeds treated by NaoCl solution and indicated its internal association. Rangel (1945) and Changsri and Weber (1963) have reported internally seed-borne nature of *Alternaria brassicae, A. brassicola* and *A. raphani*. They observed low germination, poor seedling growth and blight of leaves and pods.

In pathogenicity test (Table 1), *Alternaria alternata* caused 16.25% and 15.62% seedling infection with 20% and 36% germination losses in Badsahi and Elephant ear varieties respectively. Stoll (1948) observed *Alternaria alternata* as serious pathogen of Cauliflower seedlings.

Alternaria brassicae, a serious fungus of crucifers was isolated frequently from Lahi with 12.12% and 14.75% seedling infection and 34% and 39% germination loss in Badsahi and Elephant ear cultivars respectively. Infected seedling and rotted seeds showed grey black lesions and blighting of young cotyledonary leaves and post-emergence damping-off. These results clearly indicate pathogenic behaviour of this fungal species and are similar to those of Rangel (1945), Changsri and Weber (1963) and Chahal and Kang (1979) and Brokenshire and Prasanna (1984), who have reported virulent nature of *Alternaria brassicae* in different crucifers.

Alternaria raphani caused 12.5% seedling infection and 20% germination loss in Badsahi and 12.16% seedling infection and 26% germination loss in Elephant ear variety under glass house conditions. These results confirm the report of Changsri and Weber (1963) who have reported virulent effects of *Alternaria raphani* in crucifers. They observed poor germination and heavy seedling mortality in artificial inoculation experiments. Groves and Skolko (1944) and Wiltshire (1947) observed severe blight by *Alternaria alternata, A. brassicae, A. brassicicola* and *A. raphani* in some cruciferous plants.

In chemical control (Table 2), captafol and thiram were found effective for all the tested species viz., *Alternaria alternata, A. brassicae* and *A. raphani,* while dithane M-45 also gave satisfactory results against these pathogens in comparison to other fungicides i.e. bavistin, brassicol, topsin and vitavax which were found moderate to less effective. Chirco and Harman (1980), Rai and Singh (1982) applied thiram and dithane M-45 against *Alternaria* blight of mustard as suitable chemicals. Walker (1952) also reported captafol, dithane M-45 and vitavax as good chemicals against seed-borne *Alternaria* species. He also stated that thiram was helpful in the suppression of infection and to increase seed germination.

Table 1. Pathogenicity test of 3 virulent seed-borne Alternaria spp. of Lahi (**Brassica napus** L.) in two cultivars.

Name of Pathogen	Variety	No. of seeds sown	Normal Healthy seedlings	Infected Seedlings		% seedling infection	% Seed germination	Pre-emergence loss
				Slightly infected seedlings	Severely infected seedlings			
Alternaria alternata	Badsahi	100	67	5	8	16.25	80	20
	Elephant ear	100	54	4	6	15.62	64	36
A. brassicae	Badsahi	100	58	4	4	12.12	66	34
	Elephant ear	100	52	6	3	14.75	61	39
A. raphani	Badsahi	100	70	4	6	12.50	80	20
	Elephant ear	100	63	4	5	12.16	74	26
Control	Badsahi	100	100	-	-	-	100	-
	Elephant ear	100	100	-	-	-	100	-

Table 2. Chemical control of three seed-borne **Alternaria** species by fungicidal seed-dressing in Lahi (Brassica napus L.) (concentration 0.3% of seed weight) Values in percentage

Fungicides	A. alternata				A. brassicae				A. raphani			
	Seed infec-tion	Seed germi-tion	Abnormal seed-lings	Healthy seed-lings	Seed infec-tion	Seed germi-tion	Abnormal seed-lings	Healthy seed-lings	Seed infec-tion	Seed germi-tion	Abnormal seed-lings	Healthy seed-lings
Control	95	36	15	18	99	74	27	47	99	49	32	17
Bavistin	78	42	10	32	38	84	22	62	70	59	28	31
Brassicol	49	44	11	33	43	80	28	52	81	42	21	21
Captafol	15	51	4	47	3	90	–	90	3	83	–	83
Dithane M-45	9	69	–	69	12	80	7	73	8	51	–	51
Thiram	16	57	8	49	–	80	–	80	–	80	–	80
Topsin	36	37	6	31	76	76	40	36	74	59	34	25
Vitavax	54	68	16	52	19	70	7	64	4	64	–	64

The available literature (Bilgrami *et al.*, 1981) indicate that *Alternaria radicina* and *A. tenuissima* are being reported for the first time from India.

The authors are grateful to I.C.A.R., New Delhi for providing financial assistance.

REFERENCES

BILGRAMI, K.S., JAMALUDDIN and RIZWI, M.A. 1981. **Fungi of India**, Part II, pp. 94. Today and Tommorow Printers and Publishers, New Delhi, India.

BROKENSHIRE, T. and PRASANNA, K.P.R. 1984. Diseases of winter oil seed rape in SE Scotland. In:Crop protection in Northern Britain, 216 - 221.

CHAHAL, A.S. 1981. Seed-borne infection of **Alternaria brassicae** in Indian mustard and its elimination during storage. Curr. Sci., 50 : 621-623.

CHAHAL, A.S. and KANG, M.S. 1979. Some aspects of seed-borne infection of **Alternaria brassicae** in rape and mustard cultivars in Punjab. Indian Jour. of Mycol. & Pl. Path. 9 : 51 -55.

CHANGSRI, W. and WEBER, G.F. 1963. Three **Alternaria** species pathogenic on certain cultivated crucifers. Phytopathology, 53 : 643 - 648.

CHIRCO, E.M. and HARMAN, G.E. 1980. The effect of **Alternaria brassicicola** infection of **Brassica** seed vigour and viability. Jour. of Seed & Technol. 3 : 12 -22.

ELLIS, M.B. 1971. Dematiaceous Hyphomycetes. Common Wealth Mycological Institute, Kew, Surrey, England, pp. 608.

GROVES, J.W. and SKOLKO, A.J. 1944. Notes on seed-borne fungi II **Alternaria**. Canad. Jour Res. Sect. C. 22 : 217 - 234.

KADIAN, O.P. and SURYANARAYANA, D. 1971. Studies on seed- mycoflora of oil seed crops. Indian Phytopath., 24 : 487 - 490.

RAI, B. and SINGH, D.B. 1982. Effect of fungicides in the leaf surface mycoflora of mustard. Acta Botanica Indica, 10 : 223 - 232.

RANDHAWA, H.S. and AULAKH, K.S. 1981. Pathology of shrivelled seeds of rape and mustard in Punjab. Indian Phytopath., 34 : 318 - 324.

RANGEL, J.F. 1945. Two **Alternaria** diseases of cruciferous plants. Phytopath., 35 : 1002 - 1007.

STOLL, K. 1948. On the **Alternaria** blackening of Brassicae. Nachtz. Bl. dtsch Pflsch Dienst, Berl. N.F. 2 : 174-178.

SURYANARAYANA, D. and BHOMBE, B.B. 1961. Studies on fungal flora of some vegetable seeds. Indian Phytopath., 32 : 30 - 41.

WALKER, J.C. 1952. **Diseases of vegetable crops.** McGraw-Hill Book Company, Inc. pp. 529.

WILTSHIRE, S.P. 1947. Species of **Alternaria** on brassicae. Imp. Mycol. Inst. Mycol. Paper. 20.

Madras Agric. J. 77(3 & 4): 142-146 Mar-Apr. 1990

INFLUENCE OF BLUE GREEN ALGAE ON GROWTH, YIELD COMPONENTS AND ECONOMY IN LOW LAND RICE

S. JEYARAMAN

Department of Agronomy, Agricultural College and Research Institute, Madurai-625 104

ABSTRACT

Studies on the effect of soil application of a composite culture inoculum of blue green algae on N economy in low land rice indicated that application of 75 kg N per ha along with soil application of composite culture of blue green algae at 10 kg per ha at 10th day after transplanting recorded higher grain yield. It was found significantly superior over the application of 75 kg N per ha alone and statistically