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Weed Smothering (*Corchorus olitorius* L.) in Jute by its High Density Broadcast Sowing, using Cover Crop Principle

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A B S T R A C T

Jute being a C3 crop, it cannot compete with the C4 weeds at its early stage and about 40 per cent of total cost of cultivation of jute goes in weeding process alone. Upsurge of new weed flora, labour scarcity, herbicidal resistance and its environmental concern and slow mechanization urged us to control weeds in jute field by its smothering effect. Experiments were conducted at ICAR-CRIJAF, Barrackpore, WB in 2018-19, 2019-20 & 2020-21 with jute (cv. NJ-7010) by its high density broadcast sowing (seed rate @ 6.0 to 7.5 kg/ha). Irrigation, fertiliser and pesticides requirements were standardised for this purpose. Only 45 cm wide strip (5% of total area) around the jute field was manually weeded to prevent seed formation of weeds in boarder areas. The dense jute canopy (200-348 /m2) of 29 cm mean height at 25- DAS reduced the incident light at jute base by 90-95 per cent and dominated all C4 weeds. In this 1st year it reduced the grass, broadleaf, sedges weed population (max 52 m2) and weed bio mass by 98, 98.5, 64.5 and 91.65 per cent respectively over manual weeding twice. Next year at 25 DAS it reduced the grass sedges weed population by 70, and 62% respectively over initial status. In third year most of the grass (507/m2), broadleaved (504/m2) and sedges (52/m2) were smothered by its cover crop effect at early stage (25 DAS). Remaining weeds were rudimentary, incapable of producing seeds. In consecutive three years out, of 20.7 lakh (40 DAS), 26.8 (25 DAS), 34.8 l lakh jute plants/ha (15 DAS), only 3.3, 6.3 and 7.64 lakhs jute plants/ha i.e., 16, 23.5 and 22 % of total initial population were found effective and harvested (125 to135 DAS). The improved experiment of 2nd and 3rd year produced 3.837 & 3.798 t fibre/ha respectively which were at par with manual weeding, chemical herbicide and mechanical weed control process. It eliminated weeding and thinning processes and consumed only 195 and 276 man days/ha from sowing to fibre extraction over conventional method (340 to 365 man days/ha). It saved 89-145 man days/ha (Rs.22500 to 36250/ha). Mesta (*Hibiscus cannabinus*) also showed similar response as smother crop (2018-19). Pretilachlor 50 EC @ 0.9 l a.i/ha (POE, 7 days) was found effective for weed control in zero till piara crop. Weed smothering by intercropping green garm with jute (1:1)/mixed cropping were also found economic, produced 0.8-1.0 t pulse grain/ha along with 2.7-2.9 t jute fibre and 1.7 to 2 tonnes nutrogen rich (2.35%) pulse waste per ha.. Pre emergence herbicide Pretilachlor 50 EC and Ipfencarbazone 22.8 %SC were found effective for jute. This weed smothering merit of jute can be used for reducing weed seeds in seed bank growing in repeated flushes, it can also be used as cover crops for different crops which will seqester a lot of carbon to soil also. Weed smothering by high density broadcast jute sowing will eliminate dependence on herbicides, mechanical and manual weeding and make jute farming more remunerative and sustainable in nature.

Introduction

Jute being a C3 crop, it cannot compete with the C4 weeds at its early stage and about 40 per cent of total cost of cultivation of jute goes in weeding process alone. Upsurge of new weed flora, labour scarcity during weeding, herbicidal resistance along with its environmental concern and its slow mechanization urged us to control weeds in jute field by its smothering effect. If the crop is not weeded at right time (within 25 days) the yield loss is up to 70% (Saraswat, 1974). In cultural weed management, crop competitiveness could be one of several measures and is an important component in integrated weed control. Higher crop seed rates could be an integrated tool for weed management, because higher crop plant densities generally are more competitive with weeds.

Fortunately jute crop is primarily a broadcast crop (seed rate 6-7.5 kg/ha) which require some improved agronomic management practices so that the dense jute canopy (300 to 370 plants /m2) can suppress composite weeds flora within 25 days by its smothering effect. Initial documentation showed high density broadcast jute sowing (6.75-7.5 kg/ha) with improved agronomic practices, with a population of 268/m2 can effectively smother weeds in jute field by reducing sunlight entry (>95 percent) below jute canopy un affecting its fibre production (38.37 q/ha) and saves 89-145 mandays /ha (amounting to Rs.22500 to 36250/ha, Ghorai & Roy, 2020). In plots with the highest seeding rate (8 million/ha) of spring wheat weed biomass was significantly lower, however lodging problem, especially in early seeded plots occurred (Auskalniene and Auskalnis, 2008) in Lithuania.

In Industrial hemp, planting density significantly influenced weed suppression and a number of phonological characters, and yield of hemp. Weed suppression increased with increasing hemp plant population. Increase of plant density from 100 to 200 plants m-2 markedly reduced weed weight from 23.2 to 6.5 g m-2. Further reductions in weed weights in hemp field were observed at 300 plants m-2 (2.6 g m-2) and 400 plants m-2 (1.5 g m-2), Hall *et al.*, (2014).

Thus experiments were conducted at ICAR-CRIJAF, Barrackpore, WB in 2018-19, 2019-20 & 1920-21 with jute (cv. NJ-7010) by its high density broadcast sowing (seed rate @6.0 -7.5 kg/ha) to smother composite weed flora culturally and make jute farming more profitable minimizing weed control expenditure.

Materials and Methods

Experiments were conducted in Randomised Block Design, with 11-12 treatment replicated thrice at ICAR-CRIJAF, Barrackpore, WB in 2018-19, 2019-20 & 2020-21 with jute (cv. NJ-7010, Line JRO BA 3). The integrated weed management treatments includes high density broadcast sowing (HDS, 6-7.5 kg seed/ha) for weed smothering, pre-emergence herbicides (Pretilachlor 50 EC, Ipfencarbazone 22.8 %SC) at different doses, post emergence herbicides (applied by CRIJAF herbicide applicator) Glufosinate ammonium 13.5 %, Paraquat 41%SL, intercropping with green gram (cv. TMB 37, Sukumar and Virat) and mechanical weeding by "Improved CRIJAF Nail Weeder" including two checks manual weeding twice and unweeded control for comparison. These treatments were tested in jute in Jute-Rice (cv Kshitish, transplanted/ zero till paira crop 7 days before jute harvest) - relay (Zero-till paira 7 days before rice harvest) cropping system. Pretilachlor 50 EC was applied @0.9 l ai/ha for weed control in paira or relay crop (POE, 7 DAS) In the third year high density jute sowing was compared with low density jute sowing (LDS) where live jute seeds (1.2 to 3.5 kg/ha) were mixed with proportionate quantity of inert and fried jute seed to make up the seed rate up to 6 kg/ha for ease of broadcasting tiny jute seeds by farmers' field. The high density seed rates (HDS) were 6.75 kg, 7.5 kg and 6.0 kg/ha respectively in 1st, 2nd and 3rd year respectively. The dates of sowing in three years were 20th May, 24th April and 17th April respectively. The fertilizer dose was N:P:K::80:80:80. Basal fertilizer dose was N:P:K::

20:80:80. The first year crop was rain fed due to late sowing and good rain. For 2nd and 3rd year the jute crop was sown with one post sowing irrigation. Second and third irrigations were given on 7 and 21 (with 30 Kg N top dressing) days after sowing. Fourth irrigation was given at 35 days after sowing (with 30 Kg N top dressing). To combat fungal attack the crop was sprayed with Tebuconazole @ 1.5ml/l at 15 and 21 DAS. Only 45 cm wide strip (5% of total area) around the jute field was manually weeded to prevent seed formation of weeds in boarder areas. The crop was harvested at 125 to 135 DAS. Observations were recorded as per standard procedures. Fibre extraction was done manually after retting. The data were analysed statistically.

Results and Discussion

Weed flora present in jute field

Composite weed flora of jute field constituted of different grassy (e.g, *Ecinocloa colonum, Cynodon dactylon, Brachiaria mutica etc), dicot (e.g, Trainthema spp, Physalis minima and Digera arvensis, Alternanthera spp etc.) and sedge weeds (Cyperus rotundus) etc*.

Reduction of incident light at the base of jute canopy

High density jute canopy (20.7, 26.8 & 34.8 lakhs) reduced the incident light percent below its canopy at 25- DAS up to 95 % by its smothering effect (Fig 1 and Photo 1).

Under HDS (T9) in the 1st year, the total jute population was recorded as 20.7 lakh/ha at 41 DAS. In this year (2018-19), initial weed population were: grass 268.00/m2, broadleaf weeds 249.33/m2 and sedges 35.83/m2 at 15 DAS (Table 1). However, weeds of 0.45 m along the borders were controlled manually to eliminate reseeding of weeds from boarder areas. The jute canopy reduced the incident light at base by 95 percent. Very scanty weed population was observed at 41 DAS under HDS (T9) which were very lanky in growth and were ineffective to set seed/fruits (both grass and broal leaved weeds) for next generation. It reduced the grass, broadleaf weed, sedges population and its bio mass by 98, 98.5, 64.5, 91.65 per cent respectively over manual weeding twice (T8, Table 1), Ghorai & Roy 2020. HDS, reduced the weed dry weight to 2.6 g/m2 at 41 DAS. Reductions in weed weights in hemp field were observed at 300 plants m-2 (2.6 g m-2) and 400 plants m-2 (1.5 g m-2), Hall *et al.*, (2014).

Out of 20.7 lakh jute plants (41 DAS), 11.26 lakh jute plants (54.4%) disappeared before jute harvest due to self thinning as result of severe competition for light, nutrition and high temperature in the dense jute jute canopy. Harvestable jute population was only 3.3 lakhs/ha i.e., 16% of population found 41DAS and 35% of population at harvest (9.44 lakhs/ha). At harvest, chad and dead jute plants were 65% of total jute population (9.4 lakhs/ha), 135 DAS. It yielded 25.3 q jute fibre/ha (Table 2) and it was at par with conventional manual weeding (T8), other herbicides (T1-T6; Prelilachlor & Ipfencarbazone) and mechanical weed control process (T7). Mean palnt height and basal diameter and individual palt weight were 337cm and 1.53 cm respectively.

From sowing to fibre extraction, total manpower requirement in this high density jute cultivation method was only 195 man days /ha and saved 145 mandays/ha (Rs.36250) as it completely eliminated the manpower requirement for weeding and thinning in jute. Normally 340 man days are required in jute cultivation from sowing to its fibre extraction in conventional method where manual weeding and weeding is followed.

In 2nd year, the jute canopy (29 cm height only) at 25 DAS of high density broadcast jute sowing (7.50 kg/ha, T8) reduced the incident light at jute base by more than 90 percent and dominated all C4 weeds. This year initial grass, broad leaf and sedge populations were 193, 15 and 52.0/ m2 (Table 3). Only 45 cm field around the jute field was manually weedeed to prevent seed formation of weeds in jute

field those peeps out from the canopy. At 25 DAS it reduced the grass, sedges weed population by 70, and 62% respectively (Table 3) over initial status. Remaining weeds were lanky and rudimentary in nature, incapable of producing seeds. At jute harvest time the plots were completely free of weeds. Out of 26.8 lakh jute plants/ha (25 DAS) only 6.3 lakhs/ha i.e., 23.5% of the total population could be harvested at 125 DAS (Photo 1). Chads popultion (<1.5 m) at harvest was 10.6 lakh/ha (40 %) and rest of the jute plants (36.5%) died by self thinning. Mean plant height, basal diameter and individual plant weight at maturity were 274 cm, 1.6 cm and 118g respectively and it yielded 3.837 t jute fibre/ha (Table 4). It was at par with conventional manual weeding (T7), mechanical weed control process (T6) and other herbicides (T1-T5; Prelilachlor & Ipfencarbazone). It eliminated manpower requirement for weeding and thinning, consumed 276 man days/ha from sowing to fibre extraction (117 man days/ha) & saved 89 man days/ha over conventional method (365 man days/ha) of jute cultivation (Table 4). A plant density of 1,11,111 plants ha-1 normal planting (60 cm x 15 cm) produced significantly more kapas yield (3.134 t ha-1), reduced weed dry matter with higher weed control efficiency (61.88%) as against high plant density of 1, 11,111 plants ha-1 paired row planting and 1, 48,148 plants ha-1 (Madavi *et al.,* 2017).

Under HDS (T12, Table 5) in the third year (2020-21), initial grass, broadleaf and sedges weeds 506.67/m2, 504.00/m2 and 8.33/m2 at 15 DAS. High density jute sowing (6kg/ha) and average initial plant population of 34.8 lakhs/ha (maximum 41.6 lakhs/ha) reduced light interception by 93 per cent below its canopy at 25 DAS. Mean plant height, basal diameter and individual plant weight at maturity were 371 cm, 2 cm and 93.67g, respectively (Table 6). Effective plants at harvest was only 7.64 lakhs/ha i.e only 22 percent of initial population and rests (78 %) were chads and died by self thinning process due to hierarchy of domination and suppression which results in severe competition for light, space and nutrition within a plant stand. This high density sowing (T12), yielded 3.798 t jute fibre and was at par with conventional manual weeding (T8) and mechanical weeding process (T11). It and reduced 102 man days/ha (Table 6) over manual weeding process in its major operations and saved Rs.25500/ha).

In intercropping with jute (1:1), green gram (*Vigna radiata*) reduced more than 90% sunlight entry in soil and reduced weed biomass by 76% at 25 DAS (Ghorai *et al.,* 2018). Green gram yield (‘*TMB-37’*, 52-55 Days) in intercrop and mixed crops were 0.8-1.0 t and 0.56 t/ha respectively (Table 2 & 3) with fibre yields of 2.7-2.9 t/ha and 2.9 t/ha, respectively. Small grain cv. ‘*Sukumar*’ (65 days) yielded 0.82 t pulse/ha with 2.5 t jute fibre/ha. All green gram cultivars produced 2-3.0 t nitrogen pulse wastes/ha (Ghorai *et al.,* 2016) to improve soil health and sequester carbon in jute soil In mixed crop, 30 jute and 6 green gram seedlings were maintained/m2 and excess jute seedlings around 20 cm diameter of green gram were removed within 15 DAS. Low density jute sowing reduced the cost of jute cultivation significantly (Table 6), Ghorai and Chakravorty (2020). Paira crop zero till rice (broadcast sown 7 days before jute harvest) yielded 3.4 to 4 t rice grain/ha. Relay/ zero till paira crop of bottle gourd, lentil, mustard, rajmash, khesari and field pea recoded yields of 16 t, 1.485 t, 1.06 to 1.6 t/ha (2017-18), 0.55t, 1.56, 2.7 t/ha respectively. Weed smothering by high density broadcast jute sowing will eliminate dependence on herbicides, mechanical and manual weeding and make jute farming more remunerative and sustainable in nature. Only 45 cm wide strip (5% of total area) around the jute field was manually weeded to prevent seed formation of weeds in boarder areas.

The dense jute canopy (200-348 /m2) of 29 cm mean height at 25- DAS reduced the incident light at jute base by 90-95 per cent and dominated all C4 weeds. Remaining weeds were rudimentary, incapable of producing seeds. In three years out of 20.7 lakh (40 DAS), 26.8 (25 DAS), 34.8 l lakh jute plants/ha, only 3.3, 6.3 and 7.64 lakhs jute/ha i.e., 16, 23.5 and 22 % of total population could be harvested (125 to135 DAS).

Table.1 Weed biometry (15 DAS) under different weed management practices in jute (2018-19)

Treatments	Grasses No./m2	Broad leaf weeds No./m2	Sedges No./m2	Dry weight of weeds (Kg/ha)
Treatments	61.33	16.00	0.00	**91.83**
T1: NJ 7010+TMB 37 (1:1) Pretilachlor 50EC @ 0.9 l/ha+1HW -Rice- Bottle gourd (gunny bag columns) + Spinach (Zero till pair)	32.00	13.33	1.33	**52.17**
T2: NJ 7010 + TMB 37 (Mixed) Pretilachlor 50EC @ 0.9 l/ha +1HW - Rice	58.67	4.00	5.33	**94.67**
T3: NJ 7010+ Sukumar (1:1) Pretilachlor 50EC @ 0.9 l/ha+1HW-Rice	16.67	90.67	26.60	**170.83**
T4 : Ipfencarbazone@ 68.43 g/ha+1HW-Rice – lentil (zero till paira crop)	43.67	93.33	26.77	**175.00**
T5: Jute + Palak (mixed) Ipfencarbazone @ 91.24 g/ha +1HW- mustard (zero till paira crop)	19.00	65.33	29.43	**129.33**
T6:Ipfencarbazone@ 114g/ha+1HW-	40.80	83.47	6.07	**65.00**
T7: CRIJAF nail weeder (7DAS) + Scrapper (15DAS) +1HW –Rice- Field Pea (Zero till)	61.17	262.67	37.17	**437.33**
T8: Two manual weedings-Rice- Khesari (zero till)	268.00	249.33	35.83	**350.00**
T9: High density jute sowing (6.75 kg/ha) for weed smothering + no weeding and thinning	5 (41 DAS)	3.7 (41 DAS)	12 (41 DAS)	**29.2 (415 DAS)**
T10 : Haloxofop R methyl 10.5 % W/W EC @ 94.5 g +1HW+ Rice – Khesari (ploughed)	222.67	417.33	30.37	**350.33**
T11: Control – rice - fallow	106.69	173.08	12.43	**107.36**
CD (5%)	**92.70**	**125.76**	**13.90**	**96.81**

Table.2 Jute biometry and fibre yield as affected by different weed management practices in jute-rice-pulse/oilseeds sequences (2018-19)

Treatments	Plant height (cm)	Basal Diameter (cm)	Fibre yield and intercrop yield (t/ha)	Rice yield (t/ha)	Paira crop yield in sequence (t/ha)
T1: NJ 7010 + TMB 37 (1:1) Pretilachlor 50EC @ 0.9 l/ha+1HW -Rice- Bottle gourd (gunny bag columns) + Spinach (Zero till paira)	318.67	1.63	2.358 (0.939)	6.199	**16.0 (3.75)**
T2: NJ 7010 + TMB 37 (Mixed) Pretilachlor 50EC @ 0.9 l/ha +1HW – Rice-Rajmah	306.67	1.58	2.937 (0.56)	6.342	**0.547**
T3: NJ 7010 + Sukumar (1:1) Pretilachlor 50EC @ 0.9 l/ha+1HW-Rice	318.00	1.47	2.492 (0.82)	6.201	**--**
T4 : Ipfencarbazone@ 68.43 g/ha+1HW-Rice – lentil (zero till paira crop)	295.67	1.35	2.417	6.218	**1.485**
T5: Jute + Palak (mixed) Ipfencarbazone @ 91.24 g/ha +1HW- mustard (zero till paira crop)	**299.00**	**1.47**	**2.857 (1.43)**	**5.958**	**1.062**
T6:Ipfencarbazone@ 114g/ha+1HW- Rice	**284.00**	**1.43**	**2.646**	**5.888**	**--**
T7: CRIJAF nail weeder (7DAS) + Scrapper (15DAS) +1HW –Rice- Field Pea (Zero till)	**276.00**	**1.22**	**2.801**	**6.051**	**2.712**
T8: Two manual weedings-Rice- Khesari (zero till)	**280.67**	**1.29**	**2.369**	**6.117**	**1.560**
T9: High density jute sowing (6.75 kg/ha) for weed smothering + no weeding and thinning	**337**	**1.53**	**2.53**	**6.096**	**--**
T10 : Haloxofop R methyl 10.5 % W/W EC @ 94.5 g +1HW+ Rice – Khesari (ploughed)	**275.00**	**1.32**	**2.899**	**5.364**	**1.25**
T11: Control – rice - fallow	**278.67**	**1.41**	**0.2067**	**6.198**	**--**
CD (5%)	**36.34**	**0.24**	**0.565**	**1.076**	

Table.3 Weed population (15-DAS) of jute field as faceted by weed management treatments (2019-20).

SL NO.	Treatments	Grassy weeds No.m/2	Broad leaf weeds No.m/2	Sedges/ No.m/2
T1	NJ 7010+TMB 37 (1:1) Pretilachlor 50EC @ 0.9 l/ha + CRIJAF Nail weeder (10DAS)– Paira crop of Rice in jute	11.33	15.67	**9.33**
T2	JRO BA-3 + TMB-37 (1:1) Pretilachlor 50EC @ 0.9 l/ha + CRIJAF Nail weeder (10DAS)–Paira crop of rice in jute	14.67	24.00	**18.67**
T3	TNJ 7010 + Virat (1:1) Pretilachlor 50EC @ 0.9 l/ha + CRIJAF Nail weeder (10DAS)–Paira crop of Rice in jute.	17.33	6.67	**14.67**
T4	Ipfencarbazone@ 68.43 g/ha +1HW- Paira crop of Rice – lentil (zero till paira crop)	18.67	16.33	**26.00**
T5	Ipfencarbazone @ 91.24 g/ha + 1HW(-Jute + Palak, mixed**)** Paira crop of Rice in jute - mustard (zero till paira crop)	17.00	12.00	**13.67**
T6	CRIJAF nail weeder (7DAS) + Scrapper (15DAS) – Paira crop of Rice - Field Pea (Zero till)	48.00	21.33	**17.33**
T7	Broadcast (6.0 kg/ha) and one manual weedings 18 DAS - Paira crop of Rice - Khesari (zero till paira crop)	98.67	10.00	**10.67**
T8	High density broadcast jute sowing (7.50 kg/ha) for weed smothering (no weeding and thinning)	193.33	14.67	**52.0**
T9	NJ 7010 + Glufosiante ammonium 13.5% SL (10 DAS) @ 1.2 Kg SL/ha) +1HW	20.67	2.00	**10.33**
T10	. NJ 7010+ Glufosiante ammonium 13.5% SL (10 DAS) @ 2.2 Kg SL/ha +1HW	27.33	2.33	**10.33**
T11.	NJ 7010 + Paraquat Dichloride 24% SL (10 DAS) @ 1.8 Kg SL/ha) l +1HW	24.33	2.00	**13.67**
T12	Control – fallow	118.67	19.00	**51.67**
	S.Em±	22.81	3.69	**13.36**
	CD (5%)	**66.88**	**10.81**	**39.41**

Table.4 Jute fibre and rice yield as affected by different weed management treatments applied in jute crop (2019-20).

SL NO.	Treatments	Plant height (cm)	Basal Diameter (cm)	Popu -lation /ha	Fibre yield (t/ha)	Jute equivalent yield (t/ha)	Jute Green Biomass (t/ha)	Paira rice yield following jute (t/ha)
T1	NJ 7010+TMB 37 (1:1) Pretilachlor 50EC @ 0.9 l/ha + CRIJAF Nail weeder (10DAS)– Paira crop of Rice in jute	268	1.25	3.10	2.893 (0.990)	4.716	6.167	**3.474**
T2	JRO BA-3 + TMB-37 (1:1) Pretilachlor 50EC @ 0.9 l/ha + CRIJAF Nail weeder (10DAS)– Paira crop of rice in jute	270	1.43	2.99	2.713 (0.958)	4.479	6.375	**3.833**
T3	TNJ 7010 + Virat (1:1) Pretilachlor 50EC @ 0.9 l/ha + CRIJAF Nail weeder (10DAS)– Paira crop of Rice in jute.	266	1.33	3.35	27.43 (0.994)	4.528	6.383	**3.735**
T4	Ipfencarbazone@ 68.43 g/ha +1HW- Paira crop of Rice – lentil (zero till paira crop)	324	1.81	2.58	**2.800**	**2.80**	**6.541**	**3.914**
T5	Ipfencarbazone @ 91.24 g/ha + 1HW(-Jute + Palak, mixed) Paira crop of Rice in jute - mustard (zero till paira crop)	295	1.67	2.36	**2.857**	**2.857**	**5.978**	**3.468**
T6	CRIJAF nail weeder (7DAS) + Scrapper (15DAS) – Paira crop of Rice - Pea (Zero till)	310	1.63	4.88	**3.799**	**3.799**	**6.642**	**3.569**
T7	Broadcast (6.0 kg/ha) and one manual weedings 18 DAS - Paira crop of Rice - Khesari (zero till paira crop)	324	1.57	5.25	**4.045**	**4.045**	**6.658**	**4.096**
T8	High density broadcast jute sowing (7.50 kg/ha) for weed smothering (no weeding and thinning)	274	1.65	6.30	**3.837**	**3.837**	**7.436**	--
T9	NJ 7010 + Glufosiante ammonium 13.5% SL (10 DAS) @ 1.2 Kg SL/ha)+1HW	366	1.46	2.11	**3.333**	**3.333**	**5.133**	--
T10	. NJ 7010+ Glufosiante ammonium 13.5% SL (10 DAS) @ 2.2 Kg SL/ha+1HW	338	1.70	1.94	**30.00**	**3.00**	**6.000**	--
T11.	NJ 7010 + Paraquat Dichloride 24% SL (10 DAS) @ 1.8 Kg SL/ha) l +1HW	370	1.71	2.34	**3.300**	**3.300**	**5.600**	--
T12	Control – fallow	218	1.17	--	**1.500**	**1.500**	**2.900**	
	S.Em±	8.70	0.08	0.19	**0.139**	**0.147**	**0.308**	**0.162**
	CD (5%)	**25.52**	**0.23**	**0.57**	**0.407**	**0.430**	**0.903**	**0.501**

Table.5 Weed population and green biomass as affected by low density sowing and weed management practices at 15 DAS (2020-21)

Sl. No		Grass weeds No./m2	Broad leaf weeds No./m 2	Sedges No./m2	Weed biomass t/ha
1	Live seed 1.2 kg /ha (cv. NJ 7010) + inert seed (4.8 kg/ha) + Pretilachlor 50 EC 0.9kg/ha +1 HW	3	83	252	**0.115**
2	Live seed 1.50 Kg/ha (cv.NJ 7010) + inert seed (4.5 kg/ha) + Pretilachlor 50 EC 0.9kg/ha +1 HW	4	100	489	**0.10**
3	Live seed 1.9 kg/ha(cv. NJ 7010) + inert seed (4.1 Kg/ha) + Pretilachlor 50 EC 0.9kg/ha +1 HW	4	64	265	**0..30**
4	Live seed 2.25kg /ha (cv.NJ 7010) + inert seed (3.75Kg/ha)x+ Pretilachlor 50 EC 0.9kg/ha + 1 HW	0	71	127	**0.82**
5	Live seed 2.6 kg/ha (cv NJ 7010) + inert seed (3.4 kg/ha) + Pretilachlor 50 EC 0.9kg/ha + 1 HW	8	93	228	**0.116**
6	Live seed 3.0 kg/ha (cv NJ 7010) + inert seed (3.0 kg/ha) + Pretilachlor 50 EC 0.9kg/ha + 1 HW	0	77	92	**0.8**
7	Live seed 3.75kg/ha (cv NJ 7010) + inert seed (2.25 kg/ha) + Pretilachlor 50 EC	1.3	81	247	**0.7**
8.	Live seed 6.0 kg/ha (cv NJ 7010) + inert seed (0 kg/ha) + 1 HW	56	109.33	158.67	**1.42**
9	Jute (JRO BA 3, 2.2 kg/ha) + Green gram (Cv. Virat 15 kg/ha) + Pretilachlor 50 EC 0.9kg/ha + 1 HW	5.3	56.00	112.00	**0.95**
10	Unweeded control 6.0 kg/ha (cv. NJ 7010)	78.67	233	135	**2.8**
11	Live seed 6.0Kg/ha (cv NJ 7010) + CRIJAF nail weeder (5-6 DAS) + 1 HW	66.67	88.00	138	**1.3**
12	High density sowing (6 kg/ha) + No weeding and thinning	506.67	504.00	8.33	**2.66**
S.Em		22.12	36.95	134	**0.32**
CD (1%)		**64.87**	**108.36**	**394 (CD 5%)**	**0.93**

Table.6 Plant population at harvest, individual fibre yield, total fibre yield and labour requirement in major operations under different weed management practices (2020-21).

Sl.No	Treatments	Plant population (Lakh/ha)	Individual fibre yield (g/plant)	Total fibre yield (t/ha)	Labour requirement (Mandays/ha)
1	Live seed 1.2 kg /ha (cv. NJ 7010) + inert seed (4.8 kg/ha) + Pretilachlor 50 EC 0.9kg/ha +1 HW	2.71	14.0	3.798	**129.67**
2	Live seed 1.50 Kg/ha (cv.NJ 7010) + inert seed (4.5 kg/ha) + Pretilachlor 50 EC 0.9kg/ha +1 HW	3.65	11.0	3.867	**132.00**
3	Live seed 1.9 kg/ha(cv. NJ 7010) + inert seed (4.1 Kg/ha) + Pretilachlor 50 EC 0.9kg/ha +1 HW	3.91	9.0	3.471	**132.00**
4	Live seed 2.25kg /ha (cv.NJ 7010) + inert seed (3.75Kg/ha)+ Pretilachlor 50 EC 0.9kg/ha + 1 HW	3.97	10.13	3.950	**149.33**
5	Live seed 2.6 kg/ha (cv NJ 7010) + inert seed (3.4 kg/ha)+ Pretilachlor 50 EC 0.9kg/ha + 1 HW	4.15	9.44	3.798	**162.33**
6	Live seed 3.0 kg/ha (cv NJ 7010) + inert seed (3.0 kg/ha) + Pretilachlor 50 EC 0.9kg/ha + 1 HW	3.72	9.81	3.629	**142.67**
7	Live seed 3.75kg/ha (cv NJ 7010) + inert seed (2.25 kg/ha) + Pretilachlor 50 EC 0.9kg/ha + 1	5.26	6.20	3.239	**250.00**
8.	Live seed 6.0 kg/ha (cv NJ 7010) + inert seed (0 kg/ha) + 1 HW	5.48	7.95	4.249	**282.33**
9	Jute (JRO BA 3, 2.2 kg/ha) + Green gram (Cv. Virat 15 kg/ha) + Pretilachlor 50 EC 0.9kg/ha + 1 HW	3.30	6.87	2.246 (0.27)*	**172.00**
10	Unweeded control 6.0 kg/ha (cv. NJ 7010)	4.07	5.15	2.129	**134.00**
11	Live seed 6.0Kg/ha (cv NJ 7010) + CRIJAF nail weeder (5-6 DAS) + 1 HW	5.41	7.13	3.840	**201.33**
12	High density sowing (6 kg/ha) + No weeding and thinning	7.64	5.58	3.798	**180.00**
S.Em ±		0.41	0.86	0.201	**10.08**
CD (1%)		**1.20**	**2.53**	**0.588**	**29.56**

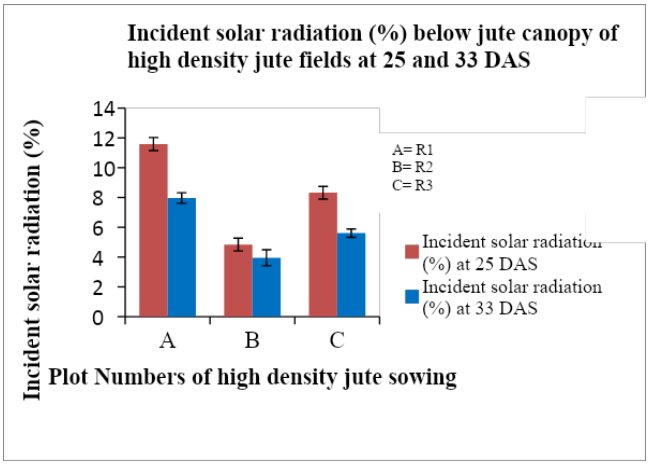
*Green gram seed yield (Cv. Virat): Yield poor due to Cyclonic storm, Amphan in 2020, WB

Photo.1 Relative light flux below and above jute canopy

Photo.2 (a & b) Composite weed smothering in jute by its high density sowing (7.5 kg/ha) at 25 DAS

Photo.3 Ultimate plants from high density sowing for weed smothering

Fig.1 Incident solar radiation (%) at 25 and 33 days after jute sowing under high density sowing (7.5 kg/ha)



The improved experiment of 2nd and 3rd yr. year produced 3.837 & 3.798 t fibre/ha respectively. It eliminated weeding and thinning processes and consumed only 195 and 276 man days/ha from sowing to fibre extraction over conventional method (340 to 365 man days/ha). It saved 89-145 man days/ha (Rs.22500 to 36250/ha). Mesta (*Hibiscus cannabinus*) also showed similar response as smother crop (2018-19). This weed smothering merit of jute can be used for reducing weed seeds in seed bank growing in repeated flushes, it can also be used as cover crops for different crops which will seqester a lot of carbon to soil also.

References

Auskalniene, O. and A. Auskalnis, 2008: The influence of spring wheat plant density on weed suppression and grain yield. *Žemdirbystė/Agriculture* 95 (3) 5-12.

Ghorai A K, Kumar, M and Kar C S (2016). Weed smothering in jute with green gram intercropping. *Indian J Weed Sci* 48(3): 343–344, 2016

Ghorai, A. K. and Chakraborty, A. K. 2019. Low density jute sowing to minimise cost of different operations in integrated weed management system. In: Proceed. International Seminar on Agriskills for convergence in research, industry and livelihood (AGRIL), BCKV, Kalyani, West Bengal, India, from 28 Nov to 01st Dec, 2019, Pp 110.

Ghorai, A. K. and Suman Roy. 2020. Weed Smothering in Jute by its High Density Broadcast Sowing. *JafNews* 18(1):9

Ghorai, A. K., Kumar, M. and Roy, S. (2018). Low cost and eco-friendly weed management technologies for jute. Proceed. ISWS Golden Jubilee International Conference on "Weeds and Society: Challenges and opportunities" held at ICAR-Directorate of Weed Research, Jabalpur, India during 21-24 Nov 20-18. P 243.

Hall, Jack, Surya P. Bhattarai and David J. Midmore (2014). Effect of industrial hemp (*Cannabis sativa* L) planting density on weed suppression, crop growth, physiological responses, and fibre yield in the subtropics. *Renewable Bio Resources*. DOI: http://dx.doi.org/10.7243/2052-6237-2-1

Madavi, B, Rani, P. L, Sreenivas, G. and Surekha, K. 2017. Effect of High Density Planting and Weed Management Practices on Weed Dry matter, Weed Indices and Yield of Bt Cotton, *Int. J. Pure App. Biosci*. 5(4): 1945-1950.

Saraswat, V. N. 1974. Efficient management of jute cultivation for a farm unit in West Bengal with specific reference to Economy of weed Control. Ph. D. Thesis. Calcutta University, Calcutta (unpubl.)

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