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Breeding for photo-period insensitivity and fibre yield in capsularis jute (*Corchorus capsularis* L.)

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Abstract

The photo-period insensitive mutant (D-18-7) and sensitive variety (JRC 7447) of capsularis jute (*Corchorus capsularis* L.) were crossed to raise F_1 hybrid. The F_1 plants had flower initiation in almost same duration as in sensitive parent showing dominance of sensitiveness to insensitiveness. From segregating F_2 population two recombinants (D 90 and D 110) were selected that flowered in 90 and 110 days respectively. Pedigree selection continued till the flowering habit was stable. These two selections and three sensitive varieties (JRC 7447, JRC 212 and JRC 321) were sown every month round the year. The selections flowered almost in 90 and 110 days respectively while the sensitive varieties had variation in flowering time for different sowing times. Yield trials twice in April and once in June registered superiority of these two selections at 100-day harvest in April trials and that of D 110 at 120 day harvest, to the control.

Key words : Jute, recombinants, photo-period insensitivity, fibre yield

Introduction

The cultivated capsularis jute (*Corchorus capsularis* L.) varieties are photo-period sensitive and flower initiation occurs in first fortnight of September when day length is just over 12 hours (day and night is equal on the 22nd September). If sown in April, jute plants get longer time of vegetative phase and late sowing has less vegetative phase leading to lower fibre yield as compared to that in early sowing. This is because the fibre is extracted from the bark of the stem and taller the plant, more is the fibre yield. Photo-period insensitive varieties are likely to produce equal fibre yield even in late sowing.

A photo-period insensitive short duration mutant maturing in about 60 days after sowing has been reported [1]. Due to short vegetative period its fibre yield is low. The present work is aimed at evolving photo-period insensitive recombinants maturing in different periods with assured economic fibre yield.

Materials and methods

The F_1 seeds were raised by crossing photo-period sensitive standard variety, JRC 7447 with insensitive mutant, D-18-7. Seeds of F_1 and parents were sown in April and selfed F_2 seeds were collected. From the segregating F_2 population (with respect to flowering) two recombinants flowering in 90 and 110 days were selected (designated as D 90 and D 110). Pedigree selection of these two types continued upto F_8 generation until these two became stabilised.

These two selections and three standard sensitive varieties, JRC 321, JRC 7447 and JRC 212 were sown every month round the year to note the flowering behaviour. The two selections and three varieties were put to yield trials sown twice in April and once in June in RBD design with 3 replications having plot size 6m × 4.5m (Net plot 5.4m × 3.9m) and spacing at 30cm × 4-5 cm. Normal fertilizer dose of NPK in 60:30:30 kg/h. was applied. Data were analyzed following standard method.

Results and discussion

Flowering pattern of two parents, F_1 and F_2 population (Table 1) sown on 15th April revealed that D 18 flowered in around 60 days while JRC 7447 and F_1 had flowering in around 130 days. But there was wide range of flowering behaviour in F_2 population ranging from 56 to 132 days. The flowering time in F_1 coincides with that of sensitive parent, JRC 7447. This indicates the dominance of sensitiveness over insensitiveness. Such

Table 1. Flowering pattern standard photo-period sensitive, insensitive, F_1 and F_2 population

Varieties	Flowering after sowing on 15th April
D 18 (insensitive)	60-65 days
JRC 7447 (sensitive)	130-135 days
F_1	118-126 days
F_2	56-132 days

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observation in F_1 and F_2 and in the parents are similar to the earlier report [2].

Flowering pattern due to sowing in every month throughout the year revealed that days to flower were more or less constant in respective D 90 and D 110 irrespective of variable day-length in different months i.e. it was almost 90 days and 110 days in D 90 and D 110 respectively (Table 2). On the other hand, in the standard varieties, flowering pattern was variable e.g. 136-138 days for April sowing and 122-129 days for May sowing. Further the days to flower decreased in subsequent sowing upto July depending on the period available before 15th September when normally flowering occurs. For sowing during September to February the flowering occurred in 50-60 days due to the fact that the photo-period was below the critical photo-period during these months. The above flowering pattern clearly indicates the photo sensitiveness of the varieties and insensitiveness of D 90 and D 110.

Table 2. Days to flower in selections and standard varieties on different dates of sowing throughout the year

Variety of sowing	D 90	D 110	JRC 321	JRC 7447
4th April	89.8	110.5	138.2	136.5
5th May	91.2	109.8	122.8	129.8
4th June	90.6	110.0	104.2	107.5
4th July	90.6	109.6	78.6	82.0
4th August	91.8	110.4	55.8	59.5
4th Sept.	90.5	110.5	53.5	51.8
3rd Oct.	89.6	109.8	49.8	50.4
4th Nov.	89.2	109.5	43.4	44.6
4th Dec.	90.8	110.2	50.5	53.2
5th Jan	90.2	110.2	56.2	54.6
4th Feb.	90.4	110.6	66.4	64.4
4th March	91.5	111.0	158.6	161.2
Mean	**90.6**	**110.2**	**91.5**	**93.0**

Two yield trials of the 2 selections and 3 standards were performed - one in April and another in June. The jute plants were harvested at 100-day growth stage in both trials. The statistical analysis of the yield data revealed that the two selections had yielded more or less equal fibres in both trials and significantly higher compared to that in the standards. But fibre yield of the standard varieties was less due to sowing in June as those could receive less vegetative phase before the initiation of flowering in September. In another sowing during April and harvesting at 100 days for D 90 and at 120 days for the rest, it was observed that D 90 produced equal yield as in first trial. But D 110 yielded significantly higher yield over the rest. Amongst the standard varieties JRC 212 and JRC 7447 yielded significantly higher yield compared to that in JR 321 (Table 3). The yield of D 110 and three standard varieties was more (being harvested at 120 days) because of 20 days longer vegetative phase. Fibre yield is positively correlated to basal diameter and plant

Table 3. Fibre yield on harvest at different days after sowing (q/ha)

Varieties	Harvest at 100-days after sowing on		Harvest on 100 and 120 days after sowing on
	22 April	2 June	22 April
D 90	24.1	24.7	24.1 (harvest at 100 days)
D 110	24.3	23.89	28.5 (" " 120 days)
JRC 321	22.5	19.89	23.3 (" " ")
JRC 212	23.6	20.9	25.1 (" " ")
JRC 7447	23.3	20.9	24.9 (" " ")
CD at 5%	0.47	0.42	0.64
CD at 1%	0.66	0.59	0.90

height as fibre is available from the extracted bark of the stem. Longer vegetative phase leads to taller plant and more basal diameter. Hence, the yield was more in those entries. D 90 was harvested at 100-day growth stage since its maturity (flowering) was at 90 days and harvesting was at 100 days i.e. at small pod stage which was the recommended stage for harvesting. D 110 had maturity (flowering) at 110 days and harvesting at 120 days i.e. at small pod stage as in D 90. For comparison with D 110, the standard varieties were harvested at 120 days.

The three yield trials revealed that D 90 and D 110, the two Photo-period insensitive selections, had more or less equal yield even in late sowing but the standard had decreased yield particularly due to late sowing. At 120 day growth stage D 110 yielded highest fibre. All these indicate the superiority of D 90 and D 110 at 100 day stage and of D 110 at 120-day stage. Basu and Hossain [3] observed more or less equal fibre yield in D 18-7 (insensitive) while the control (sensitive) D 154 had higher yield for April sowing and less for June sowing. From the results it can be concluded that the lines D 90 and D 110 are photo-period insensitive. Further, these two lines are maturing (flowering) in 90 and 110 days and are harvestable at 100-days and 120 days respectively. These lines are superior to the photo-period sensitive standard varieties. Besides, those two selections can be sown as late as June without sacrificing fibre yield i.e., these two have wide sowing time.

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