

Selection Prediction for Yield of Fibre in Jute (*Corchorus capsularis* and *C. olitorius*)

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Abstract: Field experiment was conducted with three cultivated varieties of *C. capsularis* and of *C. olitorius* to study the performances of yield and yield contributing characters at four harvest stages, 50, 70, 90 and 110 days. Wide ranges of co-efficient of variation was observed in each harvest stage in three characters. Two morphological characters, plant height and base diameter have been used for selection of jute plants with higher fibre yield. However, for selection purpose, these method needs a long time to wait until flowering. An early selection method was developed by studying morphological components and fibre yield. Using these methods breeders can do their selection process earlier prior to maturity e.g., at 70 or 90 days age of the plants. This could enable jute breeders to discard most of the segregating population for higher fibre yield at an earlier stage, which could save considerable amounts of time and labour.

Key words: Selection, prediction, yield, jute, co-efficient, variability, harvest

Introduction

Jute is an important bast fibre crop apart from cotton. It has an increasing demand for the preparation of substitute materials of synthetics. Fibre yield of this crop is dependant on some morphological characteristics such as base diameter and plant height (Ali, 1994; Shaikh *et al.*, 1980; Islam *et al.*, 1995). The crop is usually harvested at the time of average flowering, which occurs within 110-120 days from the date of sowing. Breeders usually select desirable plant materials primarily based on two morphological characteristics, plant height and base diameter. Preliminarily selection process is made before the first flowering stage and this bound jute breeders to wait a long time. A selection method applicable in the early stages of plant growth would save considerable amount of time and labour. Talukder (1990) reported that yield increased linearly with the duration of the crop in the field. Responses of stage of harvest to yield have also reported (Islam *et al.*, 1995; Weng *et al.*, 1990), but the technique of selection of breeding materials at earlier stages of growth has not yet been established. This report discussed the possibility of applying this earlier selection method for screening breeding materials at earlier stages which would save breeding time and effort.

Materials and Methods

Three varieties of *C. capsularis*, CVL-1, CVE-3, D-154 and three varieties of *C. olitorius*, O-9897, OM-1 and O-4 were used in this study. The materials were grown in a complete randomized block design. Each variety was sown in a row of 3.33m long. The inter and intra row spacing were 30 and 5cm, respectively. The stages of harvest (age of plant after emergence) of plants were 50, 70, 90 and 110 days. Thirty plants were harvested at random from each variety (15 from each replication) from each stage of harvest. Following the method advocated by Islam *et al.* (1995).

After harvest at each stage plant height and base diameter of the plants were recorded. Plants were then retted in a concrete retting tank. After retting and extraction the dry weight of fibres and sticks were also recorded. Standard deviation and co-efficient of variability were calculated (Zaman *et al.*, 1982).

Results

A wide range of variability were observed in plant height, base diameter, fibre weight and stick weight of both *C. capsularis* and *C. olitorius* at 50, 70, 90 and 110 days ages of plants (Table 1). Plant height, base diameter, fibre weight and stick weight at 50, 70, 90 and 110 days ages of the plants ranges from 6.85-13.77, 4.51-14.01, 10.35-31.88 and 10.22-32.52% in *C. capsularis* and 2.46-5.13, 4.28-14.74, 8.66-18.67 and 10.74-17.39% in *C.*

olitorius. The values of above parameters of both *C. capsularis* and *C. olitorius* showed an increasing trend from 50 to 110 days and were higher at 110 days. In *C. capsularis* plant height, base diameter, fibre weight and stick weight at 50 day, were 0.49m, 5.36mm, 0.69g and 1.09g; at 70 days 1.16m, 11.08mm, 1.55g and 2.97 g; at 90 days 1.97m, 16.99mm, 4.71g and 8.69g; and at 110 days 2.5m, 22.97mm, 8.79g and 16.0g respectively. In *C. olitorius* the above parameters at 50 days were 1.30 m, 10.85 mm, 1.51g and 2.28g; at 70 days were 2.03m, 13.17mm, 4.61g and 9.46g; at 90 days were 2.5m, 15.4mm, 7.96g and 17.0g and at 110 days 3.09m, 18.82mm, 15.58g and 38.5g respectively. The response of plant height and base diameter of 3 cultivated varieties of *C. capsularis* D-154, CVE-3 and CVL-1, were similar in each growth stages (Table 2). However, fibre weight and stick weight was higher in variety CVL-1 in all the stages.

C. olitorius varieties also responded similarly at different growth stages. Variety O-4 gave higher yield at 50 days, O-9897 at 70 days, OM-1 at 90 days and again O-9897 at 110 days. This means that the response of the varieties at different stages varies and this may be due to some genetic differences among the varieties. The mean values of plant height, base diameter, fibre weight and stick weight at different stages of both *C. capsularis* and *C. olitorius* species showed that the response of *C. olitorius* species was better compared to that of *C. capsularis*.

Discussion

Fibre yield in jute is a complex character and is being controlled by many genes (Ali, 1994). The apparent influences of yield contributing characters in jute are usually confirmed by the positive correlation coefficient of most of these characters with fibre yield. Significant positive correlation of base diameter and plant height with fibre yield has been reported earlier by many workers (Ali, 1994, 1993, 1984; Shaikh *et al.*, 1980; Rakshit, 1977) and the this study is in agreement with these reports. The wide range of co-efficient of variability of the characters of both *C. capsularis* and *C. olitorius* at different growth stages indicates widest scope for selection of stages in these characters. Fibres weight and stick weight of both species shows higher co-efficient of variability in all growth stages indicating scope for selection at earlier stages, e.g., at 70 or 90 days.

The magnitude of relationship of these characters to fibre yield at different stages of different varieties of both *C. capsularis* and *C. olitorius* jute has been established. This suggests that the values of plant height, base diameter and fibre yield at one stage predict the values at other stages as the values showed an linear increasing trend from lower to higher stages i.e. from 50 to 110

Ali *et al.*: Selection, prediction, yield, jute, co-efficient, variability, harvest

Table 1: Mean, range, standard deviation and co-efficient of variation of some morphological characters of *Corchorus capsularis* and *C. olitorius* at different growth stages

| Characters | Growth stages | | | | | | | | | | | | | | | |
|-----------------------------|---------------|-------|------|-------|-------------|-------|------|-------|------------|-------|------|-------|------------|-------|------|-------|
| | 50 days | | | | 70 days | | | | 90 days | | | | 110 days | | | |
| | Range | Mean | SD | CV% | Range | Mean | SD | CV% | Range | Mean | SD | CV% | Range | Mean | SD | CV% |
| <i>C. capsularis</i> | | | | | | | | | | | | | | | | |
| PH (m) | 0.62-0.39 | 0.49 | 0.67 | 13.77 | 1.28-1.03 | 1.16 | 0.08 | 6.85 | 2.34-1.69 | 1.97 | 0.22 | 11.19 | 2.82-2.18 | 2.50 | 0.10 | 8.45 |
| BD (mm) | 6.50-4.28 | 5.36 | 0.75 | 14.01 | 12.32-9.92 | 11.08 | 0.50 | 4.51 | 19.60-14.4 | 16.99 | 1.80 | 13.29 | 28.54-19.6 | 22.97 | 2.37 | 10.28 |
| Fibre wt. g/plant | 0.71-0.66 | 0.69 | 0.19 | 11.14 | 1.20-2.0 | 1.55 | 0.16 | 10.35 | 8.00-2.2 | 4.71 | 1.50 | 31.88 | 12.50-4.5 | 8.79 | 1.79 | 20.48 |
| Stick wt. g/plant | 1.14-1.05 | 1.09 | 0.29 | 10.95 | 3.80-2.2 | 2.97 | 0.30 | 10.22 | 15.80-4.0 | 8.69 | 2.83 | 32.52 | 24.50-9.0 | 16.00 | 2.91 | 17.43 |
| <i>C. olitorius</i> | | | | | | | | | | | | | | | | |
| PH (m) | 1.46-1.12 | 1.3 | 0.06 | 5.13 | 2.23-1.90 | 2.03 | 0.23 | 2.9 | 2.70-2.37 | 2.50 | 0.05 | 2.46 | 3.1-2.76 | 3.09 | 0.13 | 4.14 |
| BD (mm) | 12.38-9.74 | 10.85 | 0.49 | 4.53 | 14.20-12.20 | 13.17 | 0.64 | 4.88 | 17.40-14 | 15.40 | 0.67 | 4.28 | 26.4-15.4 | 18.82 | 2.85 | 14.74 |
| Fibre wt. g/plant | 2.00-1.0 | 1.51 | 0.28 | 18.67 | 5.50-4.0 | 4.61 | 0.39 | 8.66 | 10.00-6.0 | 7.96 | 1.19 | 14.94 | 25.0-13.0 | 15.58 | 2.14 | 13.00 |
| Stick wt. g/plant | 3.00-1.8 | 2.28 | 0.25 | 10.74 | 12.00-7.0 | 9.46 | 1.29 | 13.49 | 21.00-11.0 | 17.00 | 2.93 | 17.39 | 65.0-28.0 | 38.50 | 6.55 | 16.39 |

Table 2: Comparative study of some morphological characters and fibre yield in some cultivated varieties of *C. capsularis* and *C. olitorius*

| Varieties | Growth stages | | | | | | | | | | | | | | | |
|-----------------------------|---------------|---------|-------------------|-------------------|---------|---------|-------------------|-------------------|---------|---------|-------------------|-------------------|----------|---------|-------------------|-------------------|
| | 50 days | | | | 70 days | | | | 90 days | | | | 110 days | | | |
| | PH (m) | BD (mm) | Fibre wt. g/plant | Stick wt. g/plant | PH (m) | BD (mm) | Fibre wt. g/plant | Stick wt. g/plant | PH (m) | BD (mm) | Fibre wt. g/plant | Stick wt. g/plant | PH (m) | BD (mm) | Fibre wt. g/plant | Stick wt. g/plant |
| <i>C. capsularis</i> | | | | | | | | | | | | | | | | |
| D-154 | 0.51 | 5.45 | 0.69 | 1.08 | 1.13 | 10.61 | 1.37 | 2.80 | 1.96 | 16.63 | 4.92 | 9.47 | 2.41 | 21.21 | 7.75 | 14.50 |
| CVE-3 | 0.49 | 5.34 | 0.66 | 1.05 | 1.18 | 11.52 | 1.50 | 2.92 | 1.98 | 16.78 | 4.22 | 7.62 | 2.50 | 22.85 | 8.12 | 12.75 |
| CVL-1 | 0.48 | 5.31 | 0.71 | 1.14 | 1.18 | 11.12 | 1.80 | 3.20 | 1.97 | 17.57 | 5.00 | 9.00 | 2.59 | 24.86 | 10.50 | 20.76 |
| Mean | 0.49 | 5.37 | 0.69 | 1.09 | 1.16 | 11.08 | 1.56 | 2.97 | 1.97 | 16.99 | 4.71 | 8.70 | 2.50 | 22.97 | 8.79 | 16.00 |
| <i>C. olitorius</i> | | | | | | | | | | | | | | | | |
| O-9897 | 1.21 | 10.29 | 1.37 | 2.12 | 1.98 | 13.06 | 4.87 | 8.37 | 2.53 | 16.30 | 7.75 | 15.25 | 3.25 | 20.95 | 18.25 | 43.50 |
| O-4 | 1.36 | 10.94 | 1.72 | 2.67 | 1.15 | 13.33 | 4.70 | 10.50 | 2.57 | 14.45 | 7.62 | 18.50 | 3.06 | 17.50 | 14.25 | 38.75 |
| OM-1 | 1.34 | 11.32 | 1.45 | 2.07 | 1.96 | 13.12 | 4.25 | 9.50 | 2.41 | 15.45 | 8.50 | 17.25 | 2.97 | 18.00 | 14.25 | 33.25 |
| Mean | 1.30 | 10.85 | 1.51 | 2.28 | 1.69 | 13.17 | 4.61 | 9.45 | 2.50 | 15.40 | 7.95 | 17.00 | 3.09 | 18.82 | 15.58 | 38.50 |

PH = Plant height, BD = Base diameter

days. These could be used in screening and selection of breeding materials at an earlier stage and that could be 70 or 90 days. Selection of materials at either of the stages would enable jute breeders to discard most of the individuals, which are segregating for lower fibre yield. This will drastically reduce the plant population normally handled in a breeding programme. Usually three or four generation must be required to observed the segregation patterns and to select true breeding materials.

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