# RESPONSE OF GROWTH, YIELD AND QUALITY OF DIFFERENT COTTON CULTIVARS TO SOWING DATES

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Effect of sowing dates and cultivars was significant on almost all yield and yield components. First sowing (May 20) produced 10% more flowers, 23% more open bolls, 18% more seed cotton yield and 13% more ginning out turn than second sowing (June 10). Maximum yield was produced by SLH-284 (1462.8 kg $ha^{-1}$) followed by NIAB-111 (1347.2 kg $ha^{-1}$), CIM-496 (1183.1 kg $ha^{-1}$) and CIM-506 (1177.1 kg $ha^{-1}$). Number of sympodial branches was significantly affected by different cultivars i.e. 17.9, 17.7, 20.9 and 23.8 in cultivars CIM-496, CIM-506, NIAB-111 and SLH-284 respectively. 100-cotton seed weight was maximum in treatment SLH-284 (8.25 g) while CIM-496, CIM-506 and NIAB-111 had 6.91 g, 6.60 g and 7.71 g respectively. Maximum ginning out turn was calculated in SLH-284 (34.02 %) followed by NIAB-111 (33.23 %), CIM-496 (32.07 %) and CIM-506 (31.22 %) respectively. Cotton should be sown up to May 20 to get good yield in Faisalabad region. In late sowing, yield and other components of yield decrease considerably. Among the four varieties studied, the best yield and yield components as well as radiations use efficiency of SLH-284 was the highest and this variety can perform best in Faisalabad region than other three varieties studied.

**Key words:** Cotton, sowing dates, growth, yield, quality and Pakistan

## INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is an important cash crop and a significant source of foreign exchange earning. It accounts for 10.5 percent of the value added in agriculture and about 2.4 percent to GDP. In addition to providing raw material to the local textile industry, the surplus lint cotton is exported. The area and production target for cotton crop during the current fiscal year were 3140 thousand hectares and 10720 thousand bales, respectively (Anonymous, 2004-05). The crop was however, sown on the area of 3221 thousand hectares 2.6 percent more than the target and 7.8 percent more than last year (2989 thousand hectares). The total production of cotton is estimated at 14.618 million bales for 2004-05, the highest ever recorded in the country's history, and up by 45.5 percent over the last year's production of 10.0 million bales giving an average seed cotton yield of 772 $kgha^{-1}$. Factors responsible for the unprecedented rise in cotton production include: a) 7.8 percent rise in area under the crop; higher boll bearings; use of improved quality of pesticide resulting in low pest pressures; and favourable weather condition for growth and development of the crop (Economic survey, 2004-05). The cotton crop also meets the edible oil requirements of the country. About 65% of the vegetable ghee is obtained form the cotton. During 2004-05 (July-March), local production of edible oil is provisionally estimated at 0.842 million tons which is higher by 13.8 percent than last year. A more than a bumper cotton crop and cultivation of sunflower on record area of 0.77 million acres have been responsible for higher production of edible oil. High yield of cotton is not realized previously due to many problems such as weed infestation, insect pest and disease problems, water shortage, excess salinity, low germination of seed, conventional sowing methods, poor soil management practices, pre-mature flower and boll shedding, too early or too late sowing and improper use of varieties in different agro-ecological zones. Proper sowing time plays pivotal role in yield potential; similarly, proper nitrogen dose is essential for optimum growth and yield. To examine the productivity of four cotton cultivars under two different sowing dates. To evaluate the differences in the yield and yield components of different cotton cultivars with different sowing dates.

## MATERIALS AND METHODS

The experiment was conducted during kharif 2005 at the Experimental area of PARS (Post-Graduate Agriculture Research Station) Department of Agronomy, University of Agriculture, Faisalabad. The soil was sandy loam. The experiment was laid out in split fashion having three replications with plot size 3 × 10 m with net plot size 1.5 × 6 m. The treatments were:
Sowing dates SD1=May20, 2005 and $SD_2$=June10, 2005.
Varieties $V_1$=CIM-496, $V_2$=CIM-506, $V_3$=NIAB-111, $V_4$=SLH-284
Crop was sown uniformly at 75 cm apart in rows using 25 kg $ha^{-1}$ seed rate with single row hand drill. Thinning was done leaving 30 cm plant-to-plant distance. All the other cultural practices such as hoeing, irrigation and plant protection measures were kept normal for the crop.

**Ginning out turn (GOT)**

Before ginning, seed cotton samples were dried in the sun. Dust and inert matter was removed from samples and these were weighed and ginned separately using single roller electric gin. The lint obtained from each sample was weighed and its percentage was calculated by applying following formula.

$$GOT\% = \frac{\text{Weight of lint}}{\text{Weight of seed cotton}} \times 100$$

**Statistical analysis**

All statistical analysis was performed according to design and treatments.
Data collected was statistically analyzed by using the Fisher's analysis of variance technique and least significance difference (LSD) test at 5% probability was employed to compare the significance of treatments means (Steel and Torrie, 1984).

**RESULTS AND DISCUSSIONS**

**Germination Count ($m^{-2}$)**

Significant differences in germination count per unit area among different varieties. The average plants per unit area were 4.83 in CIM-496, 4.66 in CIM-506, 5.83 in NIAB-111 and 7.16 in SLH-284 (Table 1). The variety SLH-284 at sowing date of 20 May gave the best germination while the same variety SLH-284 at the sowing date of June 10 was statistically at par with SLH-284 at May 20. The variety CIM-506 at sowing date of May 20 gave the lowest germination results and CIM-496 at June 10 sowing results was statistically at par with CIM-506 at May 20 sowing. The germination results of two sowing dates (May 20 and June 10) were non significant.

**Number of plants $plot^{-1}$**

The average numbers of plants plot-1 were 154.5, 156.7, 169.3 and 183.3 in CIM-496, CIM-506, NIAB-111 and SLH-284 respectively. The treatment V4 (SLH-284) produced maximum number of plants $plot^{-1}$ and is statistically significant from other treatments. While treatment V1 (CIM-496) produced minimum number of plants $plot^{-1}$ and it is also statistically at par with treatment V2 (CIM-506). The variety SLH-284 produced 18 % more plants in a plot than CIM-496 (183.3 vs 154.5). The first sowing date (May 20) produced more (15 % more) number of plants than sowing date second (June 10) (177.75 vs 154.16).

**Number of monopodial branches $plant^{-1}$**

Different sowing dates were non-significant while the variety SLH-284 gave the maximum number of monopodial branches and NIAB-111 had statistically at par with SLH-284. While the variety CIM-506 gave the minimum number of monopodial branches $plant^{-1}$ and CIM-496 had statistically at par with CIM-506. The average number of monopodial branches $plant^{-1}$ was 0.803 in CIM-496, 0.55 in CIM-506, 0.93 in NIAB-111 and 1.16 in SLH-284. Most studies suggest that this parameter is genetically controlled and thus external factors such as sowing date did not cause any significant effect on this parameter. These results are in line with those of Butter et al., (2004). He found that early sowing produced more monopodial branches than late sowing.

**Table 1. Effect of sowing dates on the yield and quality of cotton cultivars**

| Treatments | Germination Count ($m^{-2}$) | Plnats $plot^{-1}$ | Monopodial Branches | Sympodial Branches | Bolls $plnat^{-1}$ | 100-cottonseed weight | Seed cotton yield | GOT (%) | Harvest Index | TDM (kg $ha^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sowing dates** | | | | | | | | | | |
| SD1=May 20 | 5.66 NS | 177.75 a | 1.05 NS | 20.5 NS | 25.30 b | 7.51 NS | 1424.60 a | 34.71 a | 23.08 NS | 595.29 a |
| SD2=June 10 | 5.58 | 154.16 b | 0.67 | 19.7 | 27.83 a | 7.22 | 1160.40 b | 30.55 b | 21.91 | 510.59 b |
| LSD at 5% | 0.723 | 5.82 | 0.325 | 3.30 | 0.40 | 0.83 | 58.55 | 0.60 | 0.844 | 11.02 |
| **Cultivars** | | | | | | | | | | |
| CIM-496 | 4.83 c | 154.5 c | 0.803 bc | 17.9 c | 25.18 c | 6.91 c | 1183.10 c | 32.07 c | 21.56 c | 528.39 c |
| CIM-506 | 4.66 c | 156.7 c | 0.550 c | 17.7 c | 25.33 c | 6.60 c | 1177.10 c | 31.22 d | 21.56 c | 471.26 d |
| NIAB-111 | 5.83 b | 169.3 b | 0.930 ab | 20.9 b | 27.12 b | 7.71 b | 1347.20 b | 33.23 b | 23.11 b | 575.57 b |
| SLH-284 | 7.16 a | 183.3 a | 1.16 a | 23.8 a | 28.63 a | 8.25 a | 1462.80 a | 34.02 a | 23.75 a | 636.54 a |
| LSD at 5% | 0.812 | 8.24 | 0.323 | 1.16 | 0.44 | 0.37 | 35.57 | 0.67 | 0.546 | 7.27 |

Any two means not sharing a letter differ significantly at 5% and 1% probability level
NS = non-significant

**Number of sympodial branches plant$^{-1}$**

A greater number of sympodial branches plant$^{-1}$ is an indication of its potential for higher production of cotton. Non-significant differences among the sowing dates but among varieties SLH-284 gave the maximum number of sympodial branches while CIM-506 and CIM-496 were at par and lowest number of sympodial branches. The variety CIM-496 produced average number of branches 17.9, CIM-506 had 17.7, NIAB-111 had 20.9 and SLH-284 had 23.8 average number of sympodial branches plant$^{-1}$. These results were in accordance with El-Shahawy-MIM (1999) and Butter et al., (2004). They found that early sowing produced more sympodial branches than late sowing.

**Number of bolls plant$^{-1}$**

Average number of bolls plant$^{-1}$were 25.18 in CIM-496, 25.33 in CIM-506, 27.12 in NIAB-111 and 28.63 in SLH-284. The result also indicates that second sowing date June 10 produced more number of bolls plant$^{-1}$ than May 20 first sowing by 10 % (27.83 vs 25.3). Varieties SLH-284 at sowing date of June 10 gave the maximum number of bolls while CIM-506 sowing date of May 20 gave the minimum number of bolls. The variety SLH-284 at second sowing produced 27 % more bolls than CIM-506 at first sowing. The average numbers of total bolls plant-1 were 25.18, 25.33, 27.12 and 28.63 in CIM-496, CIM-506, NIAB-111 and SLH-284 respectively. These results were similar to those of Butter et al., (2004), Nirval BG. Et al (1995), Arain, et al (2001) Mohammad et al. (2003). They found that early sowing produced more number of bolls than late sowing.

**100-Cotton seed weight**

The average 100-cotton seed weight was 6.91 g, 6.60 g, 7.71 g and 8.25 g in CIM-496, CIM-506, NIAB-111 and SLH-284 respectively. The variety SLH-284 at first sowing produced maximum weight of 100-cotton seed and was statistically significant from all other varieties. While the variety CIM-496 at second sowing produced minimum weight of 100-cotton seed and was statistically at par with variety CIM-506 at second sowing. The variety SLH-284 at first sowing produced 31 % higher 100-cotton seed weight than variety CIM-496 at second sowing (8.7 vs 6.6). The two sowing dates gave the non-significant difference. These results were in accordance with those of Butter et al., (2004). He reported that early sown cultivars produced more seed weight than late sown.

**Seed cotton yield kg ha$^{-1}$**

The average seed cotton yield was 1183.1 in CIM-496, 1177.1 in CIM-506, 1347.2 in NIAB-111 and 1462.8 in SLH-284. The variety SLH-284 gave 23 % more yield than CIM-496, 24 % more yield than CIM-506 and 8 % more yield than the variety NIAB-111 (1462.8 vs 1183.1, 1177.1, 1347.2). The highest seed cotton yield was given by SLH-284 at sowing date of May 20. The minimum yield was given by CIM-496 at sowing date of June 10. The $D_1V_4$ combination gave 22 % more yield than $D_1V_1$, 21 % more yield than the $D_1V_2$, 8 % more yield than the $D_1V_3$, 56 % more yield than the $D_2V_1$, 46 % more yield than the $D_2V_2$, 36 % more yield than $D_2V_3$, 25 % more yield than the $D_2V_4$ (1630.2 vs 1326.9, 1344.9, 1496.7, 1039.3, 1109.3, 1197.8 and 1295.3). Seed cotton yield was also significantly correlated with number of bolls matured per unit area. These results were similar to Porter-PM et al., (1995), Shekara-BG et al., (1998), Srinivasan G. (2001) and Ali et al., (2004). They found that early sown cultivars produced gave more yield than late sown cultivars.

**Ginning Out Turn (%)**

The average GOT values were 32.07 % in CIM-496, 31.22 % in CIM-506, 33.23 % in NIAB-111 and 34.02 % in SLH-284. The variety SLH-284 at first sowing date (May 20) gave maximum GOT value and was statistically at par with NIAB-111 at first sowing date. While variety CIM-496 at second sowing date (June 10) gave minimum GOT value and was statistically at par with CIM-506 at second sowing date. The two sowing dates also showed significant results. First sowing date (May 20) gave 13 % more GOT value than second sowing date (June 10).

**Harvest index**

The harvest index of the variety SLH-284 was maximum among all varieties (23.75 %). The average harvest index was observed 21.56 %in CIM-496, 21.56 % in CIM-506, 23.11% in NIAB-111 and 23.75 % SLH-284. SLH-284 at first sowing date (May 20) gave maximum harvest index of 24.09 %.

**Total dry weight**

Data shows an increased trend in total dry weight from emergence to final harvest. Among the sowing dates, first sowing date produce 14 % more TDM than second sowing date (595.29 vs 510.59 g m$^{-2}$). Variety $V_4$ (SLH-284) produced maximum TDM (636.54 g m$^{-2}$) followed by $V_3$ (NIAB-111), which produced 575.57 g m$^{-2}$ dry weight. While $V_2$ (CIM-506) produced lowest TDM (471.26 g m$^{-2}$). El-Shahawy-MIM (1999) also reported that early sowing produced more dry weight than late sowing.

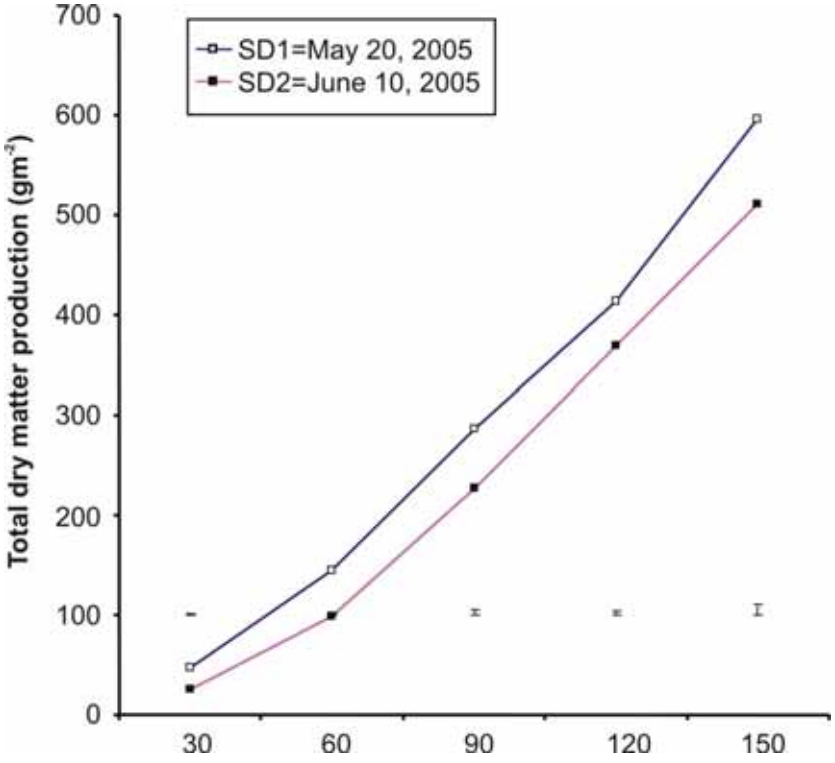


**Fig. 1. Effect of sowing dates on the total dry matter (TDM) production. Bars represent LSD at 5 %**

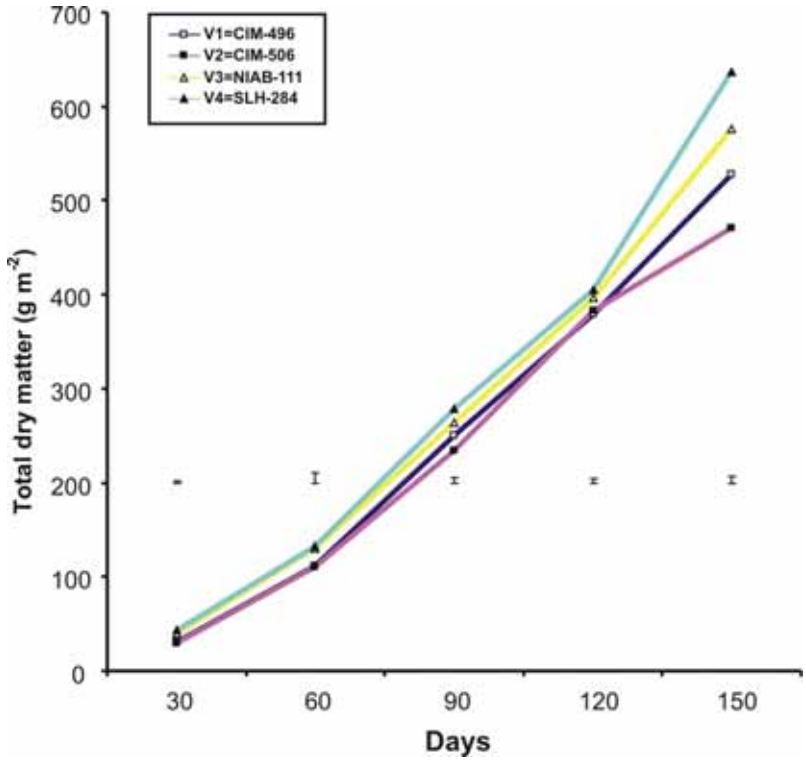


**Fig. 2. Effect of different varieties on the total dry matter (TDM) production. Bars represent LSD at 5 %**

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