



Effect of Weather Parameters on The Performance of Bt. Cotton Grown Under Different Sowing Windows

M Ratnam and S Rajamani

Integrated Agro Advisory Service, Regional Agricultural Research Station, Lam Farm, Guntur-522 034

ABSTRACT

A field experiment was conducted on clay soils of AMFU, Regional Agricultural Research Station, Lam, Guntur during *kharif* 2010-11 & 2011-12 to assess the influence of weather parameters on the performance of Bt. cotton under Krishna agro-climatic conditions of Andhra Pradesh. Highest rainfall (534.4 mm) has received by the crop sown on 2nd FN of July and lowest (69.3 mm) received by crop sown on 1st FN of October. The results indicated that the average plant height, no. of monopodia, no. of sympodia, number of bolls/plant, ten boll weight, dry matter accumulation and kapas yield was highest in crop sown on 2nd FN of July and was lowest in crop sown on 1st FN of October. Positive and significant correlation among yield-yield components and agro meteorological parameters. Mean maximum and minimum temperature and RH₂ had positive correlation on yield and yield parameters except no. of monopodia per plant stage was observed, whereas sunshine hours, GDD and HTU increased with delay in sowings which showed negative correlation.

Key words : AMFU, Bt. Cotton, GDD=Growing degree days, HTU, Weather parameters.

Cotton is an important commercial crop and widely traded commodity across the world. Its yield is sensitive to weather, soil as well as management practices and predominantly grown under dry land farming. Uncertainty in rainfall and other weather parameters in dry land farming cause large year to year fluctuations in yield. The unreliability and delay in the rainfall is posing serious problems in cotton production and productivity. Proper sowing windows are needed to boost up the cotton production under delayed conditions. In the present investigation efforts were made to assess yield and performance of Bt cotton hybrid in relation to climate under delayed sowings. Response of Bt. cotton to different sowing windows indicated that yield reduction to an extent of 18.8 and 54.9 per cent was noticed when sowing was delayed from June to August, respectively (Hallikeri, S. S. and Halemani, 2008 and Hallikeri, S. S. *et al.*, 2009).

In Andhra Pradesh, cotton crop cultivated under dry and irrigated farming system. Due to late arrival of monsoon and late release of canal water, late sowings are inevitable under these situations. Therefore, the performance of Bt. cotton hybrid under such late sown conditions need to be assessed. Hence, the present study was conducted to study the effect of weather parameters on Bt

cotton hybrid under different sowing windows are necessary where frequent monsoon and weather vagaries are to appeared.

MATERIAL AND METHODS

Field experiment was conducted in 10th block of Regional Agricultural Research Station, Lam Farm located at Guntur (Latitude: 16°18', Longitude: 80°29', Altitude: 33 m.a.m.s.l) verticals. The climate is sub-tropical with mean annual rainfall of 950 mm. The soils of experimental field was clay loam in texture, neutral to slightly alkaline in reaction (pH 7.8 to 8.2). The experiment was conducted for two successive *kharif* 2010-11 & 2011-12 in Krishna agro-climatic zone of Andhra Pradesh. The experiment consisting of six dates of sowings viz., 2nd FN of July, 1st FN of August, 2nd FN of August, 1st FN of September, 2nd FN of September, 1st FN of October and 2nd FN of October. All treatments are randomly allocated in three replications and adopted split plot design. The most dominant Bt. NCS-145 (bunny) of the region was used in both the years. Daily weather data from AMFU, RARS, Lam was collected for the study. The agrometeorological indices such as growing degree days (GDD) and heliothermal units (HTU) which are the derived parameters of temperature,

Table 1. Agro-climatic environment of Bt. Cotton under different sowing windows at AMFU, RARS, Lam.

Sowing window	Total rainfall (mm)	Mean T max (°C)	Mean T min (°C)	SSH (h/d)	RH ₁	RH ₂	GDD	HTU
2 nd FN of July	534.4	32.9	23.2	5.3	74.2	53.2	17.6	93.0
1 st FN of August	398.4	33.9	24.2	5.6	76.8	56.5	18.6	103.9
2 nd FN of August	477.3	32.4	22.5	5.9	82.3	58.8	16.9	100.0
1 st of FN of Sept.	74.4	32.4	21.9	6.5	79.6	53.6	16.7	108.2
2 nd FN of Sept.	91.4	33.8	23.0	6.9	77.8	52.8	17.9	123.5
1 st FN of Oct.	69.3	32.8	20.7	7.3	82.8	54.2	16.3	118.6
2 nd FN of Oct.	36.6	32.2	20.5	7.1	83.0	52.2	15.9	112.5

Table 2. Effect of dates of sowing on growth, yield and yield parameter of Bt. cotton.

Sowing window	Plant height (cm)	No. of monopodia/ plant	No. of sympodia / plant	No. of bolls/plant	10 boll weight (g)	Dry matter (g/m ²)	Yield (kg/ha)
2 nd FN of July	93.7	2.0	19	51	44	783.3	2510
1 st FN of August	91.3	1.3	21	44	39	783.3	1820
2 nd FN of August	80.3	1.1	18	31	34	583.3	1450
1 st of FN of Sept.	78.3	1.4	16	29	22	583.3	600
2 nd FN of Sept.	76.3	1.8	14	10	25	333.3	130
1 st FN of Oct.	48.3	1.0	9	3	10	200.0	16
2 nd FN of Oct.	48.3	1.0	9	3	10	200.0	16

Table 3 Correlation coefficient (r²) between growth, yield and yield attributes and agro meteorological parameters of Bt. cotton.

Yield & yield parameters	Total rainfall (mm)	Mean Max T(°C)	Mean Min T(°C)	SSH(h/d)	RH ₁ (%)	RH ₂ (%)	GDD	HTU
Seed cotton yield (kg/ha)	0.95	0.01	0.66	-0.98	-0.98	0.31	-0.41	-0.58
Dry matter accumulation (g/m ²)	0.90	0.06	0.75	-0.96	-0.96	0.28	-0.38	-0.56
10 boll weigh (g)	0.88	0.22	0.86	-0.96	-0.96	0.28	-0.33	-0.50
No of bolls/ plant	0.87	0.12	0.77	-0.95	-0.95	0.35	-0.37	-0.55
No of monopodia/plant	0.10	-0.11	0.14	-0.14	-0.14	-0.64	-0.39	-0.41
No of sympodia/plant	0.76	0.20	0.82	-0.86	-0.86	0.19	-0.35	-0.51
Plant height (cm)	0.65	0.05	0.68	-0.72	-0.72	0.05	-0.25	-0.40

sunshine hours have been estimated following method of Nuttonson (1955). Base temperature considered for this study was 15.6°C. Sowing wise mean values of maximum and minimum temperatures, sunshine hours (SSH), relative humidity (RH₁ & RH₂) morning & evening, rainfall, GDD and HTU was calculated and correlated with lint yield and yield parameters. GDD and HTU were calculated by using relevant formulae.

$$\text{GDD} = \frac{\text{Tmax} + \text{Tmin} - \text{T base}}{2}$$

$$\text{HTU} = \text{GDD} \times \text{SSH}$$

RESULTS AND DISCUSSION

Agro-climatic environment

The important average weather parameters and derived Agro-climatic indices prevailing during crop growth have been shown in Table.1. The highest amount of 534.4 mm rainfall was received during crop growth period of D1 (1st sowing window i.e., 2nd FN July), out of which seedling phase received 45.2 mm, vegetative phase received 176.2 mm square formation received 205.8 mm, peak flowering 71.8 mm and boll development received 35.4 mm than other dates of sowing and lowest was received in last date of sowing i.e., 1st FN of October and 2nd FN October.

Growth, yield, yield components and crop weather relationship

Variation in sowing windows of Bt cotton under Krishna agroclimatic zone greatly affected the plant height, number of monopodia and sympodia, number of bolls/plant, boll weight, dry matter production and yield. The crop sown on 2nd FN of July resulted in maximum plant height, number of monopodia and sympodia, number of bolls/plant, boll weight, dry matter production and yield followed by 1st FN of August sowing. Correlation coefficient between yield and yield parameters and agrometeorological parameters were calculated and these parameters showed statically significant correlation (Table 2&3). The response of Bt. Cotton to different sowing windows indicate that yield reduction to the extent of 27.5 to 99.4 per cent when sowing was delayed from

August to October and these results akin to Suresh S. Hallikeri and Halemani. H.L, 2008)

Rainfall, mean maximum and minimum temperature and RH₂ has significant positive correlation on yield and yield parameters except monopodial stage but sunshine hours, GDD and HTU increased with delay in sowings and has shown negative correlation (Table 3)

CONCLUSION

Agrometeorological parameters viz., rainfall, mean maximum and minimum temperature, relative humidity, growing degree days and heliothermal units greatly influenced on plant height, no. of monopodia and sympodia, no. of bolls per plant, ten boll weight, dry matter production and yield. Correlation coefficient between yield, yield components and meteorological indices has showed statistically significant correlation. Rainfall, temperature (max. & min.), RH₂ has significantly positive correlation and sunshine hours, GDD and HU has negative correlation on yield and yield components of Bt. cotton. It is thus concluded that higher yield of Bt. Cotton can be achieved, if he crop is sown by 2nd FN of July by capturing favourable effects of all weather parameters in the Krishna Agro Climatic zone of Andhra Pradesh.

LITERATURE CITED

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