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Production Potential of Hybrid Cotton Under Varied Weather Condition

Buddhewar N.P., Sathe R.K.*and Khobragade A.M.
Department of Agricultural Meteorology, College of Agriculture, Parbhani
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani - 431 402, India
*Email: rajivsathe510@gmail.com

ABSTRACT

The present investigation entitled "Production potentional of hybrid cotton under varied weather condition" was carried out at Research Farm, Department of Agricultural Meteorology, Marathwada Agricultural University Parbhani (M.S.) during Kharif season 2010-11. The experiment was laid out in split plot design with three replication and four factors viz. date of sowing (22/06/10-D_1), (29/06/10-D_2), (06/07/10-D_3), (13/07/10-D_4), (20/07/10-D_5) and (27/07/10-D_6), variety (NHH-44-V_1, NHH-44 Bt-V_2, NH-615-V_3) spacing (90 x 60 cm) and plant protection (Recommended spraying schedule P_1) and no plant protection i.e. (control) P_0. To find suitable variety of hybrid cotton. Among various growth characters of these cotton variety, plant height was found to be greatly influenced under different date of sowing. Maximum plant height was observed in D_1 (MW-25) and minimum height was recorded in D_6 (MW-30). It was observed that the duration from sowing to emergence (P_1), emergence to seedling (P_2), seedling to square formation (P_3), square formation to flowering (P_4), flowering to boll setting (P_5), boll setting to boll bursting (P_6) and bursting to first picking (P_7) stages varied considerably in different dates of sowing first date of sowing had more duration from sowing to maturity as compared to delayed sowing. This shortening of duration was due to thermal stress at later sowing dates. Emergence count was highest in $D_1V_1P_1$ (MW-25) treatment combination as compared to rest of the treatments. Leaf area index and dry matter accumulation plant^{-1} (g) was recorded maximum 30 DAS to 120 DAS with maximum value at 120 DAS in case of early sown crop as compared to later sown crop. Highest seed yield of cotton and biological yield (kg/ha) was found in D_1 (MW 25) treatment of sowing date. The interaction effect of different treatments on seed yield and biological yield of cotton was found statistically significant. The most critical growth stages deciding the seed yield of cotton the seed yield of cotton are square formation to flowering, flowering to boll setting and boll setting to boll bursting. From the highest canopy temperature were observed in D_1 at MW 50. If the canopy temperature is greater than there is soil moisture deficit in the field. Further highest mean canopy temperature were observed in D_6 (32.8^{0}C) date of sowing and lowest found in D_1 (31.8^{0}C). In cotton varieties highest albedo (0.060) was observed in V_1 (NHH44) under D_1 with P_1 treatment followed by 0.059 in D_2 date of sowing. V_3 (NH-615) and lowest albedo was observed in D_6 date of sowing in variety V_2 (NHH-44 Bt). It is concluded that for getting the better yield optimum date of sowing is D_1 (MW-25) as compared to rest of the sowing date treatment.

Keyword: hybrid cotton, sowing dates, varieties, meteorological weeks, weather conditions.

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INTRODUCTION

Cotton (*Gossypium* spp.) is one of the important cash crop of India, which is a sub-tropical crop grown in India in an area with rainfall of 600 to 900 mm. It tolerate high temperature upto 45 to 46^{0}C but temperature below 25^{0}C are not conductive to this crop, temperature between 27 to 32^{0}C are optimum for boll development and maturation but above 38^{0}C yield are reduced. The length of growing period (LGP) from 150 to 240 days depending upon the genotypes soil and prevailing environment. Cotton needs about 700 to 1300 mm water to meets its evapotranspiration demand. Cotton grown on wide range of soil but medium and heavy textured soil are preferred for cultivation of cotton crop. Climate and weather is a basic input in agriculture. The growth development and yield of the crop depend on suitability of the solar radiation, temperature and rainfall etc. [2]. Among the various factors responsible for low yield, the loss caused by weather and climatic condition is a major constraint. In cotton 60 per cent of the yield losses is due to weather as compared to 30 per cent of the other crops like cereals, oilseeds and pulses. This huge loss in cotton is because of the factors that climate influences not only the growth, development and

reproductive activities of the crops, but also itinfluence the prevalence of pest diseases and nutrient availability throughout the cropping season.

MATERIAL AND METHODS

The present research work on "Crop weather relationship in hybrid cotton" was conducted during *kharif* season of 2010-2011. The field experiment was conducted during *kharif* 2010-2011 on experimental farm of Department of Agriculture Meteorology, College of Agriculture, Parbhani. Geographically Parbhani is situated 409 m above the mean sea level, $19^0$16' North latitude and $76^0$47' East longitude and has sub-tropical climate. The weather data for the relevant period of experiment recorded at Central Meteorological Observatory, Marathwada Krishi Vidyapeeth, Parbhani. The field was ploughed in summer season twice with the help of tractor drawn cultivator, followed by 2-3 criss-cross harrowing was done to break the colds and make the field in the good tillth condition. After layout, the sowing was done with the help of manual labour by dibbling method of sowing. The seeds of cotton cultivar namely NHH-44, NHH-44 *Bt* and NH-615 were dibbled with row to row and plant to plant spacing (90 x 60 cm) during 06 different meteorological weeks MW_{25}(22-06-2010), MW_{26}(29-06-2010), MW_{27}(06-07-2010), MW_{28}(13-07-2010), MW_{29} (20-07-2010) and MW_{30}(27-07-2010). Fertilizer were applied to the crop as per the recommendations. The crop received 80 kg N, 40 kg P and 40 kg K per hectare. The field of experiment was laid out in split plot design with three replication and 36 treatment combinations of which six are different dates of sowing (06), varieties (03) and plant protection schedule (02). (6 x 3 x 2) these 36 treatments were randomly distributed in blocks in each replication. The biometric observations were recorded by adopting the schedule that isEmergence count, Plant height (cm), Number of branches plant^{-1}, Dry matter plant^{-1} (g), Seed yield of cotton (kg ha^{-1}),Harvest index, Leaf area index (LAI), Meteorological observation like Canopy temperature, Albedo etc.

RESULTS AND DISUCSSION

The data presented in Table 5 revealed that mean plant height of cotton crop was increased continuously from sowing to harvest of the crop. Increase in plant height was slow upto 30 DAS. While, it was significant observed for different intervals of days after sowing. Similar results were also reported by Abdus Salam *et al.*, [1]. The number of branches plant^{-1} was increased continuously upto 150 DAS of the crop is presented in Table 6 and depicted in Fig. 4.The early sown crop has higher growth rate and branching pattern due to availability of longer sunshine duration, soil moisture, temperature and humidity for its vegetative growth. These results are similar to the findings of Rao and Basu [4]. However, in late sown crop the vegetative growth was restricted due to shorter period of sunshine, soil moisture, low temperature and high humidity. The data revealed that the LAI increased remarkably from sowing to 90 DAS. Thereafter the increase in LAI was very meager and reached to maximum at 120 DAS. Thereafter, there was a decrease in leaf area from 120 to 150 DAS. The increase in the LAI in different dates of sowing treatment upto 90 days indicated that the photosynthets synthesized during this period (vegetative growth stage) were allocated to leaf and stem and once the reproductive stage attains.Simillar results were obtained from Khippal *et al* [3]. The photosynthets might have been allocated towards reproductive organs i.e. bolls. However, maximum dry matter accumulation observed in D_1 (25 MW) i.e. 131.05 Kg/ha at 150 DAS and it is decreased in delayed sown crop i.e. D_2 (26 MW) to D_6 (30 MW). The biomass production is mainly governed by genetic potential of the variety under different set of weather parameter. But the extent of decrease in biomass under delayed sowing was due to thermal stress tolerance capacity of a variety to higher temperature, low temperature under late sowing, delayed germination and hampered branching and consequently leads to poor dry matter production than timely sown crop. The data presented in Table 11 revealed that the sowing time produced significantly different seed yield of cotton in individual treatment. Similar results were found by Namdeo(1991) where revealed that sowing of cotton during 25 MW i.e. (D_1) was found significantly superior that 8-10th and 25-28th July sowings. Late sowing by 30 days (26-28th July) reduced the seed yield of cotton with a margin of 5.38 q/ha in comparison to 23rd to 25th June sowing. The highest seed yield of cotton was observed at harvest for D_1 25th MW (1191 kg ha^{-1}) and found significantly superior followed by D_2 to D_5 and lowest was observed in $D_6$30th MW (729 kg ha^{-1}) due to delay sowing. In respect of crop variety, V_1 (NHH-44) produced significantly highest seed yield of cotton (1108 kg/ha) followed by V_3 (NH-615) 878 kg/ha and lowest seed yield of cotton produced V_2 i.e. (NHH-44 *Bt*) 717 kg/ha.

Table 1: Growth and growth contributing characters influenced by different treatments.

Treatments	Plant height (cm)	No. of branches	Leaf area(cm)	Dry matter (g)
Date of sowing				
D_1 : 25MW (22-06-2010)	58.34	7.09	1.362	74.56
D_2 : 26MW (29-06-2010)	50.00	6.21	1.309	73.52
D_3 : 27MW (06-07-2010)	49.73	6.44	1.195	72.46
D_4 : 28MW (13-07-2010)	47.44	5.41	1.051	70.95
D_5 : 29MW (20-07-2010)	48.68	5.91	0.894	69.38
D_6 : 30MW (27-07-2010)	38.09	5.35	0.787	67.57
S.E. ±	2.80	0.13	-	-
C.D. at 5%	7.4	0.42	-	-
G. Mean	48.75	6.09	-	71.41
Variety				
V_1 (NHH-44)	49.55	6.27	1.267	71.47
V_2 (NHH-44 *Bt*)	47.87	6.13	1.054	71.52
V_3 (NH-615)	48.86	5.88	0.891	71.23
S.E. ±	0.85	0.21	-	-
C.D. at 5%	2.50	0.63	-	-
G. Mean	48.76	6.09	-	71.41
Plant protection				
P_1	53.61	7.00	1.316	71.69
P_0	43.91	5.18	0.713	71.12
S.E. ±	0.85	0.45	1.075	-
C.D. at 5%	2.50	1.31	-	-
G. Mean	48.75	6.09	-	71.41

Table 2 : Seed, stalk, biological yield and harvest index of cotton as influenced by different treatments

Treatment	Seed cotton yield (kg ha^{-1})	Stalk yield (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest index
Date of sowing				
D_1 : 25MW (22-06-2010)	1191	2242	3433	34.69
D_2 : 26MW (29-06-2010)	995	1681	2676	37.18
D_3 : 27MW (06-07-2010)	856	1551	2407	35.56
D_4 : 28MW (13-07-2010)	836	1300	2136	39.13
D_5 : 29MW (20-07-2010)	798	1342	2140	37.28
D_6 : 30MW (27-07-2010)	729	1046	1775	41.07
S.E. ±	10.60	12.97	23.57	-
C.D. at 5%	33.35	40.81	74.16	-
G. Mean	901	1527	2428	36.61
Variety				
V_1 (NHH-44)	1108	1905	3013	36.77
V_2 (NHH-44 *Bt*)	717	1254	1971	36.37
V_3 (NH-615)	878	1452	2330	37.68
S.E. ±	9.50	9.60	-	-
C.D. at 5%	27.76	28.74	-	-
G. Mean	901	1527	2428	36.61
Plant protection				
P_1	1112	1662	2774	40.08
P_0	690	1392	2082	33.14
S.E. ±	4.50	4.70	9.20	-
C.D. at 5%	12.58	13.25	25.83	-
G. Mean	901	1527	2428	36.61

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