

EFFECT OF DIFFERENT PLANTING DATES ON THE GROWTH AND YIELD OF COTTON (*G. HIRSUTUM* L.) CULTIVARS

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A field experiment to assess the effect of different planting dates on the growth and yield of Cotton (*G. hirsutum* L.) Cultivars was conducted at (A.R.I.), Tando Jam during summer 1986. Four planting dates (1st April, 15th April, 1st May and 15th May) and six cultivars i.e., Qalandri, TH-1100, TH-1174, TH-199/80, TH-3/83 and Rehmani were studied. Early planted (1st or 15th April) cotton recorded significantly higher seed cotton yield 2.30 and 2.62 m.t/ha, than the cotton planted on 1st and 15th May.

The newly evolved cultivar gave significantly higher seed cotton yield of 2.59 m.t/ha as compared to Rehmani, TH-1100 and TH-1174 cultivars.

Key words: Planting dates, Cultivars, Yield, Yield characters.

INTRODUCTION

Cotton is an important cash crop of Pakistan, grown on more than 2.498 million hectares during 1986-87. Unfortunately, average yield in our country is much lower as compared to other growing countries in the world. In addition to the evaluation of high yielding varieties, agronomic practices play an important role in the development of cotton crop [1]. Yadee [2] reported that the early sown crop gave the high seeding stand, plant height and seed cotton yield as compared to later sown crop. Sindh *et. al.* [3], Chuhan and Suryanaryana [4], Shekhawat and Chundawat [5], Bridge *et. al.* [6], Mithaiwala and Memon [7], reported that delay in sowing beyond 15th May significantly reduced in seed cotton yield. Khan *et. al.* [8] and Ullah *et. al.* [9] observed that crop sown in early April, gave the significantly higher seed cotton yield than sown in end of May. Muhammad and Hanif [10] stated that, plant height, number of bolls and seed cotton yield decreased with delay in sowing. Khan and Ali [11], reported that plant height, number of monopodial and sympodial branches exhibited a mark decline with delay in sowing. However *et. al.* [12] reported that cotton sown either in mid April or mid May gave similar performance in respect of plant height, number of bolls and seed cotton yield. Present investigation was conducted to assess the effect of different planting dates on the growth and yield of newly developed cultivars under the agroecological conditions of Tando Jam.

MATERIALS AND METHODS

Field experiment was conducted at Agronomy experimental field (A.R.I.) Tando Jam during summer 1986. The treatments consisted of four planting dates (1st April, 15th April, 1st May and 15th May) and six cultivars Qalandri,

Rehmani, TH-1100, TH-1174, TH-199/80 and TH-3/83.

The experiment was laid out in split plot design with sowing dates in main plots and cultivars in sub plots, having four replications. The net plot size was 7 x 5m. The crop was sown in rows 75 cm apart with drill using seed rate of 35 kg/ha. The seedlings were thinned keeping plant to plant distance of 25 cm.

The normal fertilizer dose of 84 kg N and 50 kg P₂O₅/ha was applied prior to sowing in the form of urea and single super phosphate. all other cultural operations were given according to the recommended schedule. The meteorological data recorded during the crop season is given in Table 1.

Table 1. Average meteorological observations recorded daily from April 1986 to September 1986.

Months	Air temperature °C		Relative humidity %	Sunshine hours	Rain-fall (mm)
	Maximum	Minimum			
April	38.53	20.43	72.59	10.29	-
May	41.71	24.07	77.35	10.95	-
June	40.56	27.92	88.14	4.28	-
July	37.11	27.09	86.61	6.31	-
August	31.58	24.58	86.49	7.77	10.45
September	36.01	23.81	86.67	11.09	-

A maturity 5 plants/plot were tagged for recording the observations, on plant height, number of monopodial and sympodial branches/plant, number of productive bolls/plant, seed cotton yield/plant and specify how yield/ha was recorded. All the data were subjected to statistical analysis using the analysis of variance procedure and means were separated by L.S.D. (least significant difference) test, following Gomez and Gomez [13].

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RESULTS AND DISCUSSION

Seed cotton yield. Seed cotton yield was significantly ($P = 0.05$) affected by planting dates (Table 2). The highest seed cotton yields (2.30 and 2.62 m.t/ha) was obtained in early planted (1st or 15th April) cotton, which were significantly better than 1st and 15th May plantings (Table 3). Similar results have been reported by Yadee [2], Singh *et al.* [13], Chuhan and Suryanaryana [4], Shekhawat and Chundawat [5], Bridge *et al.* [6], Mithaiwala and Memon [7], Muhammad and Hanif [12]. They reported that delay in sowing cotton significantly suppressed the yield. Khan *et al.* [10], Ullah *et al.* observed that crop sown in early April

gave significantly higher seed cotton yield. A considerable reduction in seed cotton yield was noted as sowing was delayed after 15th April. It might be due to the reduced vegetative growth, early termination of crop growth period caused by the adverse effect resulting from the rise in air temperature early in the reproductive phase.

The cultivars also differ significantly ($P = 0.01$) to seed cotton yield. The newly developed cultivar TH-3/83 gave significantly maximum seed cotton yield (2.59 m.t/ha) followed by Qalandri, and TH-199/80, giving (2.31 and 2.30 m.t/ha) respectively, which were significantly at par with TH-1174 (1.64 m.t/ha) Table 3. This attributed to the gen-

Table 2. Mean squares corresponding to various sources of variation for seed cotton yield and its components of cotton cultivars as influenced by planting dates.

Source of variation	D.F.	Mean square					
		Plant height	Monopodial branches/plant	Sympodial bbranches/plant	Productive bolls/plant	Seed cotton yield/plant	Seed cotton yield/ha
Replication	3	208.65NS	2.00NS	143.40NS	17.27NS	172.23NS	0.24NS
Planting dates (P)	3	495.39NS	8.20**	905.66**	584.19**	10579.57**	3.05*
Main plot error	9	354.40	0.90	75.76	64.66	1487.41	0.48
Cultivars (C)	5	1556.83**	0.56NS	17.82NS	41.70**	846.25NS	1.62**
PxC	15	592.89**	0.47NS	27.11NS	17.54NS	700.37*	0.19NS
Sub Plot error	60	184.11	0.72	25.61	11.56	374.67	0.20
Total	95	-	-	-	-	-	-

* Significant at $P = 0.05$; ** Significant at $P = 0.01$; NS Non-significant.

Table 3. Mean seed cotton yield/ha (M.T.) of cotton cultivars as affected by different planting dates.

(A) Planting dates	Yield/ha (M.T.)
1st April	2.30 a
15th April	2.62 a
1st May	1.95 b
15th May	1.84 b
S.E. \pm	0.20
C.D. at $P = 0.05$	0.45
(B) Cultivars	Yield/ha (M.T.)
Qalandri	2.31 ab
TH-1100	2.07 bc
TH-1174	1.64d
TH-199/80	2.30 abc
TH-3/83	2.59 a
Rehmani	2.16 bc
S.E. \pm	0.16
C.D. at $P = 0.05$	0.32
CD at $P = 0.01$	0.43

Means followed by the same letters do not differ significantly at 5 per cent probability level.

etical make up of the material.

Yield attributes. It is apparent (Table 2) that plant height differ significantly ($P = 0.01$). Cultivar Rehmani produced taller plant (181.81 cm), followed by TH-199/80 and TH-3/83 caused 166.88 and 162.00 cm respectively. However, the maximum plant height (149.32 cm) was observed in cultivar TH-1174 (Table 4). This may be due to change in parental material.

Table 2 depicted that number of monopodial branches were change significantly ($P = 0.01$) due to different planting dates. Delay in planting (1st or 15th May) increase in number of monopodial branches (3.17 and 2.75)/plant, over early 1st April, did lower number of branches (1.90)/plant. (Table 4). Similarly sympodial branches were also significantly different ($P = 0.01$) due to different planting dates, later sown crop (1st or 15th May) produced maximum number of sympodial branches (26.64 and 25.38)/plant respectively. Whereas early planted (1st or 15th April) recorded lesser number of sympodial branches (14.27 and 16.24) (Table 4). These results are not in agreement with the findings of Khan and Ali [8] who reported that number of monopodial and sympodial branches decreased with delay in sowing.

Table 4. Mean yield components of cotton cultivars as affected by different planting dates.

Treatments	Plant height (cm)	Monopodial branches/plant	Sympodial branches/plant	Productive bolls/plant	Seed cotton yield/plant (gm)
(A) Planting dates					
1st April	160.19	1.90 c	14.27 b	19.17 a	87.01 a
15th April	166.51	2.10 bc	16.24 b	19.97 a	98.44 a
1st May	164.11	3.17 a	26.64 a	10.18 b	56.49 b
15th May	156.16	2.75 ab	25.38 a	10.18 b	58.01 b
S.E. ±	5.43	0.27	2.51	2.32	0.20
CD at P = 0.05	-	0.61	5.67	5.24	0.45
CD at P = 0.01	-	0.88	8.16	7.54	0.65
(b) Cultivars					
Qalandri	155.95 cd	2.33	20.84	16.26 ab	81.72
TH-1100	154.51 cd	2.23	19.06	14.16 b	73.75
TH-1174	149.32 d	2.76	22.17	12.50 c	64.48
TH-199/80	166.88 b	2.57	20.70	15.60 ab	74.85
TH-3/83	162.00 bc	2.44	20.87	17.94 a	84.45
Rehmani	181.81 a	2.56	20.51	13.74 b	70.80
S.E. ±	4.80	0.30	1.79	1.20	1.58
CD at P = 0.05	9.60	-	-	2.40	-
CD at P = 0.01	12.77	-	-	3.19	-

Means followed by the same letters do not differ significantly at 5 percent probability level.

Number of productive bolls/plant varied significantly ($P = 0.01$) due to different planting dates (Table 2). Crop planted on 1st or 15th April progressively increased in number of productive bolls (19.17 and 19.97)/plant, over later planted 1st or 15th May giving lesser number of productive bolls (10.18)/plant (Table 4). The results are in accordance with the results obtained by Muhammad and Hanif [12] who reported that number of bolls decreased with delay in sowing.

Cultivars also differ significantly ($P = 0.01$). TH-3/83 produced maximum number of productive bolls 17.94/plant, followed by Qalandari and TH-199/80 giving 16.26 and 15.60/plant respectively, whereas cultivar TH-1174 recorded lesser number of productive bolls 12.50/plant (Table 4). It might be due to genetical make up of the material.

Seed cotton yield/plant was change significantly ($P = 0.05$) due to different planting dates (Table 2). The maximum seed cotton yields (87.01 and 98.44 gm)/plant were obtained under 1st or 15th April planted crop. However delay in planting after 15th April significantly depressed in the seed cotton yield (56.49 or 58.01 gm)/plant (Table 4). The high yields in early sown crop was mainly due to higher number of productive bolls/plant. Similar results have been reported by Yadee [2], Khan *et al.* [10], Ullah *et al.* [11]. They reported that early planted crop gave higher seed cotton yield.

It is observed from the present investigation that cotton sown either 1st April or 15th April at 15 days interval, produced significantly better seed cotton yield as compared to 1st May or 15th May planted cotton, this increment in yield mainly due to higher productive bolls and seed cotton yield/plant. However each successive delay in planting beyond 15th April progressively depressed in the yield. Cultivars were also differ significantly, newly developed TH-3/83). Cultivars gave maximum yield than all the rest cultivars. It is suggested that for obtaining better seed cotton yield, the cultivar TH-3/83 should be grown on 1st or 15th April, under Agro-ecological conditions of Tando Jam.

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Machine operation. In determining output, the time required to transport thrasher to the field and to install it there were not taken into consideration. After putting the thrasher into operation by starting the engine, the drum speed was checked using a tachometer. The speed was then brought to the required level by adjusting the engine, while continuing with normal sunflower seed feeding at the inlet end. The thrasher was run continuously, and the speed was checked from time to time. At the desired steady drum speed, samples from the output end were collected for 2 mins for each combination of drum speed and concave clearance on each type of thrasher. The machine was operated for 6 hr. Samples were collected at one-hour intervals. Immediately before sample collection, the drum speed and concave position were reconfirmed.

Data collection

Output. Five samples, each for 2 mins duration, were collected for each combination of speed and concave clearance on each thrasher. Average output of these 2 samples were determined, and converted to kilogram per minute.

Cleaning efficiency. Grains and other materials (straw etc.) were separated manually from the samples drawn, and each portion was weighed separately. The percentage cleaning efficiency (C.E.) was given by:-

$$C.E. = \frac{\text{Grain weight}}{\text{Grain + other materials wt.}} \times 100$$

Cleaning efficiency for 2 samples for each combination on each machine were calculated separately, and averages were determined for each combination.

Grain breakage. From the clean sample (free from other materials) the whole grains and broken grains were sorted out manually. Then the percent grain breakage (G.B.) was calculated as:

$$G.B. = \frac{\text{Weight of broken grain}}{\text{Weight of total grain}} \times 100$$

Nature of design. The experimental design had three factors, viz. drum type, drum speed and concave clearance, with three, two and three levels respectively. The model

was a key operation in the mechanized raising of the sunflower, a crop well-suited to bridging the edible oil gap in Pakistan. Three threshers of the peg, rasp bar and rubber bar type were studied, with various combinations of drum type, drum speed and concave clearance. Based on statistical and graphical analysis of the results, the highest yield and realized on a peg-type cylinder unit with a concave clearance of 4.4 cm, with only moderate grain breakage and fair cleaning efficiency.

Key words: Mechanization, Evaluation, Oilseed threshing.

INTRODUCTION

Pakistan is facing a chronic shortage in edible oils and is spending billions in valuable foreign exchange for its import [1]. This situation may worsen significantly in the future, if current trends of increased per capita consumption of edible oils in the country prevail during the next decade [2]. Realizing this, efforts are being made by policy makers and researchers to increase the domestic production of edible oils.

Due to its short duration (90-100 days), high oil content (40%) and ability to withstand stress conditions [3], sunflower has been viewed as the potential oil crop of the future around the world [4]. In Pakistan, its area has increased 10-fold over the last five years [5]. A tremendous potential for further expansion of area under sunflower in the country exists because of its ability to fit in with conventional cropping systems [6]. Availability of farm machinery required for production, protection and harvesting of sunflower is also involved. The role of mechanization of farm operation in maximizing per hectare yield and accelerating the raising of sunflower is well documented [7]. At present threshing is mostly manual which is inefficient, expensive and detrimental to seed quality.

This study was conducted to assess and evaluate the performance of threshers for both quantity and quality of the output taking into consideration important variables like drum type, drum speed and concave clearance, followed by a recommendation for a suitable unit.

METHOD

Variables in the study were drum type, drum speed and concave clearance and their effect on thrasher output, cleaning efficiency and grain breakage was studied. Three types of drums, namely peg type, rasp bar type and rubber strip type were examined at 300 and 600 rpm, maintaining the concave clearance at 2.54, 4.40 and 6.35 cm. Regional Network on Agricultural Machinery (RANAM) Test Codes and Procedures for Farm Machinery were followed [8].