

## Status of Red stripe disease of sugarcane in Punjab, India

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Red stripe disease caused by *Acidovorax avenae* sub sp. *avenae* is one of the oldest and important bacterial disease of sugarcane. In Punjab it has been quite severe on the variety CoJ 85 during the past few years. To know the status of this disease on new recommended varieties of sugarcane a survey was conducted in the four districts of Punjab viz. Gurdaspur, Amritsar, Jalandhar and Ludhiana in the month of June- August 2011 and 2012. On the average of three months, it was found that the maximum prevalence of Red stripe was 31.7.0% and 32.0% in Amritsar district on variety CoJ 85 in 2011 and 2012, respectively. Maximum disease incidence of 3.5% and severity 39.0% was observed on variety CoJ-85 in the month of July 2011 and 3.3% and 42.1% in 2012 respectively. However, least disease incidence and severity was recorded on variety CoJ 88. It was concluded that an early variety CoJ 85 was more susceptible to the Red stripe disease than other varieties in Punjab.

**Key words:** Sugarcane, Red stripe, bacteria, Punjab, *Acidovorax avenae* subsp. *avenae*

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### INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is one of the most important cash crops of the world and is of great agro-economic importance. In India, It is being cultivated throughout the country except in certain hilly tracts in Kashmir and Himachal Pradesh. The main cane growing states are Uttar Pradesh, Uttaranchal, Bihar, Punjab and Haryana. Uttar Pradesh is the leading state in growing sugarcane in India but average yield per hectare is highest in Tamil Nadu, Maharashtra and Karnataka. India has an area of 5.0 million hectare under sugarcane cultivation with total production of 338.963

million tones (Anonymous, 2013). In Punjab it is cultivated in about 83 thousand hectare of land with an average cane production of 4.890 million tones (Anonymous, 2013).

Sugarcane production is constrained by diseases of fungal, bacterial and viral origin. Of these the Red stripe caused by *Acidovorax avenae* sub sp. *avenae* is one of the oldest and important bacterial disease of sugarcane and possess a constant threat to the successful cultivation of sugarcane varieties in the state. The disease occurs in two forms i.e., Leaf stripe and Top rot, which may occur singly or together under field condition

having relatively high atmospheric humidity.

In India Red stripe was first reported by McRae and Desai in 1933 (McRae and Desai, 1933). Since then, severe infections have been noted on varieties like Co 419 in Maharashtra (Albuquerque and Arakeri, 1956; Bhide *et al.*, 1956; Summanwar and Bhide, 1962) Co 449, Co527 and Fiji B in Tamil Nadu (Rangaswami, 1960 a,b) and Co 312 in Delhi and eastern districts of Punjab (Chona and Rao, 1963). An epidemic of Red stripe has been reported on Co 312 in Delhi and eastern Punjab during May-June, 1963 which was shown to cause by *Pseudomonas rubrilineans* to which other outbreaks of Red stripe in India have been attributed (Chona and Rao, 1963). Since the disease has not received any attention in our country and no work on disease incidence and severity on different varieties is available in India. Keeping this in view a survey was conducted for years in major sugarcane growing districts of Punjab.

## MATERIALS AND METHODS

### *Prevalence and severity of Red stripe disease in Punjab*

Surveys were conducted for recording the prevalence and disease severity of Red stripe disease in sugarcane crop in the district of Amritsar, Jalandhar, Ludhiana and Gurdaspur of Punjab state in the month of June, July and August during 2011 and 2012. From each selected field, incidence of Red stripe was recorded amongst 300 randomly selected plants. In total, 221 fields during 2011 and 240 fields during 2012 were surveyed from four districts representing different agro-climatic regions of the state. The plant with long narrow chlorotic streaks usually midway in the leaf and near the midrib was considered as red stripe affected plant. The disease intensity was calculated as:

Disease Intensity (Per cent) =  $\frac{\text{Sum of all numerical grades} \times 100}{\text{Total No. of leaves observed} \times \text{Maximum grade}}$

\*Grades: 1 = 1-5%, 2 = 6-20%, 3 = 21-50%, 4 = 51-70%, 5 = >71%

## RESULTS AND DISCUSSION

The data obtained on prevalence of Red stripe disease (Table 1a) revealed the maximum prevalence of 58% and 59% in Amritsar district on variety CoJ 85 in August 2011 and 2012, respectively followed by 41% and 43% in Gurdaspur district on the same variety. Of all the varieties surveyed maximum disease prevalence was on variety CoJ 85 with 21.2% and 21.5% in 2011 and 2012 with least disease prevalence on variety CoJ 88 with 1.6% and 1.8% (Table 1b). The highest disease incidence (3.5% and 4.3%) was recorded on variety CoJ 85 during the month of July in both the years followed by Co 89003 (2.4% and 2.7%, respectively) and least (1.4%) on variety CoJ 88 (Table 2). Also the disease severity was found maximum (39.0% and 42.1%) on variety CoJ 85 in the month of August in both the years and least (5.0%) on CoJ 88. The overall Red stripe incidence (2.0-2.5%) and severity (17.3-18.0%) was maximum in the month of July and minimum incidence (0.6-1.0%) and severity (1.6-107%) incidence (0.6-1.0%) and severity (1.6-107%). It was found that during 2011 and 2012 in Punjab relative humidity (RH) remained below 70% in the month of June and maximum more than 90% in the month of August. These factors are most congenial for the development of Red stripe disease. Similar results on the appearance of the Red stripe phase in the month of July to August were also reported by Ahmed *et al.* (1993). They reported that the temperature and humidity prevailing during July to August were favourable for Red stripe phase of disease while the temperature below 32°C in the month of October-November did not favour the development of disease. Based on the studies carried out, it was found that the highly recommended varieties CoJ 85 variety was more susceptible to Red Stripe disease as compared to other recommended varieties in Punjab State. Therefore it can be concluded that with the change in climatic condition the disease is increasing rapidly making vulnerable to the recommended varieties. Therefore proper management practices should be adopted so that the disease can be managed without affecting the economy of the farmers.

**Table 1a** : Prevalence of red stripe disease in different districts of Punjab

Location / District	Variety	No. of field Surveyed						Prevalence of disease (%)					
		2011		2012		2011				2012			
		2011	2012	June	July	August	Average	June	July	August	Average		
Curdaspur	CoJ 85	17	20	24	41	12	25.7	22	43	15	26.6		
	CoJ 88	13	12	0	0	0	0.0	0	0	0	0.0		
	Co 89003	13	11	0	0	0	0.0	0	7	0	2.3		
	CoS 8436	08	11	0	13	0	4.3	0	11	0	3.6		
	CoH 119	14	09	7	14	0	7.0	9	14	0	7.6		
Amritsar	CoJ 85	19	22	26	58	11	31.7	24	59	13	32.0		
	CoJ 88	07	08	0	0	0	0.0	0	0	0	0.0		
	Co 89003	10	12	0	20	0	6.7	0	18	0	6.0		
	CoS 8436	10	15	0	20	0	6.7	0	19	0	6.3		
	CoH 119	06	07	0	17	0	5.7	0	19	0	6.3		
Ludhiana	CoJ 85	15	18	7	20	0	9.0	8	21	0	9.6		
	CoJ 88	05	07	0	0	0	0.0	0	0	0	0.0		
	Co 89003	13	12	0	8	0	2.7	0	6	0	3.0		
	CoS 8436	12	15	8	24	0	10.7	6	22	0	9.3		
	CoH 119	04	02	0	0	0	0.0	0	9	0	3.0		
Jalandhar	CoJ 85	20	25	10	35	10	18.3	9	36	8	17.7		
	CoJ 88	10	12	0	20	0	6.6	0	22	0	7.3		
	Co 89003	14	10	0	14	0	4.7	0	15	0	5.0		
	CoJ 88	10	12	0	20	0	6.6	0	22	0	7.3		
	Co 89003	14	10	0	14	0	4.7	0	15	0	5.0		
	CoS 8436	06	10	0	17	0	5.7	0	16	0	5.3		
	CoH 119	05	02	0	20	0	6.7	0	18	0	6.0		
Overall average				4.1	17.05	1.65	7.61	3.85	16.85	1.55	7.46		

**Table 1b** : Prevalence of red stripe disease in different varieties cultivated in Punjab

Variety	Prevalence of disease (%)									
	2011					2012				
	Gurdaspur	Amritsar	Ludhiana	Jalandhar	Average	Gurdaspur	Amritsar	Ludhiana	Jalandhar	Average
CoJ 85	25.7	31.7	9.0	18.3	21.2	26.6	32.0	9.6	17.7	21.5
CoJ 88	0.0	0.0	0.0	6.6	1.6	0.0	0.0	0.0	7.3	1.8
Co 89003	0.0	6.7	2.7	4.7	3.5	2.3	6.0	3.0	5.0	4.1
CoS 8436	4.3	6.7	10.7	5.7	6.9	3.6	6.3	9.3	5.3	6.1
CoH 119	7.0	5.7	0.0	6.7	4.9	7.6	6.3	3.0	6.0	5.0

**Table 2** : Incidence and severity of red stripe disease on different sugarcane varieties in Punjab

Variety	No. of fields surveyed	Disease incidence (%)									Disease severity (%)					
		2011					2012				2011			2012		
		2011	2012	June	July	August	June	July	August	June	July	August	June	July	August	
CoJ 85	71	85	2.2	3.5	1.9	3.3	4.3	1.6	16.8	39.0	8.2	17.2	42.1	8.6		
CoJ 88	35	39	0.0	1.0	0.0	0.0	1.4	0.0	0.0	5.0	0.0	0.0	4.8	0.0		
Co 89003	50	45	0.0	2.4	0.0	1.0	2.7	1.3	0.0	11.0	0.0	0.0	11.4	0.0		
CoS 8436	36	51	1.4	1.7	1.0	2.1	2.2	1.2	2.0	19.0	0.0	1.8	18.6	0.0		
CoH 119	29	20	1.2	1.4	0.0	1.4	1.9	1.0	1.8	12.8	0.0	2.2	13.3	0.0		
Overall average			1.0	2.0	0.6	1.7	2.5	1.0	4.1	17.3	1.6	4.2	18.0	1.7		

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