Correlation Study of Weather and Growth Parameters in Banana

C D Badgujar

Banana Research Station,
Mahatma Phule Krishi Vidyapeeth, Jalgaon – 425 001 (Maharashtra)

ABSTRACT

Weather is an uncontrolled and important factor, the effect of which on banana is difficult to quantify under the field experiments. Phenological studies of the banana crop based on the meteorological data of last 30 years (1980 - 2009) was subjected for the correlation analysis and evaluated. The study indicated that the rainfall, relative humidity had positive correlation with the bunch weight but negative correlation with temperature. Significantly negative correlation of bunch weight was recorded with wind velocity, evaporation and sunshine hours.

Key Words: Cavendish banana ,Rainfall, Temperature, Relative humidity, Wind velocity, Evaporation, Sunshine hours, Correlation.

INTRODUCTION

Globally, banana ranked fourth most important crop after rice, wheat and corn. It is grown in more than 130 countries across the world in an area of 8.25Mha. producing 97.38 MT of banana and plantains. India is largest producer of banana in the world, contributing nearly about 25 per cent to the world production of banana with total production of 27.0 MT from an area of 0.77 million ha. Banana is a crop of tropics and subtropics requiring hot and humid climate. The most suitable climate for banana growth is one with warm moist weather throughout the year without strong winds. Bhattacharyya and Madhava Rao (1965) reported effect of climatic factors on growth of Robusta banana.

Favorable factors for banana production are rainfall in excess of 100 mm per month and the temperature range of 10 to 40° C (Sommonds 1966). Both internal and external factors influence growth and production of the banana. The internal factors are genetically related characters of the variety while the external factors include climate, soil, pest and diseases. (Borges *et al* 2000).Weather is an important production factor in agriculture. Unfortunately, this production factor can hardly be controlled. In fact, weather risks are source of uncertainty in agriculture. The effects of weather can either lead to increase metabolism and disease and pests incidence in field environment.

The relationship between weather parameters and plant growth, durational and yield attributes in field crops as well as plantation crops have been reported by many research workers however, such type of information is limited in banana and plantain. For sustainability in banana production, response to changing climatic conditions is an important factor for consideration. Hence, this work was carried out to find out the correlation in between weather parameters and plant growth and yield attributes over a period of thirty years (1980-2009) at Banana Research Station, Jalgaon.

MATERIALS AND METHODS

Thirty years (1980-2009) data of annual averages of weather parameters (rainfall, temperature, relative humidity, wind velocity, evaporation, and sunshine hours) was collected from the Oil Seeds Research Station, Jalgaon. The growth, duration and yield attributes data (plant height, plant girth, number of leaves, number of hands, number of fingers, days to flower, days to harvest, finger length, finger girth and bunch weight) of respective years was also collected from old records of Banana Research Station ,Jalgaon. The simple correlation

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*Corresponding Author's Email : badgujarcd@gmail.com

has been worked out and tested its significance as per methods suggested by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Rainfall

The correlation coefficients of the weather parameters with the plant parameters are depicted in Table 1. The average annual rainfall of this area is 735 mm and the average rain fall of 30 years was recorded as764.1 mm. It was found that all the plant attributes were non- significantly correlated. Only two attributes *viz*. days for flowering and harvesting were negatively correlated whereas rest of attributes recorded positive correlation with rainfall. Rain fall recorded positive but week correlation with bunch weight. Similar results were reported by Pillai *et al* (1996).

Temperature

The average maximum temperature of 30 years was 34.7 ^{0}C. Out of 10 attributes studied, five attributes exhibited negative correlation with maximum temperature whereas rest of the attributes correlated positively. The days for flowering and harvesting recorded significantly positive correlation with maximum temperature. Bunch weight recorded very week and negative correlation with maximum temperature. All plant growth attributes were recorded non- significant correlation with minimum temperature. Out of 10 attributes, pseudo stem height and girth, number of fingers per bunch, finger length and girth and bunch weight recorded negative correlation, however rest were positively correlated. These results were in agreement with the findings of Pillai *et al* (1996) and Kothawade *et al* (1985).

Relative humidity

The average humidity of 30 years at morning and evening was 88.11 and 40.6 per cent, respectively. All the plant attributes except number of leaves, days to flower and days to harvest recorded a negative correlation with morning relative humidity and for rest of the attributes it was positive. The days to flowering and harvesting exhibited the significant negative correlation with morning humidity. Relative humidity at evening

Table 1. Correlation coefficient of climatic parameters with banana.

Banana Attributes	Annual rainfall (mm)	Temperature (^{0}C)		Relative Humidity (per cent)		Wind Velocity (km/hr)	Pan Evapora-tion (mm)	Sun-shine Hours
		Max	**Min**	**Morn.**	**Even**			
Plant height (cm)	0.10	(-) 0.08	(-)0.17	0.16	0.45*	0.50**	(-)0.51**	(-)0.34
Plant girth (cm)	0.32	0.06	(-)0.03	0.28	0.35	(-)0.40*	(-)0.42*	(-)0.24
No. of leaves/ plant	0.01	0.10	0.24	(-)0.20	(-)0.20	0.61**	0.53**	0.25
No. of hands/bunch	0.27	(-)0.22	0.04	0.18	(-)0.01	(-)0.40*	(-)0.45*	(-)0.21
No. of fingers/ bunch	0.26	(-)0.29	(-)0.13	0.27	(-)0.20	0.47**	(-)0.57**	(-)0.22
Days to flower	(-)0.15	0.38*	0.28	0.47**	0.48**	0.61**	0.58**	0.54**
Days to harvest	(-) 0.20	0.40*	0.18	0.53**	0.46*	0.70**	0.67**	0.48**
Finger length (cm)	0.08	0.07	(-)0.22	0.09	0.64**	0.54**	(-)0.41*	(-)0.35
Finger girth (cm)	0.15	(-)0.06	(-)0.33	0.23	1.41*	0.64**	(-)0.60**	(-)0.46*
Bunch weight (Kg)	0.13	-0.01	(-)0.26	0.29	0.47**	0.63**	(-)0.56**	-0.37*

*, ** significant at 5% and 1% respectively

have recorded significant positive impact on plant height, finger length, finger girth and bunch weight however, it was negative with the days to flowering and days to harvest. Similar results were recorded by Pillai *et al* (1996) and Kothawade *et al* (1985) and Turner (1971).

Wind velocity

The average wind velocity of 30 years was 14.10 km/h. All the attributes of banana showed significant correlation with wind velocity. Of these, number of leaves, days to flower and harvest recorded significant positive correlation whereas rest of attributes were correlated negatively. These results were in agreement with Pillai *et al* (1996), Kothawade *et al* (1985) and Sommonds (1966).

Evaporation

The average evaporation of thirty years was 10.6 mm. All the growth and yield parameters of banana have been significantly influenced by evaporation. The number of leaves, days for flowering, and harvesting were recording positive correlation; however it was negative for the rest of the attributes. Similar results were reported by Pillai *et al* (1996).

Sunshine hours

Sunshine hours were also recorded significant positive impact on days for flowering and harvesting however, it was significantly negative for finger girth and bunch weight. Bunch weight and finger girth was negatively correlated with sunshine hours.

CONCLUSION

Weather is most important production parameter in banana cultivation. In the present study the relationship between weather parameters and growth, durational and yield attributes was established by using the weather data for the last 30 years. It was found that majority the attributes were non significantly correlated with the rainfall and temperature, however, relative humidity, wind velocity, evaporation and sunshine hours were found to affect all the attributes of banana production significantly. Out of 10 attributes, half of the attributes exhibit correlation with temperature, whereas rest of attributes show positive correlations. Relative humidity recorded significant positive impact on all attributes but durational factors were found to be shown negative correlation with relative humidity. All the attributes show significant positive correlation with wind velocity except plant girth and number of hands per bunch, evaporation was found to impact most of attributes negatively, except the durational attributes. Sunshine had negative impact on most of attributes of banana production except the durational factors.

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Received on 08/09/2015   Accepted on 23/03/2016