

Productivity and profitability of *tossa* jute (*corchorus olitorius*) under different weed management practices in jute – *toria* cropping system

K.DAS, B.GUHA AND A.S.N.ZAMAN

Regional Agricultural Research Station, Assam Agricultural University, Shillongani, Nagaon 782002.

Abstract : A field experiment was conducted during 2005-06 and 2006-07 in the experimental farm of Regional Agricultural Research Station, Shillongani, Nagaon, Assam to study the effect of different chemical and cultural methods of weed control in *tossa* jute on fibre yield and economics of weed management practices. Among all the methods of weed management, cultural method of weed control by two hand weeding (at 3 and 5 WAS) resulted the tallest plant height, basal diameter, lowest dry weight of weeds by the jute crop which ultimately resulted the highest fibre yield. Another cultural management *viz.* mulching with locally available cheap organic waste (wheat straw) @ 10 t/ha recorded the second highest fibre yield which was only 4.3 per cent lower than the highest fibre yield. Among chemical control method Quizalofop ethyl @ 50g ai/ha + adjuvant @ 1ml/lit of water (21 days post emergence) + one hand weeding recorded the highest fibre yield. The highest net return and B:C ratio was recorded under mulching with locally available cheap organic waste (wheat straw) @ 10 t/ha treatment. Second highest B:C ratio was obtained under Intercropping of jute + red amaranthus treatment followed by Quizalofop ethyl @ 50g ai/ha + adjuvant @ 1ml/lit of water (21 days post emergence) + one hand weeding treatment. There was no residual effect of weed control treatments on *toria* yield.

Key words: Cropping system, *toria*, *tossa* jute and weed

Introduction

Jute is an important fibre crop of Assam and it ranks third position in both area and production. Traditionally jute is sown as broadcast with pre monsoon shower in the month of March and April. Intensity of weed generally remains high during early phase (21-45 days after sowing) unless proper care is taken. The weed suppresses the crop and much of the fibre yield is lost upto 80% (Mishra, 1997). Yield can be increased if the crop is saved from the weed competition. Manual weeding is becoming expensive which contributes toward 40% of the total cost of cultivation (Saraswat, 1980). Assam is having hot and

humid climate and heavy rainfall during jute season encourages good growth and yield of jute. These factors also encourage profuse growth of weeds. Therefore, top priority is to be given for controlling of weeds in time to ensure high fibre yield. Usually grasses are dominant weeds at the early part of the crop growth; while broad leaved weed at the later part (Tosh, 1977). Keeping this view the present study was under taken to reduce the crop weed competition and to suppress the weed growth at early stage of jute crop.

Materials and Methods

The experiment was carried out at the Regional Agricultural Research Station, Assam

Table 1. Yield attributing characters and fibre yield of jute, seed yield of toria and jute equivalent yield in jute-toria cropping system as affected by different weed control method for jute (pooled of 2 years)

| Treatment | Plant height (cm) | Basal diameter (cm) | Fibre yield of jute (q/ha) | Seed yield of toria (q/ha) | Jute equivalent yield (q/ha) | Net return (Rs./ha) | B:C ratio |
|--|-------------------|---------------------|----------------------------|----------------------------|------------------------------|---------------------|-----------|
| Quizalofop ethyl @ 50g ai/ha + adjuvant @ 1ml/lit of water (21 days post emergence) + one hand weeding | 283.2 | 1.16 | 23.87 | 7.68 | 32.13 | 17664 | 1.85 |
| Trifluralin @ 0.50 kg ai/ha at 1 day before sowing + one hand weeding | 273.3 | 1.14 | 21.25 | 7.59 | 29.43 | 14419 | 1.69 |
| Trifluralin @ 0.75 kg ai/ha at 1 day before sowing + one hand weeding | 275.9 | 1.15 | 22.40 | 7.69 | 30.69 | 15890 | 1.76 |
| Trifluralin @ 1.00 kg ai/ha at 1 day before sowing + one hand weeding | 276.8 | 1.14 | 22.09 | 7.72 | 30.42 | 15507 | 1.74 |
| Mulching with locally available cheap organic waste @ 10 t/ha | 304.7 | 1.20 | 27.02 | 7.90 | 35.55 | 21372 | 2.01 |
| Intercropping of jute + red amaranthus | 291.2 | 1.17 | 24.49 | 7.68 | 32.77 | 18090 | 1.86 |
| Two hand weeding at 3 and 5 weeks after sowing | 313.2 | 1.22 | 28.22 | 7.89 | 36.73 | 19862 | 1.82 |
| Weedy check | 200.3 | 0.93 | 14.96 | 7.84 | 23.42 | 8657 | 1.45 |
| CD (P=0.05) | 10.9 | 0.02 | 2.17 | NS | 2.12 | | |

Table 2. Dry weights of weeds and weed control efficiency at different crop age of jute crop in jute-toria cropping system as affected by different weed control method for jute (pooled of 2 years)

| Treatment | Dry weight of weeds (kg/ha) | | | Weed control efficiency (%) | | |
|--|-----------------------------|--------|------------|-----------------------------|--------|------------|
| | 15 DAS | 50 DAS | At harvest | 25 DAS | 50 DAS | At harvest |
| Quizalofop ethyl @ 50g ai/ha + adjuvant @ 1ml/lit of water (21 days post emergence) + one hand weeding | 179.1 | 497.1 | 1243.8 | 45.16 | 42.02 | 51.41 |
| Trifluralin @ 0.50 kg ai/ha at 1 day before sowing + one hand weeding | 134.1 | 620.8 | 1787.0 | 58.94 | 27.60 | 30.20 |
| Trifluralin @ 0.75 kg ai/ha at 1 day before sowing + one hand weeding | 114.7 | 511.1 | 1468.1 | 64.88 | 40.39 | 42.65 |
| Trifluralin @ 1.00 kg ai/ha at 1 day before sowing + one hand weeding | 105.5 | 486.5 | 1436.9 | 67.70 | 43.26 | 43.87 |
| Mulching with locally available cheap organic waste @ 10 t/ha | 68.6 | 328.8 | 1033.3 | 78.99 | 61.65 | 59.64 |
| Intercropping of jute + red amaranthus | 61.3 | 329.1 | 1252.1 | 81.23 | 61.62 | 51.09 |
| Two hand weeding at 3 and 5 weeks after sowing | 308.8 | 54.2 | 604.2 | 5.46 | 93.68 | 76.40 |
| Weedy check | 326.6 | 857.4 | 2560.0 | | | |
| CD (P=0.05) | 24.7 | 120.9 | 200.5 | | | |

Agricultural University, Shillongani, Nagaon, Assam during 2005-06 and 2006-07 to study the effect of chemical and cultural practices in controlling weeds. There were eight treatments viz. Quizalofop ethyl @ 50g ai/ha + adjuvant @ 1ml/lit of water (21 days post emergence) + one hand weeding at 7-10 days after application; Trifluralin @ 0.50 kg ai/ha at 1 day before sowing + one hand weeding at 3 weeks after sowing ; Trifluralin @ 0.75 kg ai/ha at 1 day before sowing + one hand weeding at 3 weeks after sowing; Trifluralin @ 1.00 kg ai/ha at 1 day before sowing + one hand weeding at 3 weeks after sowing; Mulching with locally available cheap organic waste (wheat straw) @ 10 t/ha; Intercropping of jute + red amaranthus; Two hand weeding at 3 and 5 weeks after sowing and Weedy check. The treatments were replicated four times in a randomized block design. The soil of the experimental plot was clay loam in texture, acidic in reaction (pH 5.6) with 280, 23 and 163 kg/ha of available N, P₂O₅ and K₂O, respectively. Full doses of phosphorus and potash were applied as basal and half of nitrogen at 3 weeks after sowing and remaining half of nitrogen were applied at 5 weeks after sowing. Jute variety 'JRO 524' was sown with the spacing of 25cm between rows and harvested at 125 days of crop age. Residual effect was studied on succeeding crop *Toria* variety 'M 27' with 50% recommended doses of fertilizers (recommended dose 60:30:30). Weeds from 0.25 m² at 15 and 50 days after sowing and at harvest were collected from jute field and kept in oven for drying after washing and their weed dry weight was recorded and converted to kg/ha. Weed Control Efficiency (WCE) was calculated by using following formulae

$$\text{WCE} = \frac{\text{WDWC} - \text{WDTP}}{\text{WDWC}} \times 100$$

Where,

WDWC = Weed Dry weight of weedy check

WDTP = Weed Dry weight of treated plots

Results and Discussion

The major weed flora recorded in the experimental field was *Echinochloa crus-galli* (L) Beauv., *Echinochloa colonum* (L) Link., *Cyperus iria* (L), *Cyperus rotundus* L, *Cyperus difformis*, *Fimbristylis miliacea* (L) Gaertn., *Mimosa pudica* (L), *Commelina spp.*, *Cynodon dactylon* (L) Pers., *Ipomea aquatica* Forsk., *Celosia argentea* (L)

Weed Control Efficiency (WCE)

Weed Control Efficiency (WCE) at 15 DAS was found to be the highest under cultural management practices. Its value was the highest in the treatment Intercropping of jute + red amaranthus followed by Mulching with locally available cheap organic waste @ 10 t/ha (Table 3). The WCE was the lowest in the treatment Two hand weeding at 3 and 5 weeks after sowing as weed samples were taken before weeding. Among chemical weed control method, it was the highest under Trifluralin @ 1.00 kg ai/ha at 1 day before sowing + one hand weeding. At 50 DAS, WCE was the highest in the treatment Two hand weeding at 3 and 5 weeks after sowing as two weeding were done before weed record. Between chemical and cultural management practices, cultural management practices showed the highest WCE. The value was the highest in the treatment Mulching with locally available cheap organic waste @ 10 t/ha and it was almost same in the treatment Intercropping of jute + red amaranthus. Among chemical weed control management practices the lowest WCE was recorded in Trifluralin @ 0.50 kg ai/ha at 1 day before sowing + one hand weeding and the highest in Trifluralin @ 1.00

kg ai/ha at 1 day before sowing + one hand weeding. At harvest, WCE was the highest in the treatment Two hand weeding at 3 and 5 weeks after sowing due to fast growing of jute crop after two manual weeding and suppress the weed growth. Between two cultural management practices Mulching with locally available cheap organic waste @ 10 t/ha showed the highest WCE followed by Intercropping of jute + red amaranthus Among chemical methods, Quizalofop ethyl @ 50g ai/ha + adjuvant @ 1ml/lit of water (21 days post emergence) + one hand weeding the highest its values. The highest value of WCE might be due to lower dry weight of weeds.

Fibre yield of jute, seed yield of toria and jute equivalent yield

Jute: The effect of weed control treatments on yield attributing characters was reflected in the fibre yield of jute. The tallest plants with the highest basal diameter in the treatment Two hand weeding at 3 and 5 weeks after sowing resulted the highest fibre yield of 28.22 q/ha which was closely followed by the treatment Mulching with locally available cheap organic waste @ 10 t/ha (27.02 q/ha). Both these two treatments were statistically at par and were significantly higher than all other treatments (Table 1). The highest yield of jute fibre under manual weeding treatment was also obtained by Das *et al* (1994). Better control of weeds under these two treatments favoured the jute crop to absorb more nutrients from soil resulting increased plant height, higher basal diameter and ultimately the highest fibre yield. Yields under chemical control of weeds ranged from 21.25 to 23.87 q/ha and increased over weedy check (14.96 q/ha) treatment by 42.0 to 59.7 percent.

Toria: The seed yield of *toria* did not influenced by the weed control treatments applied in jute crop. The seed yield *toria* ranged from 7.59 to 7.90 q/ha.

Jute equivalent yield: The highest jute equivalent yield was recorded in the treatment Two hand weeding at 3 and 5 weeks after sowing and this was followed by “Mulching with locally available cheap organic waste @ 10 t/ha treatment. Both the treatments were significantly higher than all other treatments. Among the chemical weed control treatments, Quizalofop ethyl @ 50g ai/ha + adjuvant @ 1ml/lit of water (21 days post emergence) + one hand weeding showed the highest jute equivalent yield.

Economic analysis

Mulching with locally available cheap organic waste @ 10 t/ha treatment produced the second highest fibre yield, but recorded the highest net return and B:C ratio (2.01), while the second highest net return was obtained under Two hand weeding at 3 and 5 weeks after sowing treatment which gave the highest fibre yield. High cost of labour for two hand weeding (3 and 5 WAS) resulted higher cost of cultivation and ultimately lower net return and lower B:C ratio (1.82). Though fibre yield under Intercropping of jute + red amaranthus treatment was lower (24.49 q/ha) than other two cultural weed management treatments required low cost for growing amaranthus, and hence recorded the second highest B:C ratio (1.86). Among chemical weed control Quizalofop ethyl @ 50g ai/ha + adjuvant @ 1ml/lit of water (21 days post emergence) + one hand weeding treatment recorded almost similar net return (Rs 17664/ha) and B : C ratio (1.85) as that of Intercropping of jute + red amaranthus (net return Rs 18090/ha and B:C ratio 1.86)

Hence, it can be stated that to get higher net return and B:C ratio, Mulching with locally available cheap organic waste @ 10 t/ha is the best followed by Intercropping of jute + red amaranthus. However, to get higher fibre yield two hand weedings (3 and 5 WAS) are the best. It is obvious that cultural practices required more labourers. Thus under labour scarce conditions application of Quizalofop ethyl @ 50g ai/ha for control of weeds would be beneficial.

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