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# Yield and some agronomic parameters of upland cotton as affected by planting dates

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**ABSTRACT** **Digital Object Identifier (DOI): https:/doi.org/10.33865/IJCRT.002.01.0357**

A field experiment was conducted at ICI Research Farm, Multan to evaluate the effect of different sowing dates on plant height, number of monopodia, number of sympodia, number of bolls per plant, boll weight, seed cotton yield kg/ha of two upland cotton varieties (ICI-2121 and ICI-2424) developed by ICI Pakistan Limited, Multan against a standard check variety IUB-2013 during 2019, and 2020 years. These varieties were planted on 1st April, 15th April, 1st May, 15th May, 1st June, and 15th June, at ICI Cotton Research Station, 19-Kasi Vehari Road, Multan. Results revealed that statistically highly significant differences in planting dates were observed for all the parameters studied except number of monopodial branches and boll weight which depicted non-significant differences. Regarding varieties and interaction between varieties and planting times, similar trend of statistical differences was observed. As regards to planting dates, generally, all the parameters under study showed their maximum performance when crop was planted on 1st May followed by 1st April planting date, whereas, minimum performance of the parameters was recorded when the crop was planted on 15th June followed by 1st June. Regarding varietal performance, on an average, maximum plant height (146cm) was observed in ICI-2121 followed by IUB-2013. Same trend of performance of varieties regarding number of monopodia and sympodia per plant was observed. Regarding average number of bolls per plant in different varieties, it was observed that ICI-2121 produced maximum (32 bolls) followed by ICI-2424 (31 bolls) and IUB-2013 (28 bolls) irrespective of planting dates. The same trend of varietal performance regarding boll weight was recorded. When seed cotton yield (kg/ha) was evaluated, on an average of varieties, ICI-2121 produced maximum seed cotton yield (1228 kg/ha) followed by ICI-2424 and IUB-2013 which produced 1147 and 1046 kg/ha seed cotton yield respectively irrespective of planting dates. It was concluded that under agro-climatic conditions of Multan, 1st May planting date was evaluated as optimum cotton sowing time. Before or after 1st May, this study does not recommend growing cotton in this particular zone. Among cotton varieties, ICI-2121 is recommended for sowing under this planting time being producing higher yields.

**Key word**: Cotton (*Gossypium hirsutum*) varieties, sowing dates, yield.

**INTRODUCTION:** Time of cotton planting definitely affects seed cotton yield as per studies conducted by the researchers around the globe. Among other factors which affect seed cotton yield could be the varieties, seed rate, plant geometry, maturity, temperature, water management, water logging, salinity and insect's pests etc. Sowing time plays an important role in obtaining maximum seed cotton yield in country like Pakistan where the climate conditions varied from province to province and within province. Yield of seed cotton can sufficiently be increased if cotton grower knows the optimum time for sowing in particular zone. Yield potential of any variety can only be realized if it is sown at its ideal time. Agronomic traits like plant height, number of monopodia, number of sympodia, number of bolls per plant, and boll weight may also come under effect of planting dates. Plant height primarily depends on planting date (Munk, 2001). Many researchers were of the view that early sown cotton produces taller plants. However, Nuti *et al.* (2006) concluded that plants grow faster and taller in late planting compared with early or normal planted cotton. The number of monopodia and sympodia is dependent on genotype and environmental fluctuations. Butter *et al.* (2004) observed that early sowing gave higher number of monopodial and sympodial branches per plant. Dong *et al.* (2006) also obtained higher number of sympodial branches per plant in early sown cotton crop. Number of bolls per plant or per unit area is one of the most important yield components of cotton. Previous researchers observed that higher number of bolls per plant was acquired through early sown cotton (Dong *et al.*, 2006) because plants produced fewer flower with delayed planting. On the contrary, Dong *et al.* (2006) recorded a greater number of bolls per unit area in late planting than normal planting.

When planting time of cotton was delayed, the boll weight recorded was less because seeds per boll decreased with delayed sowing while. However, Dong *et al.* (2006) found non-significant effect on boll weight by sowing date. Soomro *et al.* (2000) observed that cotton sown earlier or later than its optimum time showed a rapid yield decline. Gormus and Yucel (2002) revealed that early planting date gave 11.2% higher lint yield than late planting date. Iqbal *et al.* (2011) observed higher cotton yield with early planting in 3rd week of May compared to 2nd week of June. On the other hand, late planting results in delayed flowering that pushes boll development into cooler weather resulting in reduced yield (Akhtar *et al.*, 2002). Late planted cotton is usually associated with shorter fruiting period and delayed maturity that leads to reduced yield and impaired fiber quality. Soomro *et al.* (2000) found that even a delay of one week from optimum time resulted in marked decline in yield. Similarly, significant reduction in number of bolls per

plant and boll weight was recorded in late planting.

Soomro *et al.* (2000) observed that 15th May sown crop gave increased number of bolls per plant, boll weight and seed cotton yield per hectare, they further observed a remarkable decline in the yield of late sown crop. Arain *et al.* (2001) reported that early sown cotton (15th April to 15th May) gave significantly higher plant height, number of sympodial branches, number of bolls and seed cotton yield per hectare. Akhtar *et al.* (2002) reported the results of six cotton varieties under four sowing dates from 1st May to 15th June and opined that regardless of varieties, the best results were obtained when crop was planted on 16th May under Bahawalpur conditions. Muhammad *et al.* (2002) concluded that cotton sowing in the beginning of May gave significantly higher seed cotton yield than all other sowing dates. They further stated that 1st May sown crop's yield was 15% more than 1st June. On overall bases of all varieties, yield was reduced to 24% and 45% in 15th and 30th June respectively as compared to 1st May sowing dates. Early sowing of cotton gave better yield than late sown crop. Soomro *et al.* (2004) conducted studies on three cotton strains TH-4/90, TH-199/90 and TH-204/90 under four sowing dates (10th April, 25th April, 10th May to 25th May). The optimum sowing time for these strains was 25th April. The yields were decreased 14.25%, 38.27 % and 70.82% when crop was delayed or sown earlier irrespective of varieties.

**OBJECTIVES:** Keeping in view the findings from different researchers regarding sowing dates, the present study was undertaken to judge the optimum sowing time of two upland cotton varieties (ICI-2121 and ICI-2424) against a standard check variety (IUB-2013) under the climatic conditions of Multan.

**MATERIALS AND METHODS:** The experiment was conducted at ICI Research Station near 19-Kasi, Multan during 2019-20, and 2020-21 cotton seasons. Two cotton varieties ICI-2121 and ICI-2424 were tested in six planting dates (1st April, 15th April, 1st May, 15th May, 1st June and 15th June). The experiment was carried out in split plot design replicated three times on a plot size of 25m$^2$. The sowing dates were arranged in main plots and the varieties in sub-plots. All other cultural practices and plant protection measures were carried out as per recommendations and production technology of these varieties as mentioned by the breeders. Varieties and planting dates were evaluated for their agronomic traits like plant height, number of monopodia and sympodia, boll weight, number of bolls per plant and seed cotton yield. The observations recorded on plant height, monopodia and sympodia, boll weight and number of bolls per plant as the average of 10 indexed plants, whereas, seed cotton yield was recorded on net plot basis and then calculated on per hectare basis. Statistical analysis was performed after Gomez and Gomez (1984) to perceive the differences among varieties and planting times.

**RESULTS AND DISCUSSION:** Seed cotton yield and some agronomic parameters (plant height, number of monopodia and sympodia, boll weight, number of bolls per plant) of three cotton varieties under different planting dates (1st April, 15th April, 1st May, 15th May, 1st June and 15th June) in agro-climatic conditions of Multan were evaluated during 2019-2020 and 2020-2021 cotton seasons. Average performance of two years and statistical results in the form of CD 5% for each parameter are depicted in table 1. Each agronomic trait is discussed under separate heading hereunder

**Plant height (cm):** There existed significant differences in planting dates, varieties and their interaction. Maximum plant height (154cm) was recorded in the 1st April sowing date followed by 15th April (149cm) and 1st May (141cm). Minimum plant height of 104cm was displayed by 15th June sowing time followed by 1st June (120cm). This may be due to the fact that plants remained for longer period in the field and took maximum nutrition present in the soil. Among varieties, ICI-2121 produced 146cm tall plants followed by IUB-2013 and ICI-2424 which produced 130cm and 125cm tall plants respectively. These results are in accordance with the results reported by Arain *et al.* (2001) and Gormus and Yucel (2002) opined that early sown cotton produces taller plants. However, present findings are contradictory to the findings of Nuti *et al.* (2006) who concluded that plants grow faster and taller in late planting compared with early or normal planted cotton.

**Number of monopodial branches per plant:** The number of monopodia is dependent on genotype and environmental fluctuations. Non-significant differences were observed in planting dates, varieties and their interaction. Maximum monopodia (2.83) were recorded in the 1st April sowing date followed by 15th April (2.39) and 1st May (2.36). Minimum number of monopodial branches (1.71) was produced when crop was sown on 15th June followed by 1st June (2.01). Among varieties, ICI-2121 produced maximum monopodia (2.72) followed by IUB-2013 and ICI-2424 which produced 2.04 and 2.01 number of monopodial branches respectively. The present results are in conformity with the results of Arain *et al.* (2001) Munk (2001) and Butter *et al.* (2004) who observed that early sowing of cotton produced higher number of monopodial branches per plant as compared to late sown crop.

**Number of sympodial branches per plant:** Sympodial branches are also dependent on genotype and environmental interactions. Highly significant differences were observed in planting dates, varieties and their interaction. Maximum sympodia (27.08) were recorded in the 1st April sowing date followed by 15th April (26.14) and 1st May (24.80). Minimum number of sympodia (18.19) was produced when crop was sown on 15th June followed by 1st June (21.11). ICI-2121 produced maximum sympodia (25.53) followed by IUB-2013 and ICI-2424 producing 22.75 and 21.93 number of sympodial branches respectively. The results of present study support the results of Arain *et al.* (2001), Munk (2001) and Butter *et al.* (2004) who observed that early sowing produced higher number of sympodial branches per plant as compared to late sown crop. Gormus and Yucel (2002) and Dong *et al.* (2006) also obtained higher number of sympodial branches in early sown cotton crop.

**Boll weight (gm):** Non-significant differences were observed for boll weight in sowing times, varieties and their interactions. Maximum boll weight (3.4gm) was recorded in the 1st April sowing date followed by 1st and 15th May (3.2gm). Minimum boll weight was observed in 15th June sowing (3.0gm) followed by 15th April and 1st June (3.1gm). As regards to varieties, ICI-2121 produced heavier bolls of 3.32gm followed by ICI-2424 (3.15gm) and IUB-2013 with 3.03gm boll weight. The results of present study are in line with the results obtained by Pettigrew (2002) who were of the view that when planting time of cotton was delayed, the boll weight recorded was less because seeds per boll decreased with delayed sowing. However, Dong *et al.*

(2006)found non- significant effect on boll weight by sowing date.

Table 1: Performance of seed cotton yield and some agronomic parameters of three cotton varieties under different planting times in agro-climatic conditions of Multan (average of 2019 and 2020 cotton seasons).

| Planting Dates | ICI-2121 | ICI-2424 | IUB-2013 | Average of planting dates |
|---|---|---|---|---|
| **Average plant height (cm)** | | | | |
| 1st April | 165 | 147 | 151 | 154 |
| 15th April | 161 | 141 | 145 | 149 |
| 1st May | 157 | 130 | 137 | 141 |
| 15th May | 145 | 121 | 129 | 132 |
| 1st June | 133 | 113 | 115 | 120 |
| 15th June | 112 | 98 | 101 | 104 |
| Average of varieties | 146 | 125 | 130 | - |
| **Average number of monopodia per Plant** | | | | |
| 1st April | 3.57 | 2.55 | 2.37 | 2.83 |
| 15th April | 2.91 | 2.12 | 2.13 | 2.39 |
| 1st May | 2.82 | 2.05 | 2.22 | 2.36 |
| 15th May | 2.77 | 1.97 | 1.97 | 2.24 |
| 1st June | 2.33 | 1.85 | 1.85 | 2.01 |
| 15th June | 1.91 | 1.54 | 1.67 | 1.71 |
| Average of varieties | 2.72 | 2.01 | 2.04 | - |
| **Average number of sympodia per Plant** | | | | |
| 1st April | 28.95 | 25.79 | 26.49 | 27.08 |
| 15th April | 28.25 | 24.74 | 25.44 | 26.14 |
| 1st May | 27.54 | 22.81 | 24.04 | 24.80 |
| 15th May | 25.44 | 21.23 | 22.63 | 23.10 |
| 1st June | 23.33 | 19.82 | 20.18 | 21.11 |
| 15th June | 19.65 | 17.19 | 17.72 | 18.19 |
| Average of varieties | 25.53 | 21.93 | 22.75 | - |
| **Average boll weight (g)** | | | | |
| 1st April | 3.5 | 3.3 | 3.4 | 3.4 |
| 15th April | 3.2 | 3.1 | 2.9 | 3.1 |
| 1st May | 3.3 | 3.2 | 3.0 | 3.2 |
| 15th May | 3.5 | 3.2 | 3.0 | 3.2 |
| 1st June | 3.2 | 3.1 | 3.1 | 3.1 |
| 15th June | 3.2 | 3.0 | 2.8 | 3.0 |
| Average of varieties | 3.32 | 3.15 | 3.03 | - |
| **Average number of bolls per plant** | | | | |
| 1st April | 33 | 31 | 29 | 31 |
| 15th April | 32 | 29 | 28 | 30 |
| 1st May | 45 | 41 | 35 | 40 |
| 15th May | 34 | 39 | 31 | 35 |
| 1st June | 27 | 27 | 25 | 26 |
| 15th June | 23 | 21 | 21 | 22 |
| Average of Varieties | 32 | 31 | 28 | - |
| **Average seed cotton yield (Kg/ha)** | | | | |
| 1st April | 1387 | 1277 | 1198 | 1287 |
| 15th April | 1371 | 1255 | 1181 | 1269 |
| 1st May | 1497 | 1381 | 1254 | 1377 |
| 15th May | 1222 | 1178 | 1095 | 1165 |
| 1st June | 1115 | 1055 | 967 | 1046 |
| 15th June | 773 | 735 | 688 | 732 |
| Average of Varieties | 1228 | 1147 | 1064 | - |

**C.D @5%**

| | Plant height | Monopodia | Sympodia | Boll weight | Number of bolls/plant | Seed cotton yield |
|---|---|---|---|---|---|---|
| Planting Time (PT) | 9.11 | Ns | 4.12 | Ns | 3.17 | 196.15 |
| Variety (V) | 6.3 | Ns | 5.74 | Ns | 3.21 | 113.24 |
| PT x V | 18.1 | Ns | 7.23 | Ns | 4.54 | 215.71 |

**Number of bolls per plant:** Number of bolls per plant on per unit area is one of the most important yield components of cotton. Highly significant differences for number of bolls per plant in sowing times, varieties and their interactions. Maximum number of bolls (40) were produced when the crop was sown on 1st May followed by 15th May and 1st April sown crop where 35 and 31 bolls respectively were achieved. As regards to varieties, ICI-2121 produced maximum number of bolls per plant (40) followed by ICI-2424 (31) and IUB-2013 (28). On the contrary, Dong *et al.* (2006) recorded a greater number of bolls per unit area in late planting than normal planting.

**Seed cotton yield (Kg/ha):** Highly significant differences were observed for seed cotton yield (kg/ha) in sowing times, varieties and their interactions. Maximum seed cotton yield (1377 kg/ha) was produced when the crop was sown on 1st May followed by 1st April and 15th April sown crop where 1287 and 1269 kg/ha seed cotton yield respectively was obtained. As regards to varieties, ICI-2121 produced maximum yield of 1228 kg/ha followed by ICI-2424 (1147 kg/ha) and IUB-2013 (1064 kg/ha). Soomro *et al.* (2000) and Gormus and Yucel (2002) also observed that earlier or later sown crop than optimum time, showed a rapid yield decline. Soomro *et al.* (2000) also observed that even a delay of one week from optimum time resulted in marked decline in yield. Iqbal *et al.* (2011) observed higher cotton yield with early planting in 3rd week of May compared to 2nd week of June. Akhtar *et al.* (2002) viewed that late planting results in reduced yield. Muhammad *et al.* (2002) summarized that cotton sowing in the beginning of May gave significantly higher seed cotton yield than all other sowing dates. All the above-mentioned studies are in line with the present findings.

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