
Effect of weather parameters and different sowing times on the occurrence of Clusterbean Bacterial Blight

SUBHASH YADAV AND RANJAN NATH

Department of Plant Pathology, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur 313001, Rajasthan

Effect of different weather parameters viz., temperature, relative humidity, rainfall and sunshine hours and six different sowing dates with seven days interval on the occurrence of clusterbean (*Cyamopsis tetragonoloba* L. Taub.) bacterial blight caused by *Xanthomonas axonopodis* pv. *cyamopsidis* were studied on variety Pusa Navbahar during *khariif* 2001. The disease was favoured by temperature between 29-34°C, relative humidity above 68 per cent. Rainfall and sunshine hour were also found correlated with the disease development. Highest disease incidence (58.3%) was observed when the crop was sown in the last week of July. When sowing was delayed from 1st week to 3rd week of August reduction of disease incidence was 44.2 and 2.9 per cent. Highest seed yield was recorded when crop sown in 3rd week of July and yield was reduced as sowing dates were delayed from July to August month.

Key words : Clusterbean, Pusa Navbahar, Bacterial blight disease, weather parameters, sowing dates.

INTRODUCTION

Clusterbean bacterial blight disease is caused by *Xanthomonas axonopodis* pv. *cyamopsidis* Dye (Patel *et al.*, 1953). The disease has been first reported from Patna (Bihar) and Khopoli (Bombay) by Patel *et al.* (1953). Primary damage due to this disease is through seedling mortality. Secondary spread of the disease causes infection on above ground plant parts. The disease is characterized by small water soaked spot on the leaf periphery, which later on increase in size. These yellowish spots which initially appeared at leaf tips indicate that the pathogen probably enters through the hydathodes. The pathogen produces V-shaped necrotic lesions on the leaf margin, causes chlorosis, wilt and necrosis of the vascular system. In case of heavy infection it is reported to cause 58-68 per cent losses in grain yield (Srivastava and Rao, 1963; Gupta, 1978; Gandhi and Chand, 1985). Keeping in view the relevance of environmental conditions on the intensity and spread of plant disease the present investigation has been carried out to ascertain the

effect of weather parameters and know the effect of sowing dates on the development of bacterial blight disease of clusterbean.

MATERIALS AND METHODS

Effect of weather parameters

The study was conducted in the experimental field at Rajasthan College of Agriculture, Udaipur, Rajasthan, where clusterbean bacterial blight disease readily occurred under natural field condition. The trial was laid out in randomized block design with three replications and carried out during *khraif* season 2001. Clusterbean variety Pusa Navbahar was sown on two different sowing dates (July 15 and 22) at 7 day interval. The plot size was 3 × 2 m and spacing was 45 cm and 20 cm between row to row and plant to plant, respectively. To facilitate natural disease development the trial was undertaken without any plant protection measure, however, other usual agronomic management practices were followed.

Recording of observations

The observations (*viz.*, counting of number of diseased plants per plot) were recorded many times in each plot at 7 days interval. During each observation, the diseased plants in each plot were tagged to separate them from healthy one. Plot wise disease incidence was calculated as percentage of diseased plants over total plants.

Collection of weather data

Weather parameters, namely temperature, relative humidity, sunshine hours and rainfall were recorded at weekly interval during the crop growing period for both 15 and 22 July sowing date from the meteorological observatory of the Rajasthan College of Agriculture, Udaipur. Observatory is located adjacent to the experimental field. Correlation coefficients between disease incidence and weather parameters *viz.*, rainfall, temperature (max. and min.), relative humidity (max. and min.) and sunshine hours prevailing during the crop growing period were worked out.

Effect of different sowing dates

The trial was laid out in randomized block design with four replications and carried out during *kharif*

season 2001. Clusterbean variety Pusa Navbahar was sown on six different sowing dates *viz.*, July 15, 22, 29 and August 5, 12, 19 (2001) at 7 days interval.

RESULTS AND DISCUSSION

Effect of weather parameters on clusterbean bacterial blight disease incidence

The data in Table 1 showed the effect of temperature, relative humidity, rainfall and sunshine on clusterbean bacterial blight disease during *kharif* season.

Development of bacterial blight symptom and perusal of its growth curve indicated that the disease had three distinct stages i.e. establishment, progress and stabilization. The inoculum build up was primary in the initial stage when the bacterial blight got established but the progress of the disease during this period was gradual. This was followed by rapid progress of the disease helped by favourable conditions and after reaching optimum got almost stabilized.

Highly positive correlation was obtained for maximum temperature and negative correlation in minimum temperature with the disease

Table 1 : Effect of weather factors on the development of bacterial blight of clusterbean in field during July 2001 to Oct. 2001

Date of observation	Per cent disease index		Total rainfall (mm)	Sunshine (h)	Temperature (°C)		Relative humidity(%)	
	Sowing date 15 July	Sowing date 22 July			Max.	Min.	Max.	Min.
29 July, 2001	Trace	—	14.0	2.8	29.0	23.7	91	82
5 August, 2001	1.2	Trace	7.0	5.1	29.5	23.2	88	74
12 August, 2001	4.8	3.2	84.0	5.3	31.0	23.1	95	83
19 August, 2001	7.4	6.8	68.0	3.1	29.2	23.3	90	80
26 August, 2001	12.3	8.3	00.0	6.3	30.0	22.0	89	70
2 September, 2001	15.5	12.4	0.00	7.6	29.6	22.3	82	67
9 September, 2001	21.8	17.8	0.00	9.4	31.2	21.8	86	61
16 September, 2001	29.2	26.2	6.6	9.7	32.7	20.9	87	61
23 September, 2001	32.1	32.4	3.2	8.7	34.7	21.3	81	45
30 September, 2001	35.4	36.5	0.00	10.1	36.6	18.4	70	35
7 October, 2001	38.2	42.8	31.4	7.9	34.3	21.4	87	49
14 October, 2001	39.3	45.3	6.6	6.7	33.4	22.5	89	50
21 October, 2001	—	48.7	00.0	10.0	33.8	15.3	78	27
Correlation coefficient (r) with PDI								
Sowing date 15 July			0.3661	0.7642*	0.8797**	0.7157**	0.5349	0.9221**
Sowing date 22 July			0.3909	0.6604*	0.8441**	0.6777*	0.5274	0.9106**

* Significant at 5%

** Significant at 1%

development for both sowing dates. Negative correlation was obtained for maximum and minimum humidity (highly significant correlation). Sunshine hours was found to be positively correlated with the rapid progress of the disease. In the available range of total rainfall, only change in rainfall did not affect the disease progress, when relative humidity ranged between 70-79 per cent and sunshine period 5 to 10 h. It was observed that disease development gained momentum when the maximum temperature ranged from 31-34°C and minimum temperature below 22°C. It was clear from these observations that the best conditions for rapid progress of the disease were temperature between 30-34°C, sunshine 6-10 h, humidity above 81-95 per cent and rainy days, (Singh and Swarup, 1984; Jain, 1982; Singh, 1987). However, temperature upto 34-35°C on higher side and 20-22°C on lower side, were found to limit the disease development.

Effect of sowing dates on occurrence of clusterbean bacterial blight disease

The data on the effect of sowing dates on the incidence of clusterbean bacterial blight disease is presented in Table 2.

Table 2 : Effect of different sowing dates on bacterial blight development in clusterbean under natural field conditions

Date of sowing	Per cent disease index (PDI)	Seed yield (q/ha)
15 July 2001	39.3	8.35
22 July 2001	48.7	7.75
29 July 2001	58.3	6.90
5 August 2001	44.2	6.80
12 August 2001	18.7	7.40
19 August 2001	2.9	7.50
SEm ±	1.34	1.0677
C.D. 5%	4.04	3.2185
C.D. 1%	5.59	4.4495
C.V.	7.59	10.81

The results in Table 2 revealed that the per cent disease incidence became low with the late sowing. Thus, sowing on 19 August, 2001 resulted least disease incidence (2.9%) as compared to other dates. Sowing on 29 July, 2001 resulted highest disease development (58.3%), followed by sowing on 22nd July, 2001 (48.7%) and 5th August, 2001 (44.2%). Though, sowing in 3rd week of July (15 July) showed high disease incidence but gave significantly high yield in comparison to other dates of sowing.

REFERENCES

- Gandhi, S. K. and Chand, J. N. 1985. Yield losses in guar due to bacterial blight caused by *Xanthomonas campestris* pv. *cyamopsidis*. *Indian Phytopath.*, **38** : 516-519.
- Gupta, V. P. 1978. *Investigation on bacterial blight of cowpea caused by Xanthomonas vignicola* Burk. with special reference to seed transmission and control. M.Sc. Thesis, University of Udaipur, Udaipur.
- Jain, J. P. 1982. *Epidemiology and pathogenesis of bacterial blight of guar caused by Xanthomonas campestris* pv. *cyamopsidis*. Ph.D. Thesis, University of Udaipur, Udaipur.
- Patel, M. K.; Dhande, G. W. and Kulkarni, Y. S. 1953. Bacterial leaf spot of *Cyamopsis tetragonoloba* (L.) Taub. *Curr. Sci.* **22** : 183.
- Singh, J. and Swarup, J. 1984. Quantitative estimation of amino acids in clusterbean leaves infected with *Xanthomonas campestris* pv. *cyamopsidis*. *Indian J. Mycol. Pl. Pathol.*, **14** : 80-81.
- Singh, R. B. 1987. *Survival, epidemiology, pathogenesis and control of bacterial pustule of soybean*. Ph.D. Thesis Rajasthan Agril. University.
- Srivastava, D. N. and Rao, Y. P. 1963. A bacterial leaf spot disease of Guar [*Cyamopsis tetragonoloba* (L.) Taub.]. *Indian Phytopath.*, **16** : 69-73.

(Accepted for publication May 18 2006)