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Short communication

Weed smothering in jute with green gram intercropping

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Jute (*Corchorus olitorius* L.), a natural fibre crop, is grown by resource poor farmers of South East Asian countries namely, India, Bangladesh, Nepal, Myanmar, Thailand *etc*. Of late, jute is losing its commercial significance due to the stiff competition from its plastic counterparts. The net return from jute cultivation is poor owing to its high cost of cultivation (Ghorai 2008). About 40 per cent of the total cost of cultivation of jute goes in weeding process alone (Ghorai 2013). The fibre yield loss up to 90% has also been recorded if not weeded at proper time. Selective herbicides commercially used in jute can control monocots and some dicot weeds only (Ghorai *et al.* 2015). Inclusion of pulses as intercrop in jute smothered dicot and sedge weeds up to 54% (Ghorai *et al.* 2010). Moreover, this system provides nutritional security, improve soil health and strengthen the economy of poverty stricken jute farmers. There is also scanty information about viable intercropping system in jute with greengram. Thus, the experiment was conducted to develop suitable protocol for intercropping jute with greengram (1:1) that will smother weeds, increase system productivity and strengthen jute farmers' economy. Weed control efficiency of this intercropping system was also compared with other weed control methods.

The experiment was conducted at ICAR-CRIJAF farm in randomised block design (RBD) with eleven treatments (Table 1) replicated thrice during 2011-2013. The experimental soil was sandy clay loam in texture with 44% sand, 28% silt and 28% clay. Its available nitrogen, phosphorus and potassium content was 180, 34 and 133 kg/ha, respectively. The date of sowing varied from 19th to 23rd March in different years. For intercropping, jute cultivar '*JRO-204'* and green gram cultivars of different maturity like '*PM4* (65 days), '*PM5*' (55-60 days), '*RMG-62'* (55-60 days), '*Sukumar'* (55-60 days) were sown alternately in 1:1 ratio at different spacings (25-35 cm) in between jute row. Jute and green gram seed rates were 3.5 and 15-25 kg/ha, respectively. One post sowing irrigation was applied for proper germination of green gram and jute seeds. Butachlor 50 EC 1.0 kg/ha was used as pre-emergence herbicide in jute and green gram intercropping system. CRIJAF nail weeder (Patent application number: 386/KOL/2010, dated 5/4/2010) was used for mechanical weed control, line arrangement and soil mulching in broadcast jute. CRIJAF herbicide applicator (Patent application number: 319/KOL 2010 dated 28/3/2010) was used for directed application of glyphosate 41% SL in inter row space. As check, two manual weeding was used. For crop nutrition, a basal dose of N:P:K::20:70:70 was applied for intercrop. Top dressing of nitrogen was done 60 kg/ha after green gram harvest (55-65 days) with one irrigation. For sole jute, dose of fertilizers was N:P:K::60:30:30 . Irrigation was applied during top dressing after harvest of pulses near 55-60 days after sowing.

On the same day of sowing, chloropyriphos was sprayed to prevent loss of green gram seed from bird and insect damage. Bavistin 2 g/l and imidacloprid 0.3 g/l together were sprayed at 15 days intervals to save pulse crop from sucking insect attack and fungi attack. Emamectin benzoate was sprayed to control pod borer 0.3 g/lit. Deltamehrin 1.5 ml/l was sprayed to control pulse pod sucking bugs. Green gram was harvested by uprooting or picking pods at 90-100 per-cent pod maturity.

Weed flora

The weed flora found in jute field consisted of i) grasses: *Echinochloa colona* (barnyard grass), *Digitaria* spp., *Eleusine* spp. and *Cynodon dactylon*, *Brachiaria repens*, *Setaria* spp, *Brachiaria ramosa*; ii) sedges: *Cyperus rotundus*, *Cyperus difformis* and iii) broad-leaved weeds: *Eclipta alba*, *Phylanthus niruri*, *Portulaca* spp. *Trianthema* spp., *Euphorbia hirta*, *Celosia argentia*.

Weed control and economics

Weed control efficiency of intercropping system was much higher (68-82%) than conventional manual weeding twice (63.62%). Benefit: cost ratio under this system varied between 2.2 to 2.46 over 1.80 only in manual weeding process. CRIJAF nail weeder and

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Table 1. Fibre equivalent yield, weed control efficiency and economics of different weed management practices (pooled data of three years)

Treatment	Fibre equivalent yield[#] (t/ha)	Weed control efficiency (%)	Net return (x10^3 `/ha)	Benefit cost ratio
Jute (30 cm) + *PM-4* + butachlor 50 EC1 kg /ha +1HW	4.95	71.61	90.40	2.25
Jute (35 cm) + *PM-5* + butachlor 50 EC 1 kg /ha +1HW	4.81	68.04	86.81	2.23
Jute (30 cm) + sukumar + butachlor 50 EC 1 kg /ha +1HW	4.71	82.19	840.27	2.19
Jute (25cm) + *RMG-62*, butachlor 50 EC 1 kg/ha +1HW	5.26	69.27	102.21	2.46
Jute (25 cm)+ CRIJAF nail weeder twice (5 and 21 DAS) +1HW	3.91	84.33	65.61	2.07
Open furrow (25 cm) sowing of jute + butachlor 50 EC 1 kg +1HW	3.59	57.19	52.42	1.83
Butachlor 50 EC 1 kg/ha + glyphosate 0.8 kg SL/ha at 21 DAS (directed spray using hood) + 1 HW (25 cm)	3.77	82.19	62.74	2.06
Two manual weeding in jute (25 cm), 15 and 21 DAS	3.90	63.62	56.19	1.80
Jute + okra (cv. *Shakti*) [(2:1, 25 cm, okra sown 3rd week of November). + 2 HW)	5.67	81.93	105.77	2.31
Unweeded control (25 cm)	1.30	0	-19.45	0.69
Glyphosate 1.23 l SL/ha by CRIJAF herbicide applicator at 20 DAS (25 cm) + 1 HW	4.08	81.93	75.46	2.28
LSD. (P=0.05)	0.21	15.25	11.87	0.262

HW:- Hand weeding; [#]inclusive of jute stick and pulse waste

herbicide applicator recorded higher weed control efficiency (82 to 84%) and B:C ratio (2-2.28) over conventional manual weeding twice. The green gram in intercropping system produced 2 t/ha of green gram wastes (average nitrogen 2.35%, analysed using 2030 Kjeltech analyser unit, Foss Tecator) which is equivalent to 10 tonnes of farmyard manure (FYM). If incorporated in jute soil, it will improve the soil health. It can also be used as nutritious fodder. The system has been found to be remunerative and sustainable for resource poor jute farmers.

System productivity

Jute-green gram intercropping system improved the system productivity. The jute equivalent yield varied from 4.7 to 5.3 t/ha where sole jute production was around 3.9 t/ha only (Table 1). Intercropping system recorded 2.8-3.0 t jute fibre/ha along with 0.7-1.0 t/ha pulse grain (depending on grain size). Intercropping system of jute (25 cm) + '*RMG 62*' recorded significantly higher jute equivalent yield (JEY). The comparatively short stature of *'RMG-62'* fitted well in normal jute spacing (25 cm). Higher price of this grain (small shiny and polished) increased the JEY compared to other green gram varieties.

SUMMARY

Jute equivalent yield varied from 4.7 to 5.3 t/ha and was profitable over sole cropping of jute, 3.9 t/ha only. Weed control efficiency of intercropping system was 68-82% over 63.6% in conventional manual weeding twice. Benefit-cost ratio of jute and green gram intercropping system varied between 2.2 to 2.46 over 1.8 in conventional manual weeding twice. CRIJAF nail weeder and CRIJAF herbicide applicator recorded higher weed control efficiency (82 to 84%) and B:C ratio (2-2.28) over conventional manual weeding twice (63.62% and 1.80). This jute and green gram intercropping system will improve jute farmers economy, provide protein security to rural mass, and take care of soil and animal health in rural sector.

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