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Effect of Selective Defoliation on Yield and Growth of Cotton(*Gossypium hirsutum* L) Variety 'H-4'

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ABSTRACT

A field experiment on 'Hybrid-4' cotton crop was conducted for two crop seasons during the year 1973-74 and 1974-75 on sandy loam soils of Middle Gujarat. The crop was defoliated at the time of first flower appearance, first boll setting and first boll bursting stages with partial to complete defoliation. It was found that complete defoliation at any stage would reduce the yield to a great extent but partial defoliation of bottom branches at the later stages may compensate the seed cotton yield to a certain extent.

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INTRODUCTION

The contribution of leaves and bolls of different parts plays an imporant role in determining the yield and growth of the cotton plant. Brown (1971) showed that with the increase in plant density of cotton, there was a decrease in number of bolls that mature on the lower sympodia. This was due to decrease in number of fruiting points produced in this region and of an increase in the number of buds and bolls that were shed. Brown (1973) further showed that the main sources that assimilate for a developing boll are those leaves which are closely associated with it. In a crop with a high plant density, the leaf area index may reach 4.5. Under such circumstances the lower leaves are severely shaded and presumably, their net assimilation rate is lower. The amount of assimilation from these local sources for the lower bolls is decreased and there may be an association between this decrease and the increase in shedding of bolls and buds. Allison and Watson (1966) found that removal of parts of the foliage of maize caused little loss of head weight as other leaves increased their contribution considerably. In tomato, Khan and Sagar (1967) concluded that although groups of leaves were mainly responsible for the supply of assimilate to individual trusses, there was complete compensation by other functional leaves when some sources of assimilate were removed. Johnson and Addicott (1967) and Hearn (1969) also concluded that under certain circumstances shortage of assimilate might be the main factor in determining the number of bolls maturing on the plant. Very few reports

TABLE 1

Effect of defoliation of leaves on the yield and yield attributes of 'Hybrid-4' cotton.

Sr. No.	*Treatments*
1.	No defoliation
2.	First two branches defoliated from the bottom at the time of 1st flower setting
3.	First three branches defoliated from the bottom at the time of 1st flower setting.
4.	First four branches defoliated from the bottom at the time of 1st flower setting
5.	First two branches defoliated from the bottom at the time of 1st boll setting
6.	First three branches defoliated from the bottom at the time of 1st boll setting
7.	First four branches defoliated from the bottom at the time of 1st boll setting
8.	First two branches defoliated from the bottom at the time of bursting of 1st boll
9.	First four branches defoliated from the bottom at the time of bursting of 1st boll
10.	Complete removal of leaves at the time of 1st flower setting
11.	Complete removal of leaves at the time of 1st boll setting
12.	Complete removal of leaves at the time of 1st bursting of boll
	F. Test
	S. Em.
	C. D. 5 %
	C. V. %

Yield of Seed cotton q/ha		*Number of branches/ plant*		*Number of bolls/plant*		*Plant height, cm*		*Dry matter, q/ha*	
1973-74	*1974-75*	*1973-74*	*1974-75*	*1973-74*	*1974-75*	*1973-74*	*1974-75*	*1973-74*	*1974-75*
12.17	9.51	22	23	20	16	119.8	105.5	20.83	34.32
12.10	6.70	21	25	17	12	111.3	102.0	19.81	33.95
10.01	6.22	19	21	12	12	106.3	71.0	18.52	26.23
10.58	8.76	20	22	14	14	109.3	95.7	16.85	26.60
11.94	8.17	19	25	16	13	117.9	93.3	20.43	32.78
10.71	8.28	20	22	14	11	114.4	98.1	20.83	23.92
12.23	8.54	19	21	10	12	118.0	96.3	20.43	30.09
11.15	7.25	22	24	17	12	111.2	98.7	19.91	27.78
12.97	8.51	22	23	18	14	124.6	102.5	21.02	31.23
7.55	5.11	23	22	12	10	107.9	79.6	20.22	26.60
5.81	6.21	22	22	10	12	109.1	90.0	18.89	32.00
10.62	5.77	22	23	16	9	114.8	109.4	17.35	25.83
Sig.	Sig.	N.S.	N.S.	N.S.	Sig.	N.S.	Sig.	N.S.	N.S.
1.08	0.60	1.15	1.30	2.46	1.35	6.2	3.84	0.68	1.30
3.08	1.73	—	—	—	3.90	—	11.03	—	—
6.38	16.0	11.11	11.44	34.25	22.20	10.90	8.04	21.54	11.44

are available regarding proper stage of compensation and extent of defolication in cotton. In order to ascertain whether defoliation during the growth period would compensate the seed cotton yield, the present study was undertaken on 'Hybrid-4' variety of cotton at the College Agronomy Farm of the Gujarat Agricultural University, Anand Campus, Anand.

MATERIALS AND METHODS

The experiment was conducted on sandy loam soil popularly known as "*Goradu*" soil. The soil had a pH value of 7.2. It contained 0.47% organic matter, 0.030% total nitrogen, 50 kg/ha 5M $NaHCO_3$ soluble phosphorus and 350 kg/ha exchangeable potash. Randomised block design was employed with twelve treatments and four replications during the year 1973-74 and 1974-75. The treatments consisted of a control with non-removal of leaves and removal of leaves from the first two, three and four bottom branches at the time of first flower appearance, at the time of first boll set and removal of leaves from the first, two and four branches at first bursting of boll. The plants were also completely defoliated at all the above mentioned three stages. The first pickings were carried out on 19th and 18th October for the year 1973-74 and 1974-75, respectively. The last pickings were done on 9th and 12th April for the year 1973-74 and 1974-75, respectively.

A pre-sowing irrigation was given to provide an ideal soil moisture condition for uniform germination. Fertilizers were applied at the common rate of 150 kg Nm, 75 kg P_2O_5 and 75 kg K_2O/ha to all the experimental plots. The entire quantity of phosphorus and potash and one-third quantity of nitrogen (50 kg N/ha) in the form of diammonium phosphate, murate of potash and urea, respectively were applied in plough furrow before sowing. The remaining quantity of nitrogen was top dressed in four equal splits just after $1\frac{1}{2}$, $3\frac{1}{2}$, $4\frac{1}{2}$ and $5\frac{1}{2}$ months in each year after sowing. The average rainfall received was 1070 mm and 363 mm for the first and second year of the experiment, respectively.

RESULTS AND DISCUSSION

The dry matter distribution in crop like cotton is important as it blossoms through out its most of the life period and the yield potentiality is highly affected with dry matter distribution in different parts.

The data on the effect of defoliation (Table 1) revealed that the differences in the yield of seed cotton due to defoliation treatments differed significantly during both the years under study. The control treatment (no defoliation) yielded the highest seed cotton during both the years under report but the differences were not significant when compared with defoliation of bottom branches at the time of boll bursting. The reduction in yield of seed cotton is significantly lower in defoliation of the bottom branches during inadequate rainfall year as compared to adequate rainfall year inspite of providing irrigation whenever found

necessary. The yield reduced sharply with defoliation of entire plants carried out at any stage. The results also indicated that even partial defoliation at the early stage would reduce the yield to a greater extent.

The data on plant height indicated significant reduction due to defoliation. The trend of differences ni height was similar to seed cotton yield. Number of branches per plant and dry matter production did not show significant differences due to treatment during both the years under report. The data on number of bolls per plant indicated that the differences were significant during the second year of the experiment. The maximum number of bolls were obtained from no defoliation treatment which was at par with defoliation of four branches at the stage of boll bursting.

REFERENCE

Allison, J. C. S. and D. J. Watson. 1966. The production and distribution of dry matter in maize after flowering. *Ann. Bot.* **30:** 365-381.

Brown K. J. 1971. Plant density and yield of cotton in Northern Nigeria. *Cotton Grow. Rev.* **48:** 255-266.

Brown, K. J. 1973. Effect of selective defoliation on development of cotton bolls. *Cotton Grow. Rev.* **50:** 106-114.

Hearn, A. B. 1969. The growth and performance of cotton in a desert environment. II Crop performance. *J. Agric. Sci. Camb.* **73:** 87-97.

Johnson, R. E. and F. T. Addicott. 1967. Boll retention in relation to leaf and boll development in cotton. *Crop Sci.* **7:** 571-574.

Khan, A. A. and G. R. Sagar. 1967. The distribution of the products of photosynthesis from the leaves of a tomato plant during the phase of fruit production. *Hort. Res.* **7:** 61-69.