

Influence of weather conditions on the incidence of ergot of bajra in Gujarat — A preliminary study

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सार — बाजरा के गदाक रोग के लगने के पूर्व मौसम की दशाओं की प्रवृत्ति का परीक्षण किया गया है। भारी वर्षा के साथ-साथ अपराह्न में आर्पेक्षिक आर्द्रता का 80 प्रतिशत होना और उसके बाद मौसम का साफ हो जाना रोग की वृद्धि और उसकी पूर्ण वृद्धि के लिए अनुकूल होता है।

ABSTRACT. The meteorological conditions predisposing for an outbreak of the 'Ergot disease of bajra' are examined. Heavy precipitation with afternoon relative humidity about 80 per cent followed by a clearing of weather favours the initiation and full expression of the disease.

1. Introduction

Outbreak of Ergot disease of bajra of varied intensities was reported during the kharif season of 1977 from many parts of Gujarat. The disease was initially confined to south India. However, epidemic outbreaks of the disease in many parts of the country was reported during the kharif season of 1967 (Ramaswamy 1968). This appears to be due to the extensive cultivation of high yielding hybrid varieties of bajra (Singh 1973).

Ergot disease is caused by the fungus *claviceps microcephala* (waller) Tul. A high relative humidity of over 75 per cent is required for extrusion of Ascospores (Butler and Jones 1949). The conidia retain their viability upto 13 months (Singh 1973). Thus, the fungus can survive from year to a year through the agency of conidia. Cool, humid weather favours infection (Singh 1973). Meso and macro-scale weather phenomena (Ramaswamy 1978) and wind (Butler and Jones 1949) have role in disseminating the disease. An attempt has, therefore, been made in the present

paper to examine the predisposing weather conditions for the incidence and full expression of the disease from weather data.

2. Material and method

Plant pathological data, *i.e.*, the date of appearance of the disease, peak periods of infection and intensity of attack, at Ahmedabad, Dohad, Junagadh, Surat and Bhuj, supplied by Directorate of Agriculture, Ahmedabad, was tabulated (Table 1). The weeks mentioned in the paper (Table 1) are "Standard weeks" starting from 1 January. Daily records of maximum and minimum temperatures, afternoon relative humidity (R. H.) and rainfall were taken from the respective India Met. Dep. and Agromet observatories in the State. Mean daily values of humidity and temperature and rainfall amounts for (i) the weeks preceding disease expression and (ii) the weeks of appearance and peak infestation of the disease were tabulated along with normal weekly rainfall (Table 1). Peak infection indicates that adequate inoculum was always present. Therefore, a multiple regression analysis of the disease with environmental parameters like daily

TABLE 1

Disease and weather features during incidence of ergot on kharif bajra in Gujarat in 1977

Month (1977)	Std. week No.	Weekly			Disease incidence percentage of attack	Month (1977)	Std. week No.	Weekly			Disease incidence percentage of attack
		Rain-fall (mm)	Mean temp. (°C)	R.H. (%)				Rain-fall (mm)	Mean temp. (°C)	R.H. (%)	
Ahmedabad						Surat					
(Date of sowing : 17 June 1977)						(Date of sowing : 10 July 1977)					
Jul	31	29.0 (63.9)	28.3	81	No disease	Sep	36	133.6 (73.7)	27.0	86	No disease
Aug	32	181.1 (48.5)	27.0	79	Appearance of the disease	"	37	8.4 (35.2)	27.5	73	Appearance of the disease
"	33	11.1 (39.5)	28.0	71	—	"	38	18.2 (21.8)	27.5	72	60-80% attack
"	34	00.1 (39.9)	28.9	53	100% attack	Junagadh					
Panchmahals (Dohad)						(Date of sowing : 24 July 1977)					
(Date of sowing : 10 July 1977)						Sep	36	103.0 (30.2)	26.5	80	No disease
Sep	36	93.0 (47.2)	25.0	71	No disease	"	37	68.1 (22.3)	27.0	66	Appearance of the disease
"	37	70.0 (43.4)	25.0	74	Appearance of the disease	"	38	15.3 (21.6)	27.3	60	—
"	38	2.0 (30.4)	24.5	62	80% attack	"	39	00.8 (14.5)	29.0	44	30% attack
Bhuj						(Date of sowing : 21 July 1977)					
Sep	38	1.0 (6.9)	28.0	51	No disease	"	39	0.0 (2.9)	28.0	58	Appearance of the disease
"	39	0.0 (3.8)	29.0	53	Normal 2-3%	"	40	0.0 (3.8)	29.0	53	Normal 2-3%

NOTE : Figures in bracket indicate normal rainfall in mm

values of afternoon relative humidity, maximum temperature and rainfall for a period of 7 days preceding of the day on which the incidence of Ergot was observed was also carried out.

3. Discussion

It is seen from Table 1 that the disease actually appeared at all the five locations between 54 & 67 days after the crop was sown. The time elapsing between first appearance of the disease and realisation of peak infection was reached very quickly. However, this period as well as the peak intensity varied between stations. Therefore, a location-wise examination was carried out.

3.1. Ahmedabad

The crop was sown on 17 June 1977. First appearance of the disease was noticed on 10 August 1977 (week No. 32, 6-12 August), i.e., 55 days after sowing. There was no disease expression till week No. 31 (30 May to 5 August) when the actual rainfall was only 29 mm against the normal of 64 mm. There was heavy rainfall during week No. 32 (6-12 August), i.e., 181 mm against the normal of 49 mm. The afternoon relative humidity during the above two weeks was high. The date of maximum attack of the disease is given as 26 August 1979 (34-week, 20-26 August) and the intensity of the maximum attack was 100 per cent. During the weeks 33 and 34 (13-26 August) the rainfall was only 11.1 mm and 0.1 mm respectively

against a normal of about 40 mm. The afternoon RH also dropped down to 53 per cent and the mean temperature increased to 29 deg. C by week No. 34 (20-26 August).

3.2. Panchmahals (Dohad)

The crop was sown on 10 July 1977. There was no disease in week No. 36 (3-9 September) when rainfall was 93 mm against an average of 47 mm and the afternoon RH was 71 per cent. Appearance of the disease was noticed during 37th week (10-16 September), *i.e.*, 62 days after sowing when the rainfall was 70 mm against the normal rainfall of 43 mm. Afternoon RH was 74 per cent. The maximum attack of the disease was noticed on 18 Sep 1977 (38 week, 17-23 September) and the disease intensity was 80 per cent. In 38th week (17-23 September) the actual rainfall was only 2.0 mm against the normal of 30 mm and the afternoon RH dropped down to 62 per cent.

3.3. Surat

The crop was sown on 10 July 1977. There was no disease during the 36th week (3-9 September) when the rainfall was 134 mm against an average of 74 mm and afternoon RH was 86 per cent. The disease was noticed on 10 September 1977 (37th week), *i.e.*, 62 days after sowing, when rainfall was only 8 mm against the normal of 35 mm and the afternoon RH was 73 per cent. The peak period of the disease with an intensity of 60-80 per cent was reached on 20 September 1977 (38th week, 17-23 September) when the weekly rainfall was 18 mm against an average of 21 mm and afternoon RH was 62 per cent.

3.4. Junagadh

The crop was sown on 24 July 1977 and the disease appeared after 54 days of sowing. In the week No. 36 (3-9 September) preceding the first appearance of the disease, there was heavy rainfall of 103 mm against the normal of 30 mm with afternoon RH of 80 per cent. In week No. 37 (10-16 September) when the disease was first noticed, there was rainfall of 68 mm against

an average of 22 mm and the afternoon RH was 66 per cent. The maximum attack of the disease was only 30 per cent. In the week preceding peak incidence rainfall was 15 mm against a normal of 22 mm and afternoon RH was 60 per cent. During peak incidence the weather was dry and afternoon RH was 44 per cent.

3.5. Bhuj

The disease incidence was reported to be low. Though the disease appeared in week No. 39 (24-30 September) there was no increase in intensity in the subsequent weeks. During the week Nos. 38-40 (17 September to 7 October) the weather was dry, the afternoon RH was between 51 and 58 per cent and the weekly mean temperature was 28 deg. C to 29 deg. C.

The regression analysis showed that in the week preceding peak incidence rainfall has no statistical significance. However, maximum temperature of the 4th day preceding the maximum intensity was negative but significantly correlated (at 5 per cent level) indicating that rise in maximum temperature (30-33 deg. C) is detrimental to intensification of the disease.

4. Conclusion

The studies thus reveal that if there was one to two weeks of heavy and markedly above normal precipitation with afternoon RH of about 80 per cent during the flowering period of the crop, Ergot disease of bajra would be in the take off stage and that if this stage was followed by a clearing of weather with afternoon relative humidity of 70 per cent and maximum temperature less than 30 deg. C, there would be considerable damage.

The conclusion drawn are based on just one year's data. They are therefore very tentative and need further confirmation.

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