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# Response of summer irrigated cotton (*Gossypium hirsutum*) to sowing of dates and nutrient-management practices

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## ABSTRACT

A field experiment was carried out at Cotton Research Station, Srivilliputtur, during summer season of 1998 and 1999, to evaluate the response of upland cotton (*Gossypium hirsutum* L.) to delayed sowing and nutrient-management practices. Sowing on 15 February resulted in the highest seed-cotton yield, followed by sowing on 1 March. Among the nutrient-management practices, application of 60, 40 and 40 kg N, $P_2O_5$ and $K_2O$/ha in combination with azospirillum, phosphobacterium and 2 times foliar spray of DAP @ 2% at peak-flowering stage and boll-development stage recorded the highest mean seed-cotton yield.

***Key words :*** Cotton, Date of sowing, Nutrient management

In Tamil Nadu, cotton is cultivated in about 0.25 million/ha mostly in Toothukudi, Tirunelveli, Virudhunagar, Madurai, Coimbatore, Salem and South Arcot districts as summer irrigated, winter irrigated and rice fallow crops. The best time of sowing for summer irrigated cotton in Tamil Nadu is 15 February. In most cases, farmers could not take up sowing in time due to delayed harvest of winter rice and delayed onset of monsoon rains. Hence the present investigation was carried out to study the response of cotton to delayed sowing and management practices to increase the productivity under such conditions.

## MATERIALS AND METHODS

A field experiment was carried out with upland cotton at Cotton Research Station, Srivilliputtur, Tamil Nadu, during summer seasons of 1998 and 1999. The soil of the experimental field was sandy clay loam, medium in available nitrogen (264.5 kg/ha) and phosphorus (13.2 kg/ha) and high in available potassium (164.3 kg/ha) with pH 8.2. The experiment was laid out in split-plot design with 5 dates of sowing ($D_1$, 15 February; $D_2$, 1March; $D_3$, 15 March; $D_4$, 1 April; and $D_5$, 15 April) in main plot and 6 management practices ($M_1$, 60, 30, 30 kg N, P and K/ha; $M_2$, 45, 30 and 30 kg N, P

and K/ha + phosphobacterium + azospirillum + DAP spray @ 2% at peak-squaring stage and peak-flowering stage; $M_3$, 45, 30 and 30 kg N, P and K/ha + phosphobacterium + azospirillum + DAP spray @ at 2% peak-flowering stage and boll-development stage; $M_4$, 80, 40 and 40 kg N, P and K/ha; $M_5$, 60, 40 and 40 kg N, P and K/ha + phosphobacterium + azospirillum + DAP spray @ 2% at peak-squaring stage and peak-flowering stage and $M_6$, 60, 40 and 40 kg N, P and K/ha + phosphobacterium + azospirillum + DAP spray @ 2% peak-flowering stage and boll-development stage) in subplot with 2 replications. The test variety was 'SVPR 2'. A uniform dose of 12.5 tonnes farm yard manure was applied to all the plots. Need-based plant-protection measures were carried out and the crop was harvested at maturity. Observations on growth, yield attributes and seed-cotton yield were recorded and analysed statistically adopting the procedure of Gomez and Gomez (1984).

## RESULTS AND DISCUSSION

### *Summer 1998*

*Growth characters :* Maximum plant height was recorded when the crop was sown on 15 February and was comparable with sowing on 1 March and was significantly superior to the rest of the sowing (Table 1). There was no response to the nutrient-management practices. The number of monopodia/plant was highest in 15 February sowing and was significantly superior to the rest of the sowing dates. The management practices tried did not influence the monopodia. The number of sympodial branches was maximum with sowing on 15 February and was comparable with 1 March sowing. Sowing on 15 March recorded the least number of sympodial branches. The management practices did not influence the sympodial branches.

*Yield attributes and yield :* Early sowing on 15 February registered the highest number of bolls/plant and was comparable with sowing on 1 March. There was a decline in the number of bolls due to delayed sowing. Again there was slight improvement in the number of bolls/plant owing to sowing on 15 April. Other factors studied did not influence the number of bolls/plant. The mean boll weight (g/boll) in 15 February sowing was significantly higher than the rest of the treatments, the lowest being in case of 15 March after which there was an increasing trend later on.

The highest seed-cotton yield was recorded in 15 February sowing and was significantly superior to the rest of the sowing dates with the highest benefit : cost ratio. This was followed by sowing on 1 March. With further delay in sowing, seed-cotton yield was significantly reduced to 59.9%, 56.4% and 42.6% in 15 March, 1 April and 15 April sowing, respectively, as compared with the 15 February sowing. The management practices did not influence seed-cotton yield. Application of 60, 40 and 40 kg N, $P_2O_5$ and $K_2O$/ha + phosphobacterium + azospirillum + DAP spray @ 2% at peak-squaring and peak-flowering stages recorded the maximum seed-cotton yield of 966 kg/ha with the highest.

**Table 1.** Effect of date of sowing and nutrient-management practices on the growth, yield attributes and yield of cotton

| Treatment | Plant height (cm) | | Monopodia (No./plant) | | Sympodia (No./plant) | | Bolls (No./plant) | | Boll weight (g) | | Yield (kg/ha) | | Benefit : cost ratio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 1998 | 1999 | 1998 | 1999 | 1998 | 1999 | 1998 | 1999 | 1998 | 1999 | 1998 | 1999 |
| $D_1$ | 86.9 | 84.3 | 1.60 | 1.62 | 15.5 | 15.86 | 20.3 | 14.8 | 3.65 | 3.33 | 1,368 | 965 | 2.74 | 2.43 |
| $D_2$ | 84.5 | 82.0 | 1.49 | 1.65 | 15.3 | 16.07 | 16.7 | 13.3 | 3.23 | 2.99 | 1,212 | 865 | 2.43 | 2.46 |
| $D_3$ | 79.4 | 77.0 | 1.48 | 1.63 | 9.8 | 15.25 | 10.5 | 14.1 | 2.97 | 3.16 | 548 | 917 | 1.10 | 2.33 |
| $D_4$ | 81.8 | 79.3 | 1.48 | 1.55 | 12.3 | 13.11 | 11.8 | 14.8 | 3.01 | 3.31 | 597 | 960 | 1.20 | 2.00 |
| $D_5$ | 80.9 | 78.5 | 1.49 | 1.43 | 14.5 | 10.57 | 15.2 | 13.6 | 3.21 | 3.01 | 785 | 886 | 1.57 | 1.60 |
| CD (P = 0.05) | 3.1 | 3.0 | 0.31 | 0.21 | 3.3 | 0.31 | 3.7 | 0.27 | 0.29 | 0.23 | 111 | 50 | NA | NA |
| $M_1$ | 84.7 | 82.2 | 1.49 | 1.59 | 13.3 | 14.03 | 15.0 | 14.6 | 3.14 | 3.27 | 913 | 947 | 1.83 | 2.15 |
| $M_2$ | 83.8 | 81.3 | 1.48 | 1.55 | 13.4 | 14.05 | 14.7 | 13.5 | 3.07 | 3.03 | 858 | 878 | 1.73 | 2.16 |
| $M_3$ | 85.1 | 82.5 | 1.49 | 1.49 | 13.3 | 13.96 | 15.2 | 15.2 | 3.13 | 3.41 | 861 | 990 | 1.74 | 2.13 |
| $M_4$ | 84.1 | 81.6 | 1.51 | 1.60 | 13.4 | 14.65 | 15.0 | 13.8 | 3.17 | 3.09 | 885 | 897 | 1.77 | 2.18 |
| $M_5$ | 79.8 | 77.4 | 1.48 | 1.57 | 14.1 | 14.40 | 15.1 | 13.8 | 3.48 | 3.11 | 966 | 902 | 1.93 | 2.20 |
| $M_6$ | 80.4 | 78.0 | 1.60 | 1.47 | 13.5 | 14.20 | 14.5 | 13.7 | 3.39 | 3.08 | 928 | 897 | 1.89 | 2.16 |
| CD (P = 0.05) | NS | 2.5 | NS | NS | NS | 0.35 | NS | 0.35 | NS | NS | NS | 55 | NA | NA |

Details of treatments are given under text
NS, Non significant; NA, not analysed

### *Summer 1999*

*Growth characters :* Significantly taller plants were observed in 15 February sowing and 1 March sowing, respectively, compared with the later sowings. The role of high temperature after squaring in increasing the plant height was highlighted by Hesketh and Low (1968). In this experiment, when sowing was carried out during 15 February to 1 March, the squaring occurred in April while high temperature was recorded and this might be the reason for the increased plant height under these sowing dates. Among the nutrient-management practices, application of 45, 30 and 30 kg N, $P_2O_5$ and $K_2O$/ha in combination with azospirillum, phosphobacterium and 2 rounds of 2% DAP at peak-flowering stage and boll-development stage ($M_3$) recorded the tallest plant and was comparable with $M_4$ (80, 40 and 40 kg N, $P_2O_5$ and $K_2O$/ha), $M_1$ and $M_2$.

The mean number of monopodia was highest under $D_2$ (1.65) and was comparable with $D_1$, $D_3$ and $D_4$ and the least being recorded under $D_5$. Nutrient-management practices did not influence the number of monopodia/plant.

### *Yield attributes and yield*

The mean number of sympodial branches was the highest under $D_2$ (1 March sowing) and was at par with $D_1$ and $D_3$ (15.25). Significant reduction in the number of sympodia/plant was recorded in the last 2 sowings ($D_4$ and $D_5$). The mean number of sympodial branches was the highest with the application of 80, 40 and 40 kg N, P and K/ha ($M_4$) and was on a par with the application of 60, 40 and 40 kg N, $P_2O_5$ and $K_2O$/ha + biofertilizers + DAP 2% spray at peak-squaring stage (and PFS ($M_5$).

Significantly higher number of bolls/plant was recorded under $D_1$ (15 February sowing) and $D_4$ (1 April sowing) compared with the rest of the sowing dates. Among the management practices, application of 45, 30 and 30 kg N, $P_2O_5$ and $K_2O$/ha in combination with bio-fertilizers and 2 rounds of 2% DAP at PFS and BDS recorded the highest number bolls/plant. This was followed by the application of 60, 30 and 30 kg N, $P_2O_5$ and $K_2O$/ha ($M_1$).

The mean boll weight (g) was highest under $D_1$ (15 February sowing) and was comparable with $D_4$ (1 April sowing) and $D_3$ (15 March sowing). The least being recorded in $D_5$ (15 April sowing). The mean boll weight was not influenced by the management practices.

Sowing on 15 February ($D_1$) registered the highest seed-cotton yield and was comparable with $D_4$ (1 April) and $D_3$ (15 March). Lowest seed-cotton yield was recorded with the sowing on 1 March ($D_2$). Among the nutrient-management practices, application of 45, 30 and 30 kg N, $P_2O_5$ and $K_2O$/ha in combination with azospirillum, phosphobacterium and DAP 2% twice at PFS and BDS ($M_3$) recorded the highest seed-cotton yield and was at par with the application of 60, 30 and 30 kg N, $P_2O_5$ and $K_2O$/ha ($M_1$). Lowest seed-cotton yield was recorded in $M_2$. Prasad and Prasad (1994) also reported increased number of bolls/plant, boll weight and seed-cotton yield owing to application of bio-fertilizers in cotton.

Observation on the mean maximum tem-

perature for both the years revealed that in the 1998, a temperature of 40°C was recorded during April and May continuously for more than 7–9 days. Under such conditions later sowings coincided with flowering during this period ultimately results in the contabascent anthers which failed to dehisce thereby reducing boll setting and yield.

### *Economics*

The highest average net returns of Rs 12,550/ha was realized when sowing was taken up on 15 February, followed by 1 March sowing. There was not much variations in the average net returns among the nutrient-management practices. The highest net returns of Rs 12,775/ha was realized with the application of 45, 30 and 30 kg N, $P_2O_5$ and $K_2O$/ha + phosphobacterium + azospirillum + DAP spray @ 2% at PFS and BDS, followed by the recommended dose of 60, 30 and 30 kg N, $P_2O_5$ and $K_2O$/ha ($M_1$).

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