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Dry Matter Accumulation in Various Parts of Cotton Genotypes as Affected by Sowing Dates

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Abstract: The field experiment was conducted to study the effect of sowing dates on total biomass content of cotton genotypes on clay soil under agro-climatic condition of Tandojam Pakistan during 2002. The treatments were three sowings (15th April, 15th May and 15th June) and three cotton genotypes (Qalandri, DS-67-3A and NIAB-78). The results revealed maximum biomass distribution at maturity in the leaves, stem and fruits of Qalandri and DS-67-3A, respectively whereas, the minimum biomass was noted in the NIAB cotton variety. Among the tested sowing dates, 15th May and 15th April planting exhibited significantly higher biomass accumulation as compared to late (15th June) sowings. Thus, it was recommended that cotton crop should be sown during 15th April to 15th May for obtaining satisfactory boll production in agro climatic conditions of Tandojam, Pakistan.

Key words: Cotton, drymatter, genotypes

INTRODUCTION

Cotton plays a vital role in the economy of Pakistan but yield of the crop is extremely low as compared to other cotton growing countries of the world. The reasons for low yield can be manifold and attributed to several factors which reflect the growth and yield of cotton. The extreme heat under which cotton is grown in Pakistan is perhaps unique among cotton growing areas. Temperature escalate considerably in May, peak in June and continue at a high level during July and August. Arain and Khan[1] reported that these high temperatures coincide with the vegetative and early reproductive phases of cotton production. Donald[2] reported that dry matter accumulation is important in understanding the yielding capacity of the crop. Hearn[3] stated that the complete change from the vegetative to reproductive phase occurred when the rate of dry matter accumulation in bolls equaled the crop growth rate. The limiting and severity of this cut out phenomenon is dependent on the genetic makeup of varieties and on environmental conditions. Taha[4] found that the early sown crops produced the greater dry matter as a result of the increased size of the photosynthetic system and high crop growth rate during the vegetative phase and on the other hand late sown crop produced less dry matter. Further, Channa and Balouch[5] concluded that early sowing (15th April) produced more dry matter and it was decreased with the delay in sowing dates. Among the varieties, CRIS-9/80 produced the highest dry matter followed by CRIS-15/80, CRIS-2/80 and Qalandri. They further stated that dry matter accumulation in leaves was similar for three sowing dates but varied in stem and fruit. Varieties did not cause appreciable variation in total biomass in different plant organs. Keeping in view the above facts and the importance of cotton in the country, it is important to identify the genotype biomass accumulation in different parts at different sowing dates to explore the suitable cultivar for farmer recommendation.

MATERIALS AND METHODS

Studies on response of dry matter accumulation of cotton genotypes to sowing dates were carried out at Student Experimental Farm, Sindh Agriculture University Tandojam, Pakistan during 2002. The experiment was laid out in split plot design with four replications.

The details of experiment are as under:

Sowing dates (Main plot)

S_1	15th April
S_2	15th May
S_3	15th June

Genotypes (Sub plots)

V_1	Qalandri
V_2	DS-67-3A
V_3	NIAB-78

The samples consisted of four plants per treatment (Sub plots) were collected at maturity stage of the crop The plants were cut at ground level and transferred to the laboratory for dry weight determinations of different plant

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parts. Plants were dissected into stem, leaves and fruits and were dried at 90°C in a draft drying oven for 24 h. Total dry weight was determined from the dry weights of the individual plants parts for getting the required data. The collected data were statistically analyzed following the method of Gomez and Gomez[6].

The meteorological data of year 2002 exhibited maximum temperature (41-43°C) during May-July) followed by 37-38°C in the months of August-September. The temperature declined (31-32°C) in the months of October, November. The minimum temperature was 13-29°C from April to November. The relative humidity was maximum 7-91% in July-September, which decreased (68-80%) in the months of April-June.

RESULTS AND DISCUSSION

Sowing dates: The results revealed that maximum biomass of leaves (14.41%) and stems (48.26%) was exhibited under 15th April and 15th May sowing time, respectively however, fruit biomass was higher (56.39%) under 15th June sowing time followed by 15th May sowing time (46.58%). The minimum (12.25 and 31.36%) biomass in leaves and stems was observed under 15th June sowing time, respectively whereas, fruits showed minimum (37.58%) biomass under 15th April sowing time, (Table 1-3).

Genotypes: The maximum (15.39 and 40.82%) biomass was recorded both in leaves and stems under DS-67-3A cotton genotype, however, fruits recorded higher biomass (49.55%) in Qalandri. The minimum biomass of leaves and stems (10.53 and 37.88%) was found in Qalandri and NIAB-78 respectively. The fruit biomass showed different results, having minimum biomass (43.79%) in DS-67-3A (Table 1-3).

These results are in agreement with the findings of Taha[4], Khan *et al.*[7] and Khan[8] they were in the view that April and mid May sowings gain more biomass in plant due to favourable temperature and humidity which increased the vegetative parts of the plant. Hence, it was suggested that cotton crop should be sown during April as early sowing and 15th May as mid sowing and 15th June as late sowing.

Table 1: Biomass distribution in leaves at maturity

	Sowing times			
Genotype	15th April (Early)	15th May (Medium)	15th June (Late)	Mean of genotype
Qalandri	10.81	10.58	10.20	10.53
DS-67-3A	15.83	16.54	13.81	15.39
NIAB-78	15.85	16.11	12.73	14.90
Mean of sowing time	14.16	14.41	12.25	---
	Sowing dates (S)		Genotypes (G)	S x G
S.E.	0.628		0.88	1.54
LSD(5%)			2.642	
LSD(1%)			3.619	

Table 2: Biomass distribution in stem at maturity

	Sowing times			
Genotype	15th April (Early)	15th May (Medium)	15th June (Late)	Mean of genotype
Qalandri	50.40	42.33	27.04	39.92
DS-67-3A	50.23	36.90	35.33	40.82
NIAB-78	44.15	37.80	31.70	37.88
Mean of sowing time	48.26	39.01	31.36	---
	Sowing dates (S)		Genotypes (G)	S x G
S.E.	2.25		0.43	0.75
LSD(5%)	0.87		1.29	2.23
LSD(1%)	1.32		1.77	3.06

Table 3: Biomass distribution in fruits at maturity

	Sowing times			
Genotype	15th April (Early)	15th May (Medium)	15th June (Late)	Mean of genotype
Qalandri	38.79	47.09	62.76	49.55
DS-67-3A	33.94	46.54	50.86	43.79
NIAB-78	37.58	46.09	55.57	47.22
Mean of sowing time	37.58	46.58	56.39	---
	Sowing dates (S)		Genotypes (G)	S x G
S.E.	0.41		0.47	0.82
LSD(5%)	1.41		1.40	2.44
LSD(1%)	2.15		1.93	3.34

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