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Evaluation of Diversity in Sunnhemp (*Crotalaria juncea* L.) Germplasms for Fiber Yield and Yield Attributes

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Abstract

A large number of sunnhemp germplasms collected from different sources were evaluated with respect to fiber yield and yield attributes like plant height, basal diameter, fresh green weight of the harvested plants. Out of 70 germplasms, Hamirpur recorded the highest plant height with moderate basal diameter green weight and fiber yield. Other germplasms having plant height between 280 to 289.8 cm showed the same performance as in Hamirpur. But the germplasm Bombay recorded maximum base diameter, green weight and fiber production (5.77 g/plant) though its plant height was 279.3 cm. However a few germplasms like Bankura, Belgaon, Hasangabad, Sabour, Unnao, Balangir, Jawa Australia M-172, Hardo had fiber yield above 5 g/plant with moderate basal diameter, plant height and green weight. These germplasms including Bombay recorded high fiber content/plant which is the most desirable character. Selfing of each germplasm was induced by covering the individul flower buds. But no pod was set and consequently no seed was produced confirming the self incompatibility existed in all germplasms. To avoid cross pollination and to maintain genetic purity, each germplasm was sown at 200 m isolation distance. Seeds from such isolated individual germplasm should be collected and sun dried before storing in polythene packets.
Key words : Sunnhemp germplasms, Fiber yield, Yield attributes.

Sunnhemp (*Crotalaria juncea* L.) is an important bast fiber crop next to jute. It is a multi-purpose leguminous crop as it not only produces better quality fiber but also enriches the soil by adding atmospheric nitrogen. Plant of sunnhemp are used as green manure and leaves as palatable fodder as well. But its cultivation is not preferred by the farmers for its less fiber yield, though its fiber price is higher than that of jute fiber. Due to its narrow genetic base and self-compatibility barrier the improvement of this crop could not be achieved to the desired level in spite of the best effort by the plant breeders. Only option left for the improvement of this crop is the selection from the natural population and maintenance by growing at a remote place to avoid cross-pollination caused mainly by bumble-bees. The present study deals with the evaluation of the collected sunnhemp germplasms for its growth parameters and yield potentiality to select a suitable and potential germplasms for this agro-climatic region.

Methods

Seventy germplasms of sunnhemp were collected from the All India Co-ordinated Research Project on Jute and Allied Fibers, Kalyani Center, Bidhan Chandra Krishi Viswavidyalaya. During land preparation, phosphorus and potash fertilizers at 30 : 30 kg/ha were added to the soil.

Ten plants selected randomly from the middle two rows of each germplasm were havested at 50% flowering. Plant height, basal diameter, green weight (without leaves) of the harvested ten plants were recorded. After retting of the harvested plants, the fibers were extracted and dry weight of fibers was recorded.

The flower buds of five plants in each germplasm were covered with cotton plugs on the previous afternoon of anthesis. After 3 days, the cotton plugs were removed.

Results and Discussion

The average plant height, basal diameter, green weight and dry fiber weight are given in Table 1. The data indicate the presence of variation in the germplasms with respect to these characters.

The highest plant height (289.3 cm) was recorded

Table 1. Performance of some sunnhemp germplasms out of 70 germplasms studied.

Name of germplasm	Plant height (cm)	Basal diameter (cm)	Green weight per plant (g)	Fiber weight per plant (g)
Hamirpur	289.8	1.20	138.5	4.89
Ballia	289.6	1.17	135.3	4.92
Karnal	287.4	1.09	136.0	4.96
D-3	289.0	0.97	122.1	4.51
Bengal	282.4	1.16	136.4	4.37
Unnao	287.3	1.09	129.1	5.50
Australia M-73	280.8	1.06	116.4	4.14
Guntur	165.2	1.08	107.5	3.29
Jabbalpur	169.4	0.98	101.9	3.09
Bombay	279.3	1.32	153.1	5.77
Bhopal	276.0	1.10	137.0	4.96
SJ-67-34	260.2	1.01	129.0	3.73
Jhalwar	276.4	0.93	107.6	3.43
Bijnor	279.6	1.14	137.5	4.89
K-12 Yellow	217.0	1.03	115.9	4.27
Bhagalpur	250.2	0.92	102.2	3.85
Belgaol	269.7	1.31	158.2	5.19
Hasnabad	264.5	1.28	156.9	5.19
Trichur	241.0	1.02	100.8	3.01
Balanjir	263.2	1.20	147.3	5.48
Hardoi	254.8	1.17	172.8	5.41
K-12 Black	251.4	1.10	118.2	4.42
Madras	258.2	0.98	100.9	3.40
D-20	257.6	1.189	120.8	4.10
Vijaywada	278.5	1.01	122.1	4.12

in the germplasm Hamirpur closely followed by Ballia, D-3, Karnal Bengal, Unnao and Australia M-73 germplasms having plant heights in between 280.8 to 287.4 cm. On the other hand, germplasms Guntur and Jabbalpur had minimum height (165 to 169 cm). Plant height within the range of 270 to 279 cm was noted in the germplasms Bombay, Bhopal, SJ-67-34, Jhalwar, Bijnor, and K-12 yellow. Maximum of the other germplasms had plant height in between 250 to 269 cm. The differential rhythm of growth in plant height in 36 germplasm of capsulairs jute has been reported (1).

The basal diameter varied between 0.9 to 1.32 cm. The maximum diameter (1.32 cm) was recorded in germplasm Bombay having 279.3 cm plant height Hamirpur germplasm recorded the highest plant of 1.20 cm diameter.

The lowest basal diameter (0.93 cm) was observed in Bhagalpur having plant height of 250.2 cm. On the other hand, the germplasms Jabbalpur and Guntur with lowest plant height had 0.98 and 1.08 cm diameter respectively. Differences in basal diameter in 20 capsularis jute germplasms were reported earlier (2).

The plant height and basal diameter indicated that there was no direct relation between these two traits. Thus Harmirpur germplasm without having maximum basal diameter recorded the highest plant height. Similarly germplasms having the lowest plant height showed more than minimum basal diameter. It may be due to inherent characteristics of the individual germplasms.

Variation in green weight/plant was also observed in the germplasms. It ranged between 101.9 g (Jabbalpur with 169.4 cm plant height) and 158.2 g in (Belgaon with 269.7 cm plant height). The second highest green weight (156.9 g) was recorded in Hasnabad having 264.5 cm plant height closely followed by Bombay with 153.1 g green weight and 279.3 cm plant height. In general the higher plant height with moderately high basal diameter around 1.20 cm recorded the higher green weight. It shows that the green weight depends on the growth of the plants i.e. on the plant height and basal diameter.

With respect to fiber yield/plant, variation also exists in the germplasms. The highest fiber yield (5.77 g) was recorded in Bombay having higher plant height (279.3 cm), basal diameter (1.32 cm) and green weight (153.1 g). The lowest yield (3.01 g) was recorded in Trichur having 241.0 cm plant height, 1.02 cm basal diameter and 100.8 g green weight. It is well known that plant height and basal diameter are positively correlated to fiber yield as observed in Bombay germplasm.

However, fiber yield above 5 g/plant was noted in 11 germplasms like Unnao (5.50 g), Balanjer (5.48 g), Hordoi (5.41 g), Bombay had the highest yield (5.77 g). The fiber yield between 4.50 to 4.99 g was recorded in 14 germplasms, between 4.00 to 4.49 g in 25 germplasms, between 3.50 to 3.99 g in 11 germplasm and below 3.5 g in 9 germplasms.

The yield of fiber did not show definite relation with the green weight. The highest green weight (158.2 g) produced by Belgaon yielded 5.19 g fiber 153.1 g green weight of Bombay germplasm yielding 5.77 g fiber which is the highest fiber yield. It shows fiber yielding potentiality is an inherent character of the individual germplasms. The fiber is deposited along the entire length of the stem. The fiber laying ability differs with germplasm which is exhibited in the dif-

ferential yield performance among the germplasms. The differences in plant height, basal diameter, green weight and fiber yield in *olitorius* jute varieties and mutants and their hybrids were also recorded (3). The difference in fiber laying capacity in jute germplasms has been reported earlier (1). On the whole, that best performance regarding fiber yield, the most desirable economic trait was recorded in Bombay germplasm having maximum green weight and base diameter though plant height was slightly less than the highest plant height.

The selfing of the flower buds of plants belonging to different germplasm did not show any positive result. Not a single pod was set due to selfing by covering flower bud with cotton plug. It shows all germplasms were self-sterile.

Artificial cross-pollination is also not successful. Normally pollination is caused by the visit of bumble bee in the process of collecting honey from the flowers.

Obviously, the germplasm Bombay the best performer, should be maintained by sowing seeds in a distinct place to avoid cross-pollination with the pollen of other germplasms.

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