

## Disease reaction and its progress on different chilli cultivars (*Capsicum annuum* L.) against anthracnose and leaf curl virus under field condition

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Nine diverse genotypes of chilli were tested against leaf curl and anthracnose (die-back and ripe fruit rot) disease under natural field condition during March to September in two consecutive years (1997-98). None of the entries were free from both the diseases but the minimum leaf curl disease incidence was recorded in KS<sub>1</sub> (3.13%) followed by HC 28 (5.0%), CA 219 (5.39%), Pusa Sadabahar (5.84%) and KS<sub>3</sub> (6.66%). These cultivars were found tolerant in reaction. The incremental increase of disease, as a function of time was also low in KS<sub>1</sub> followed by HC 28 and CA 219. The cultivars KS<sub>2</sub>, Bhutan Oval showed moderate in disease reaction. In case of die-back disease of chilli all the cultivars were susceptible in reaction. The cultivar KS<sub>3</sub> showed lowest (31.52%) disease incidence followed by CA 219 (34.07%), KS<sub>1</sub> (35.41%) and Solan Selection (39.44%) at 120 days after transplanting (DAT), though CA 219 showed symptoms at 70 DAT and KS<sub>3</sub> at 90 DAT. KS<sub>1</sub> and KS<sub>2</sub> on the other hand produced symptoms at 100 DAT. In case of ripe fruit rot, lowest rotting was observed in KS<sub>1</sub> (33.41%) and KS<sub>3</sub> (40.45%). Highest number of fruit rot was observed in Bhutan Oval Shape (62.92%) and Pusa Sadabahar (59.00). Yield of fruits was observed maximum in the entry HC 28 (328.66 g/plot) followed by KS<sub>1</sub> (170.66 g/plot) and KS<sub>2</sub> (158.33 g/plot). Thus considering both leaf curl and anthracnose diseases the cultivars KS<sub>1</sub>, KS<sub>3</sub> and CA 219 are suitable for cultivation in wet season in W.B.

**Key words :** Chilli, cultivars, anthracnose, leaf curl, disease reaction

### INTRODUCTION

Chilli (*Capsicum annuum* L.) is one of the most important cash crop in India. It is grown extensively under a wide range of agroclimate conditions throughout the year in India. However, Major constrain for cultivation of this crop is disease of both biotic and abiotic origin. Among the diseases, the most important fungal and viral diseases are anthracnose and leaf curl respectively. Leaf curl which is transmitted by whitefly was first recorded by Mishra *et al.*, (1963). The fungal disease, anthracnose, caused by *Colletotrichum capsici* (Syd.) Butter and Bisby, is the most devastating during ripening of the fruits and the crop loss due to this disease has been reported to vary from 10-60% depending upon varieties (Bansal and Grover, 1969).

Thus because of the immense economic significance of both the diseases and considering

the importance of the disease problem of chilli in the wet season of West Bengal, it was decided to undertake the present experiment to find out the suitable cultivar tolerant to these important diseases and also the time of disease progression for suitable protection schedule.

### MATERIALS AND METHODS

The experiment with nine cultivars namely, CA-219, Chilli Hot Pepper, Solan Selection, Bhutan Oval Shape, HC-28, Pusa Sadabahar, KS<sub>1</sub>, KS<sub>2</sub> and KS<sub>3</sub> was laid out in randomized block design with four replications at Mondouri Horticultural Research Station, Bidhan Chandra Krishi Viswavidyalaya during 1997 and 1998 respectively. Seedling of nine cultivars were transplanted during 1997 and 1998 respectively. Seedlings of nine cultivars were transplanted during middle of May in each replicated plot measuring 2.25 × 2m with a

spacing of 75 × 50 cm accounting to 12 plants/plot. Leaf curl infected plants could be recognized following the symptoms described by Uppal (1940). The anthracnose disease was recognized by two symptoms, die back and ripe fruit rot. The disease reaction of the particular cultivars were graded according to the incidence of the disease and type of symptoms (leaf curl) following Konai and Narayani (1983).

Grade	Disease reaction
0	Immune (I)
0.0-1.0%	Resistant (R)
1.1-10.0%	Tolerant (T)
10.1-20.0%	Moderately susceptible (MS)
20.1-50.0%	Susceptible (S)

Observations of the following parameters were recorded :

- i) Percent disease incidence of leaf curl virus: were calculated by counting the number of plants infected and total number of plants in the plot.
- ii) Percent of incidence of die-back disease : were assessed by observing the shoot die-back and leaf symptoms of plant.
- iii) Percent of anthracnose infected fruits per plot (number basis/weight basis) : were calculated by dividing the number of fruits or weight of ripe fruit infected fruits of a plot by total number of fruits harvested from that particular plot.
- iv) Number and weight of fruits per plot: Total number of fruits and weight of total fruits per plot were assessed.

## RESULTS AND DISCUSSION

In case of leaf curl disease the minimum percent of disease incidence was observed in KS1 (3.13%) followed by HC-28 (5.00%), CA 219 (5.39%), Pusa Sadabahar (5.84%). The gradual increase of this disease on different cultivars with the age of plants have been also reflected (Fig. 1). The rate of increase of disease was found to be maximum during the period 40 to 80 days after transplanting

(DAT) and it was gradually decreased or even stopped in some cultivars at 90 days after transplanting. So it was observed that this disease was not vulnerable to attack at the age of 40 days and gradually decreased with increase are highly tolerant and crop protection to minimise this can be adopted at 40 DAT to 80 DAT.

According to disease reaction the cultivar showed tolerant were KS<sub>1</sub>, HC-28, CA-219, Pusa Sadabahar and KS<sub>3</sub>, moderately susceptible were KS<sub>2</sub> and Bhutan Oval Shape and susceptible Chilli Hot Pepper and Solan Selection (Table 1). In case of Chilli Hot Pepper, the most susceptible cultivar, disease was observed at 40 DAT (3.13%) and gradually increased up to 29.16% at 90 DAT where as in resistant cultivar like KS<sub>1</sub>, the disease first observed at 70 DAT (3.13%) which remained stable or unchanged up to 90 DAT. Another tolerant cultivar like CA-219 which showed disease at 40 DAT increased up to 70 days and remained static up to 90 DAT. The same trend was also observed in the cultivars like HC-28 and Pusa Sadabahar though disease starts at 50 DAT (Fig. 1). It was observed throughout the investigation that all the cultivars showed maximum disease at the age of 70-90 days old plants which is due to high humidity and moderate temperature (28-29°C) during August and September. This observation confirms the result of Singh *et. al.*, (1994) that leaf curl of chilli is epidemic in Nagaland during July to September due to high humidity and moderate temperature which increase the population of the viruliferous vector white flies (*Bemisia tabaci*).

**Table 1** : Percentage of leaf curl and die-back disease plants per plot and disease reaction.

Cultivar	Leaf curl(%)	Die-back(%)	Disease reaction
CA 219	5.39 (11.81)	34.07 (35.80)	T
Chilli Hot Pepper	29.16 (32.60)	52.50 (47.02)	S
KS <sub>3</sub>	6.66 (12.86)	31.52 (34.10)	T
Solan selection	26.60 (31.09)	39.44 (39.11)	S
KS <sub>1</sub>	3.13 (8.32)	35.41 (34.05)	T
KS <sub>2</sub>	16.19 (21.44)	42.81 (41.05)	MS
Bhutan Oval Shape	19.46 (23.61)	65.95 (58.48)	MS
HC 28	5.00 (9.76)	43.05 (41.08)	T
Pusa Sadabahar	5.84 (12.17)	58.37 (54.07)	T
S. Em ±	5.5530960314	6.942	
C.D. at 5%	13.37	16.78	-

T= Tolerant, S= susceptible, M.S.=Moderately susceptible. The figures in the parenthesis represent average angular value.

The anthracnose of chilli which produce die-back symptoms in growth stage of the plant was observed in 120 days after transplanting. The cultivar which produced maximum infection was Bhutan Oval Shape (65.95%) followed by Pusa Sadabahar (58.37%). Minimum infection was observed in incidence were not statistically significant (Table 1).

In case of ripe fruit rot it was observed that KS<sub>2</sub> produced maximum fruit infection (123.75/plot) followed by Pusa Sadabahar (101.75/plot), Solan Selection (96.75/plot) and HC-28 (91.50/plot) and their difference in disease incidence was statistically at par. Minimum number of fruits infected in KS<sub>1</sub> (27.75/plot) followed by Bhutan Oval Shape (58.50/plot) and Chilli Hot Pepper

Table 2 : Assessment of fruit rot infection of different cultivars.

Cultivar	Total No. of fruits/plot	Total weight or fruits/plot(g)	No. of ripe fruit rot infected fruits /plot	Weight or ripe fruit rot infected fruits (g)/plot	Percent of infected fruits/plot (no. basis)	Percent of infected fruits/plot (weight basis)
CA 219	119.00	664.80	76.25	95.90	56.86 (49.14)	50.12 (45.36)
Chilli Hot Pepper	116.75	545.05	62.25	67.76	50.34 (45.20)	40.90 (39.55)
KS <sub>3</sub>	185.50	983.40	82.00	84.60	40.45 (39.28)	32.88 (34.71)
Solan selection	192.25	785.50	96.75	88.67	54.89 (47.87)	49.19 (44.49)
KS <sub>1</sub>	84.25	315.60	27.75	24.70	33.41 (35.25)	32.85 (30.70)
KS <sub>2</sub>	237.00	1127.20	123.75	131.65	52.44 (46.39)	46.35 (42.89)
Bhutan Oval Shape	93.00	714.00	58.50	99.50	62.92 (52.72)	55.65 (48.41)
HC 28	174.75	885.10	91.50	97.12	52.21 (46.24)	41.30 (39.98)
Pusa Sadabahar	159.50	902.60	101.75	126.00	59.00 (50.30)	50.15 (45.11)
S. Em ±	41.98	56.31	28.47	36.73	3.242	3.85
C.D. at 5%	101.52	136.19	68.86	88.83	7.84	9.31

The figure in the parenthesis represent average angular transformed value.

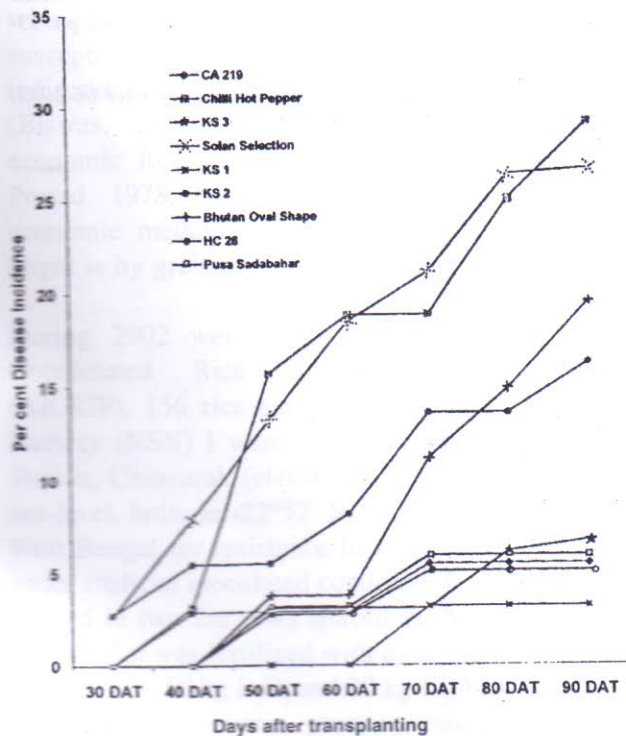


Fig. I : Gradual increase of chilli leaf curl virus disease incidence percentage on different cultivars with the increasing time.

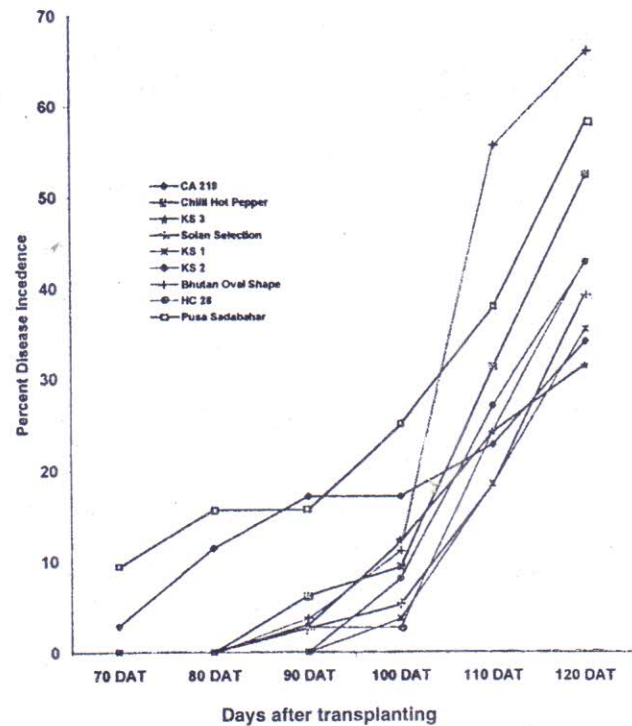


Fig. II : Gradual increase of die-back disease incidence percentage of different cultivars with increasing time.

(62.25/plot) which were statistically at par. Bhutan Oval Shape recorded maximum percent of infected fruits per plot on number basis (62.92%) followed by Pusa Sadabahar (59.0%) and minimum percentage of infected fruits per plot was observed in the cultivar KS<sub>1</sub> (33.41%) which was statistically at par with KS<sub>3</sub> (40.45%) and CA-219 (56.86%) (Table 2). Weight of infected fruits per plot was maximum in KS<sub>2</sub> (131.65g) followed by Pusa Sadabahar (126.0g) and Solan Selection (88.67g). Maximum percentage of infected fruits per plot on weight basis was recorded in the cultivars except KS<sub>3</sub> (32.88%) and KS<sub>1</sub> (32.85%) (Table 2).

To study the epidemic development of die back disease in Chilli in *kharif* season the disease intensity was recorded at onset time 30 days after transplanting to 15 days before harvest at 10 days interval. It was observed that the development of disease passed through a sigmoid curve with the function of time, even after the last days of observation the plateau was not reached (Fig 2). The cultivar CA 219 showed the initial appearance of disease at 70 DAT and increased at 80 DAT but at 90 and 100 DAT the disease intensity passed through a transitional phase and then increased slightly at 110 DAT and quite appreciably at 120 DAT. In case of Pusa Sadabahar the disease started at 70 DAT and gradually increased but at 80 DAT and 90 DAT there was also a transitional period and

after 100 to 120 DAT the increment was fast with the function of age of plants (Fig 2). The rest cultivars showed the disease at 90 DAT and within 120 DAT, the disease increased very fast. The low intensity of the disease was observed in the cultivar KS<sub>3</sub> followed by CA 219. So in case of ripe fruit rot disease the management practice can be adopted at 70 DAT. So considering the above two diseases it can be concluded that KS<sub>3</sub> and CA 219 are suitable for cultivation in humid tropical condition of West Bengal.

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