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Short Communication

Inheritance and characteristics of pale green chlorophyll mutant of jute (*Corchorus olitorius* L.)

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Pale green chlorophyll mutant of olitorius jute (*Corchorus olitorius* L.) is distinctly different from the rest of the jute varieties due to pale green colour of the whole plant including the leaves since germination. Inspite of less chlorophyll content, its growth and fibre yield were not affected. This peculiarity prompted study of its different characteristics and pattern of inheritance.

The pale green chlorophyll mutant was crossed reciprocally with full green standard variety, JRO 524. The F_1 seeds were sown with normal spacing (.30cm X 5-7 cm) and basal dose of NPK @ 30:30:30 Kg/hac. F_1 plants were crossed with both parents to raise back cross progenies. The F_2 seeds collected from the F_1 plants were sown as stated above. Fresh leaves from 4th and 5th nodes from apex of both mutant and the standard variety were collected and moisture content was estimated by drying leaves at 75°C for two hours. The chlorophyll content was measured by extracting chlorophyll in 80% acetone and recording absorption at 663 nm and 645 nm of spectrophotometer. Total nitrogen, phosphorus and potash were estimated by modified Kjeldahl method, triacid mixture - Vanandomolybdophosphoric yellow colour method in HNO_3 system and flame photometer respectively.

The chlorophyll content of fresh leaves was 82.02 mg/g, in the pale green mutant and 114.23 mg/g and 106.02 mg/g in the standard varieties JRO 524 and JRO 878 respectively. This shows that due to less chlorophyll content, the colour of the mutant is pale green. (Table 1 and Fig. 1). However, the growth of the mutant plant was not affected. It may be due to the level of chlorophyll being at thresh-hold point or due to the increased efficiency of chlorophyll. This point needs further study to explore the exact cause.

With respect to N, P and K contents in leaves, nitrogen level was equal to that in the standard variety, JRO 524 but phosphorus was less and potash was high in comparison to that in the standard.

The F_1 hybrids out of the reciprocal crossings between the pale green and full green plant had full green colour of the whole population. This indicated the dominance of the full green colour over pale green.

Table 1 Leaf size, moisture, chlorophyll, nitrogen (N), phosphorus (P) and potash (K) content in the leaves of the pale mutant and the controls.

Variety	Length (cm)	Breadth (cm)	Moisture %	Chlorophyll mg/g	N (%)	P (%)	K (%)
JRO 524	15.04	6.16	87.23	114.23	2.60	1.08	2.84
JRO 878	19.12	7.24	85.97	106.39	2.87	0.92	2.43
Pale Green	16.50	6.28	88.08	82.02	2.73	0.78	3.12

The F_2 population exhibited segregation of full green and pale green plants (3:1), which clearly shows the monogenic control of the green colour of the plants where full green colour is dominant over the pale green. This was further proved by the segregation of back cross population into full green and pale green plan in the ratio of 1:1 (Table 2).

Table 2. F_1 and segregation in F_2, BC_1 and BC_2 and ratio in the crossing of pale green and full green standard variety, JRO 524

Generation	Full green frequency	Pale green frequency	Expected ratio	χ value	P 0.05 0.01
F_1 (Pale gr. X Full Gr.)	All Full green				
Reciprocal	Do				
F_2 (Pale gr. X Full Gr.)	710	251	3:1	0.641	3.841 5.991
Reciprocal	596	209	3:1	0.397	Do
BC_1 (F_1 X Pale Gr.)	365	327	1:1	2.086	Do
BC_2 (F_1 X Full. Gr.)	All Full Green				

The yellow mutant was recessive to full green which was under monogenic control of inheritance (2).

Fig. 1(a) Pale green mutant - Rupali (b) Full green standard JRO 524

The olitorius plants have been divided into three groups based on the pigmentation of the whole plant and these are (a) deep red (b) red and (c) green. (1, 3). The segregation in the F_2 population of the hybrids out of the reciprocal crossings between full green and pale green plants has proved the dominance of full green colour over the pale green colour. On this observation the earlier three groups is suggested to be modified into four groups such as (a) deep red (b) red (c)) full green and (d)) pale green.

The pale green strain of olitorius jute was included in the Initial Evaluation Trial of All India Network Project on Jute and Allied Fibres under the code name of BC 4. The yield was promising and on average the fibre yield was 27.85 q/hac against 28.35 q/hac in the control, JRO 524 variety i.e. the yield was almost at per with the control (4).

The fibre yield was not affected in the pale green strain inspite of less chlorophyll content. This point needs study in depth to understand the exact picture of the chlorophyll in the pale green plants. However, the pale green colour of the jute plants is certainly a marker character of identification and since it is the recessive trait any natural crossing would be exposed in the first generation. Hence, incorporation of such character in a variety would help in maintaining the genetic purity of the variety.

References

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