



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; SP-9(4): 145-158
Received: 25-01-2026
Accepted: 28-02-2026

Meherunnesa Khatun
M.Sc. (Ag.), Department of
Agronomy, Palli Siksha Bhavana,
Visva-Bharati, Birbhum, West
Bengal, India

Weed management in jute: An overview

Meherunnesa Khatun

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i4Sb.5378>

Abstract

India is the world's largest producer of jute and also accounts for the maximum area under jute cultivation. However, jute occupies only about 0.55% of the country's gross cropped area. Nearly five million people are engaged in raw jute cultivation, marketing and jute-based industries. Variability in climate along with diverse soil conditions often exposes the crop to various biotic and abiotic stresses, which adversely affect fibre yield and quality. Among the biotic stresses, weed infestation is one of the most serious constraints in jute production. Different weed control methods such as physical and chemical approaches are commonly practiced. Hand weeding remains the most widely used physical method due to its effectiveness; however, it accounts for nearly 40% of the total cost of production. Chemical weed management, on the other hand, involves comparatively lower costs and has been found to produce yields statistically comparable to hand weeding. Nevertheless, excessive or improper use of herbicides beyond recommended doses can cause phytotoxic effects on jute plants and may lead to the development of herbicide resistance in weeds. In recent years, integrated weed management has gained importance as a cost-effective and environmentally sustainable strategy for weed control in jute. This review highlights various effective physical, chemical and integrated weed management practices for improving weed control and enhancing jute productivity.

Keywords: Jute, Crop weed competition, Weed flora, Weed management, Integrated Weed management

Introduction

Jute (*Corchorus* spp.) is an important fibre crop extensively cultivated in the eastern regions of India, particularly in West Bengal, Assam, Bihar, Odisha and parts of Uttar Pradesh. Popularly referred to as the "golden fibre," jute is an annual, short-day plant, with its commercial fibre mainly derived from two species, *Corchorus capsularis* (white jute) and *Corchorus olitorius* (tossa jute). Due to its biodegradable and eco-friendly nature, jute serves as a sustainable alternative to synthetic fibres. The crop is predominantly grown by small and marginal farmers and plays a significant role in supporting rural livelihoods. India, along with Bangladesh, ranks among the leading jute-producing countries (Singh *et al.*, 2015) ^[36]. Despite its economic importance, jute cultivation is constrained by several production challenges, of which weed infestation is one of the most critical. Weeds, particularly C₄ species, compete strongly with jute, a C₃ plant, for essential resources such as light, water and nutrients, especially during the early stages of crop growth. If not managed properly, weed competition can lead to substantial yield losses, with reports indicating fibre yield reductions of up to 70%. Traditional manual weeding, though effective, is highly labour-intensive and accounts for nearly 40% of the total cost of cultivation (Ghorai, 2008) ^[14]. While chemical herbicides provide rapid weed control, their indiscriminate use can result in environmental pollution, development of herbicide resistance in weeds and adverse effects on non-target organisms. In view of these limitations, Integrated Weed Management (IWM) has emerged as a promising and sustainable approach for weed control in jute. IWM combines mechanical, chemical and cultural practices to achieve effective weed suppression while reducing environmental risks and production costs (Sarak *et al.*, 2024) ^[35]. However, compared to other crops, comprehensive research on IWM strategies specifically

Corresponding Author:
Meherunnesa Khatun
M.Sc. (Ag.), Department of
Agronomy, Palli Siksha Bhavana,
Visva-Bharati, Birbhum, West
Bengal, India

earlier studies have also documented the dominant weed flora occurring in jute-growing areas (Ghorai, 2008, Ali *et al.*, 2012; Mukherjee *et al.*, 2014 ; Islam, 2014 ; Kumar *et al.*, 2015 ; Kumar *et al.*, 2018) [2, 14, 23, 24,

30]. Grassy weeds accounted for 93% of the total weed popular, whereas sedge and broad leaved weeds were 5 and 2% respectively. The jute fields are mainly infested with the following weeds-

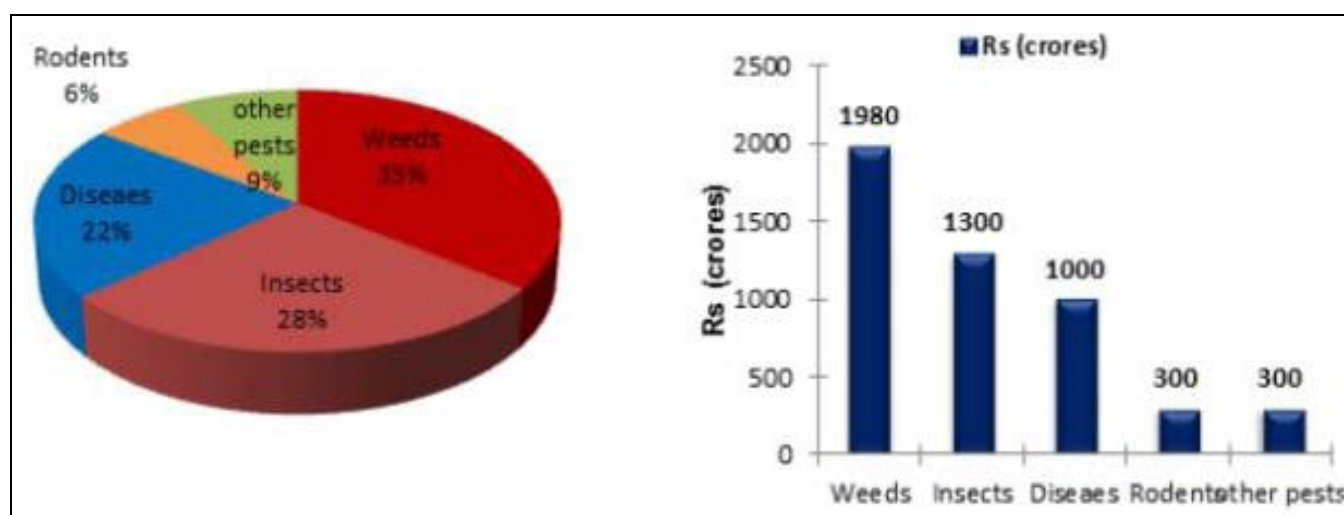


Fig 1: Kumar *et al.* Yield and revenue reduction by different pest in India[Photograph].

ResearchGate.https://www.researchgate.net/publication/236462245_Major_weed_flora_in_jute_and_their_management

Grassy weeds

Brachiaria ramosa, *Brachiaria reptans*, *Cynodon dactylon*, *Digitaria sanguinalis*, *Digitaria digitata*, *Echinochloa colona*, *Eleusine indica* and *Setaria glauca*, *Setaria verticillata*, *Leptochloa chinensis*.

Sedges

Cyperus rotundus, *Cyperus difformis*, *Cyperus compressus*,

Cyperus iria, *Fimbristylis miliacea*.

Broad-leaved

Physalis minima, *Eclipta Alba*, *Euphorbia hirta*, *Portulaca oleracea*, *Phyllanthus niruri*, *Amaranthus spinosus*, *Amaranthus viridis*, *Trianthema portulacastrum*, *Ageratum conyzoides* and *Polygonum orientale*.

Category	Scientific Name	Common Name	Family	Source
Grasses	<i>Brachiaria repens</i>	Running grass	Poaceae	Kumar <i>et al.</i> , 2015
	<i>Cynodon dactylon</i>	Bermuda grass	Poaceae	Kumar <i>et al.</i> , 2013
	<i>Dactyloctenium aegyptium</i>	Crowfoot grass	Poaceae	Ali <i>et al.</i> , 2012 [2]
	<i>Digitaria sanguinalis</i>	Large crabgrass	Poaceae	Kumar <i>et al.</i> , 2015
	<i>Echinochloa colona</i>	Jungle rice	Poaceae	Kumar <i>et al.</i> , 2015
	<i>Echinochloa crus-galli</i>	Barnyard grass	Poaceae	Mukherjee <i>et al.</i> , 2014 [30]
	<i>Eleusine indica</i>	Indian goosegrass	Poaceae	Kumar <i>et al.</i> , 2015
	<i>Leptochloa chinensis</i>	Red sprangletop	Poaceae	Hussain <i>et al.</i> , 2023
	<i>Setaria glauca</i>	Giant green foxtail	Poaceae	Hussain <i>et al.</i> , 2023
	<i>Setaria verticillata</i>	Bristly foxtail	Poaceae	Hussain <i>et al.</i> , 2023
Sedges	<i>Cyperus rotundus</i>	Purple nutsedge	Cyperaceae	Ghorai <i>et al.</i> , 2006 [15]
	<i>Cyperus iria</i>	-	Cyperaceae	-
	<i>Cyperus difformis</i>	Common sedge	Cyperaceae	Mukherjee <i>et al.</i> , 2014 [30]
	<i>Cyperus compressus</i>	Annual sedge	Cyperaceae	Mukherjee <i>et al.</i> , 2014 [30]
	<i>Fimbristylis miliacea</i>	Globe fringerush	Cyperaceae	Mukherjee <i>et al.</i> , 2014 [30]
Broad-Leaved Weeds	<i>Ageratum conyzoides</i>	Goat weed	Asteraceae	Hussain <i>et al.</i> , 2023
	<i>Amaranthus viridis</i>	Pigweed	Amaranthaceae	Kumar <i>et al.</i> , 2015
	<i>Cleome viscosa</i>	Tick weed	Capparaceae	Kumar <i>et al.</i> , 2015
	<i>Digera arvensis</i>	False amaranth	Amaranthaceae	Ghorai <i>et al.</i> , 2006 [15]
	<i>Euphorbia hirta</i>	Leafy spurge	Euphorbiaceae	Ghorai <i>et al.</i> , 2006 [15]
	<i>Phyllanthus niruri</i>	Stonebreaker	Euphorbiaceae	Kumar <i>et al.</i> , 2015
	<i>Physalis minima</i>	Gooseberry	Solanaceae	Kumar <i>et al.</i> , 2015
	<i>Portulaca oleracea</i>	Purslane	Portulacaceae	Kumar <i>et al.</i> , 2015
	<i>Trianthema portulacastrum</i>	Horse purslane	Aizoaceae	Kumar <i>et al.</i> , 2015

Overall, grassy weeds and sedges tend to pose more serious management challenges in jute cultivation compared to broad-leaved weeds.

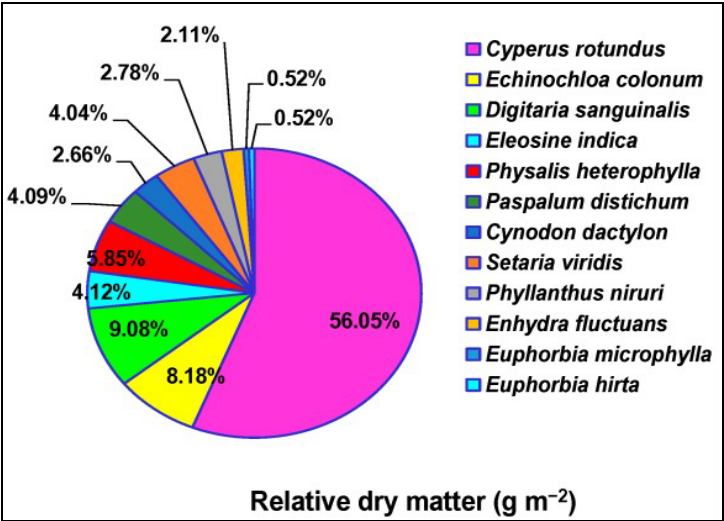


Fig 2: Hossain *et al.* (2023). Relative dry matter (RDM) of different weed species grown in response to weed interference period in Olitorius jute at 30 DAS (average of all plots) [Photograph].MDPI.<https://www.mdpi.com/2071-1050/15/12/9282>

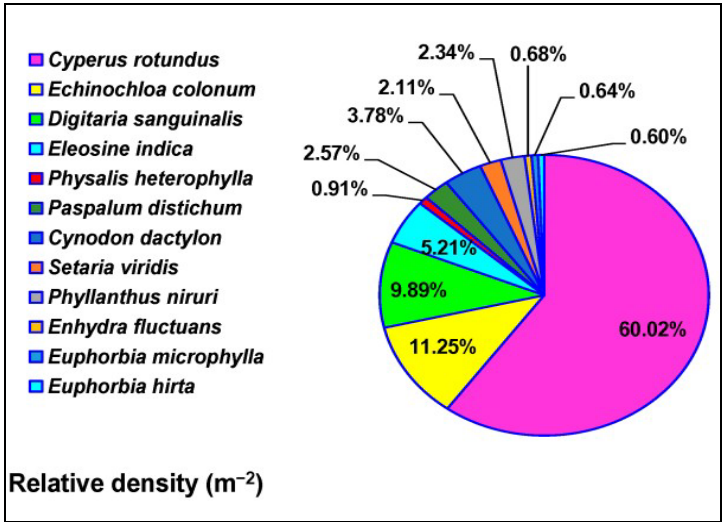


Fig 3: Hossain *et.ai.* (2023). Relative density (RD) of different weed species grown in response to weed interference period in Olitorius jute at 30 DAS (average of all plots) [Photograph].MDPI. <https://www.mdpi.com/2071-1050/15/12/9282>



Fig 4: *Cynodon dactylon* (1805). Royal Botanical Gardens <https://powo.science.kew.org/taxon/urn:lsid:ipni.org:nam es:397065-1/images>



Fig 5: *Dactyloctenium aegyptium* Wikipedia. https://en.wikipedia.org/wiki/Dactyloctenium_aegyptium



Fig 6: *Eleusine indica*. Wiktrop.
<https://portal.wiktrop.org/species/show/126>



Fig 9: *Setaria verticillata*. Rajaji Wildlife Safari Tours
<https://rajajinationalpark.org/setaria-verticillata>



Fig 7: *Echinochloa colonum*. Wikipedia
https://en.wikipedia.org/wiki/Echinochloa_colona



Fig 10: *Cyperus cotundus*. Wiktrop.
<https://portal.wiktrop.org/species/show/99>



Fig 8: *Leptochloa chinensis*. CABI Plantwise Plus.



Fig 11: *Cyperus iria*. Wiktrop.
<https://portal.wiktrop.org/species/show/97>



Fig 12: *Cyperus difformis*. Shutterstock
https://www.shutterstock.com/search/cyperus-difformis-weed?dd_referrer=https%3A%2F%2Fwww.google.com%2F



Fig 15: *Physalis minima*.
 Wikipedia. <https://en.wikipedia.org/>



Fig 13: *Fimbristulis miliacea*. Shutterstock
<https://www.shutterstock.com/search/fimbristylis-miliacea>



Fig 16: *Phyllanthus niruri*. Wiktrop
<https://portal.wiktrop.org/species/show/773>



Fig 14: *Euphorbia hirta*. Wikipedia. <https://en.wikipedia.org/wiki>



Fig 17: *Amaranthus viridis*
https://en.wikipedia.org/wiki/Amaranthus_viridis



Fig 18: *Digera arvenses* <https://en.wikipedia.org/wiki/Digera>



Fig 19: *Cleome viscosa*. Wiktrop
<https://portal.wiktrop.org/observation/show/7663>

Crop weed competition in jute

The Critical period of crop weed competition define as the short life span in the life cycle of a crop when weed causes maximum reduction in its yield or in other words, when weed control measure if adopted may fetch near maximum acceptable crop yield.

Corchorus capsularis

According to Gogoi and Kalita (1992) ^[16, 17] crop weed competition period for capsularis jute is 15 to 60 DAS (days after sowing).

Corchorus olitorius

Critical crop weed competition starts at 7 DAS and ends at 42 DAS in Olitorius jute.

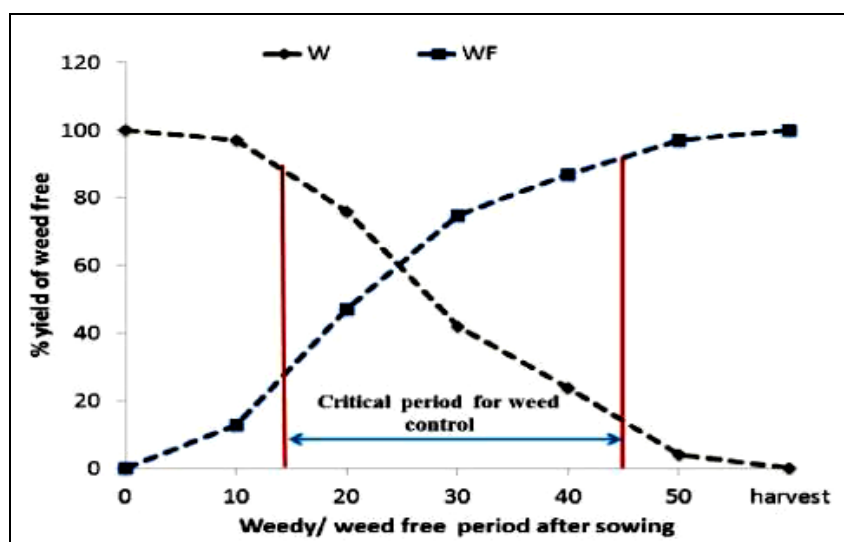


Fig 20: Critical Period for crop weed competition

Weed management options in Jute

Preventive method

It is one of the potential methods to reduce the weeds infestation in crop field but it requires times and careful attention. Different approaches of weed prevention includes

- Use of pure and clean seeds and seed certification.
- Use of well decomposed farm yard manure / compost, sewage and sludge.
- Clean farm machineries and farm animals.
- Clean irrigation channels and water and alternate irrigation system.
- Clean farm bunds, roadsides, fences and other non-crop areas.
- Plant/ weed quarantine law etc.

2. Physical (manual and mechanical) weed management in jute

2.1 Hand weeding and hand pulling

Hand weeding is the oldest method of weed control. Though it is time consuming, costly, labour intensive method, hand weeding is the most widely used weed control practice in the tropical areas due to the reduction of fear of toxic residue in the field (Adenawoola *et al.*, 2005) ^[1]. Hand weeding at 21 and 42 DAS was statistically similar to the treatment, application of fluazifop - p- butyl at 0.4 and 0.6 kg a.i. per ha at 21 DAS (Gogoi *et al.*, 1992) ^[16, 17]. Guha and Das (1998) ^[18] reported that two hand weedings are better than the several times hand hoeing in jute. Ghorai (2007) ^[19] mentioned that soil solarization is a safe

method which can give higher fibre yield of jute over the manual weeding and herbicidal control of weeds. It effectively controls annual weeds but not perennial weeds. Manual labourers use small implements e.g. khurpi which is useful to remove the annual weeds along with roots and thus it could be manual cum mechanical in nature. It has been observed that two hand weeding, first at 15-21 days and second at 35-40 days after sowing give the season long weed control in jute.

2.2 Wheel hoeing

Weeding with wheel hoe or nail weeder is very efficient especially in line sown jute crop. Wheel hoeing at 20-25 days and one hand weeding at 35-40 days after sowing gives excellent control of weed in jute. It also conserves the soil moisture at early stage of crop growth especially under rainfed condition because weeding through nail weeder results soil mulching.

2.3 Nail weeder

CRIJAF developed a new weeding implement called nail weeder which contains 2-15 nails fixed at 3 cm apart in a series each nails are 0.9-0.8 cm in thick, one scrapper and one tyne to control young composite weed flora including germinating one from line sown field at very early stage (5-7 DAS) with minimum disturbance to main crop seedlings. (Banerjee, 2020) ^[4]. CRIJAF Nail Weeder used at 4-5 DAS controlled 80 to 85% of composite weeds flora and increased fibre yield in jute (Ghorai *et al.*, 2012).



Fig 21: Manual weeding in jute field

[https://www.facebook.com/61568354370203/videos/manual- weeding-thinning-in-jutehi-friendsweeding-thinning-are-important-agricult/760348459889394/](https://www.facebook.com/61568354370203/videos/manual-weeding-thinning-in-jutehi-friendsweeding-thinning-are-important-agricult/760348459889394/)



Fig 22: Wheel hoe. <https://www.sjuliao.com/product-p- 818387.html>

Advantage of using nail weeder

- By weeding through nail weeder only 6-7 man days / ha is required while in manual weeding 45 mandays /ha is required. Thus the nail weeder increases the economic feasibility.
- The inter row weeds removed by nail weeder acts a soil mulch of the field thus it helps in soil moisture conservation
- in the dry months.
- During its operation, it pulverises the soil
- Nail weeder also helps in line arrangement and thinning of broadcast jute.
- As it is a mechanical approach of weed control so there is no toxic effect of herbicide on environment.



Fig 23: CRIJAF Nail weeder

<https://www.youtube.com/watch?v=j7-4th-UNzA>

2.4 Raking

Weeding is done by bullock drawn soil combining implement locally known as bida in West Bengal and Bangladesh. In broadcast field 2 raking are done, first is done when crop is 5-6 cm tall followed by next one after 2 weeks.

2.5 Soil solarization

Soil solarization by clear and black polythene (200-400 gauge) raised the soil temperature up to 54 °C in 0-5 cm soil profile. It kills the sprouted grass, sedges and broad leaf weeds and reduces the weed load in jute field. Clear polythene reduces weed emergence by 45-78% at 21 DAS. Soil solarization is a safe method gives higher fibre yield over manual and chemical weeding processes.

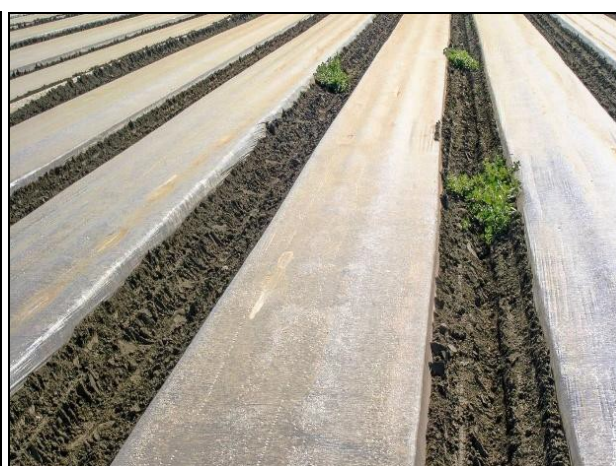
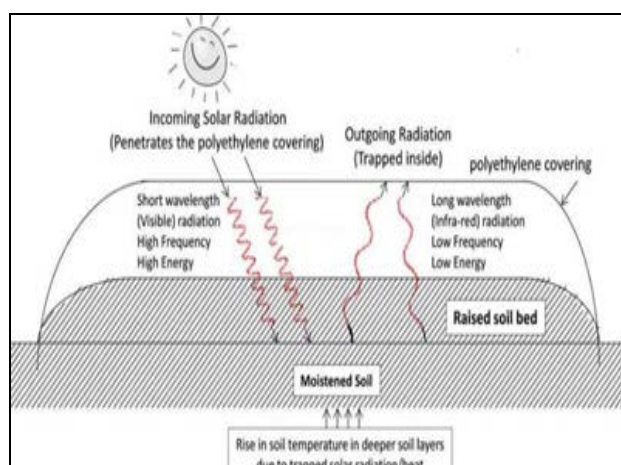


Fig 24: Principle of soil solarization. Research gate. <https://www.researchgate.net/publication/319464788>

3. Cultural method

It is an old age practice of weed management. The cultural methods are the manipulation of agronomic practices in such a way that they become more favourable to crop growth over weeds. These methods are not only cost effective but also ecofriendly. "A good crop is the best weed killer" was stated by Fryer (1983).

3.1 Proper seedbed preparation

Fine seed bed is required for jute sowing as the seeds are very

small in size, for early establishment of the crop and more competitive over weed. (TK Das Book -Weed Science Basics and Applications) ^[12].

3.2 Seed priming

Primed seeds that sprout higher and more synchronously can provide a robust crop stand with quick canopy growth, which gives rice plants an early edge against weeds. Primed seeds produced a strong seedling stand that increased rice's resistance to weeds and resilience to environmental stress.

3.3 Proper depth of sowing

Shallow sowing usually at 2-3 cm depth is a pre requisite for uniform germination and early establishment of crop.

3.4 Sowing time

Sowing time is one of the deciding factor for the occurrence and intensity of weeds. Early sowing of suitable varieties helps to escape heavy weed growth which begins just after onset of pre monsoon showers. If sowing of jute is delayed by 3-4 weeks, the seedling has to come up with vigorous flush of weeds that appear with the onset of monsoon. (Ghorai *et al*, 2013) ^[20].

3.5 Method of sowing

Line sowing of jute with 25cm * 7 cm and optimum plant population (5.5 - 6 lakhs /ha) facilitate the intercultural practices, resulting

in competitive advantage of Jute crops. Line sowing with multi row seed drill is very effective in this situation.

3.6 Method of cultivation and resistant sp.

The growth of the crop is more competitive against weed by selection of resistant cultivars, adjusting plant geometry, seed rate, spacing etc. Its favour against weeds and give an initial advantage in the early growth stage.

3.7 Intercropping

Intercropping of short duration, quick growing and early maturing crops like moong (Variety : Pant Mung - 4, Pant mung -5) suppresses the weed growth @ 40-50 percent (Ghorai *et al*, 2010) and intercropping of Summer raddish or red amaranthus results suppression of weed growth @ 22-25% gives additional revenue to small and marginal farmers (Ghorai *et al*, 2008) ^[14].



Fig 25: Intercropping of jute with mung. <https://www.slideshare.net/slideshow/improved-technologies-for-jute-cultivation-in-india/144826546>



Fig 26: Sowing jute and green gram intercrop for weed smothering and better economy. <https://www.youtube.com/watch?v=7hF-ZoodyAo>

3.8 Rate of sowing

High density broad cast sowing

Jute is a C3 crop thus it cannot compete with the C4 weeds at its early stage. The fast growing dense jute canopy (200- 348/m²) by high density broadcast sowing, reduces the light penetration at its canopy by 90-95% and dominated all C4 weeds (grass, sedge and broad leaf weed) (Ghorai and Sumon, 2022).

3.9 Time of fertilizer application

Nitrogen influences equally crops and weeds particularly grassy weeds. Skipping of basal nitrogen in jute is beneficial because during initial 12-15 days of sowing crops get the food from the seed so no need of additional nitrogen. If basal nitrogen applied then it acts as the food for the prevailing weeds.

3.10 Stale seed bed

The stale or false seed bed technique is used to control broad spectrum weed species in jute. A number of days before sowing of the crop the soil preparation of seedbed is done which promotes the germination of weed due to exposure to light then destruction of the emerging weed seedling with minimal soil disturbance. (Mohler, 2001) [31].

The control of emerging weed seedlings is mostly done by herbicides (glyphosate) (Heatherly *et al.*, 1993 and Oliver *et al.*, 1993) [21, 33] and sometime by nonchemical control methods like flame weeding and harrowing (Caldwell and Mohler, 2001 and Rasmussen, 2004) [7, 31, 34]. Stale seedbed with glyphosate @1.25 and 2.50 kg/ha + 2% (NH₄)₂ SO₄ reduced the broadspectrum weeds and did not induce the phytotoxicity to the jute seedling even at 0 days of application (same day of application) and did not shown any harmful effects on bacteria, actinomycetes and fungal population in soil.

4. Biological Method

In India aquatic weed are satisfactorily controlled by the release

Of Chinese grass carp. In Pakistan promising results has been obtained in control *Cyperus rotundas* using an insect known as *Althesapeuta cyperi*.

5. Organic method

Mulching: Use of rice-straw mulch (10- 15 t/ha) reduced the production of dry matter of weeds by 68-82% compared with manual weeding twice and yielded more jute fibre compared with the latter method (3.75 t/ha). Mulches also create a physical barrier by forming a layer near the soil surface that reduces the ability of weed seedlings to photosynthesize. (Crutchfield *et al.*, 1986, Chalker -scott, 2007) [8, 9]. The mulched plots maintained better hydrothermal regime of soil [maintained lower soil temperature (6-8°C) and higher moisture (18.0-23.4%) compared with bare soil (12.6-18.0%) cultivation] in hot summer months. This better soil-water environment and weed suppression by mulching increased the jute-fibre yield compared with control. It made the second manual weeding redundant.



Fig 27: Straw mulching in jute for moisture conservation and weed smothering, captured by Asesh Kumar Ghorai, https://www.researchgate.net/Fig/Straw-mulching-in-jute-for-moisture-conservation-and-weed-smothering_fig1_354090195

6. Cropping management

6.1 Cropping and competition method

Smother crops also known as competitive crops have great value in weed control program because they compete with weeds for water, light and nutrients. The competitive crop must be one that grows quickly producer an abundance of shade and can be harvested before the weed plants matures to permit cultivation and destruction of mature weed plants which will result reduced re-infestation of those weeds that were present previously. The principal competitive crops for weed control for our condition might be Arhar (*Cajanus Cajan*), Sugarcane (*Saccharum officinarum*), Mesta (*Hibiscus sabdariffa*), Mashkalai (*Phaeolus mungo*), Cowpeas (*Vigna sinensis*) etc.

6.2 Crop rotation

If one type of crop has been grown year after year in the same land characteristic weeds of particular crop tend to accumulate. By proper rotation and sequence of crop results healthy growth

Of the different crop and reduces accumulation of particular prevalent weed of the crop field. In Bangladesh jute is often cultivated in traditional rice fields to control rice weeds.

7. Chemical Method

- Unlike other crops the herbicide use in jute is less by the farmers because
- Jute cultivation is largely practiced by small and marginal farmers who often perceive herbicides as costly, as the value of family labour used for manual weeding is generally not accounted for.
- The availability of selective herbicides suitable for jute is limited in the market.
- Inadequate awareness and lack of technical knowledge regarding proper herbicide use frequently result in crop phytotoxicity.
- Since jute seedlings are commonly consumed as a green leafy vegetable, farmers are concerned about the potential health risks associated with herbicide residues.

7.1 Herbicide used in Jute for weed control

Name of the herbicide	Doses	Time of application	Salient features	Source
Fluchloralin	1 kg ha ⁻¹	Pre plant incorporation	Treatment should be applied in soil Having sufficient moisture.	Das (2008)
Trifluralin	0.5 kg ha ⁻¹	Pre plant incorporation	Control mainly annual grasses and Some broad leaved weeds.	Leycock <i>et al.</i> , (1978)
Pendimethalin	0.75 to 2.0 kg ha ⁻¹	Pre emergence	Controls annual grasses and broad leaved weeds.	Biswas(1986)
Alachlor	2 kg ha ⁻¹	Pre emergence	Control mainly annual grasses and some broad leaved weeds.	Leycock <i>et al.</i> (1978)
Butachlor	1-2 kg ha ⁻¹	Pre emergence	Broad spectrum of weeds in jute.	TK Das book
Metolachlor	3 kg ha ⁻¹	Pre emergence	Control mainly annual grasses and some broad leaved weeds.	Leycock <i>et al.</i> (1978)
Fenoxaprop-p-ethyl	75 g ha ⁻¹	Post emergence(21DAS)	Reduces grassy weeds like Echinochloa colona and broad leaved weeds like Physalis minima and Phyllanthus niruri.	Sarkar (2006)
Ouizalofop ethyl (TergaSuper)	50 g ha ⁻¹	Post emergence(21 DAS)	Reduces grassy weeds like Echinochloa colona and broad leaved weeds like Physalis minima and Phyllanthus niruri.	Sarkar (2006), Ghorai <i>et. al.</i> ,(2004).
oxyfluorfen	1.5 ml/litre	Post emergence(25DAE)	Effectively controls BLWs and sedges.	ICAR-CRIJAF, Director's report, 2009
Dalapon +MSMA	2-2.5 kg ha ⁻¹	Post emergence	Controls both annual and perennial grasses and some sedges.	Das (2008)

7.2 CRIJAF herbicide applicator

This is a tool used to apply non selective herbicides (Glyphosate and Paraquat etc.) in broadcast sown jute or in between jute crop

rows (15 DAE) to control composite weed flora. This controls 80 to 85 per cent of the total weed flora, one hand weeding is required to control rest of the weeds from within the rows.



https://www.researchgate.net/publication/354162873_hot_water_application_by_crijaf_herbicide_applicator_for_early_composite_we

Fig 28: CRIJAF Herbicide Applicator for non-selective herbicide application in field and horticultural crops for composite weed control.

7.3 Herbicide application by drone

Jute crop exceeds optimum spraying height by 40-50 days after sowing and therefore conventional manual spraying of pesticides becomes difficult at mid and later stages of crop growth.

Moreover, manual spraying leads to non-uniform pesticide application, poor penetration of active ingredient into the dense canopy and low application efficiency leading to inadequate control of disease and pests.



<https://icar.org.in/en/agri-drone-demonstration-icar-crijaf>

Fig 29: Agri-drone Demonstration at ICAR-CRIJAF.

8. Integrated weed management

Integrated weed management is integration of cultural, mechanical, chemical and all other available technologies in

compatible and effective manner to control the weeds by the most economical means, while posing the least possible risk to the human being and environment.

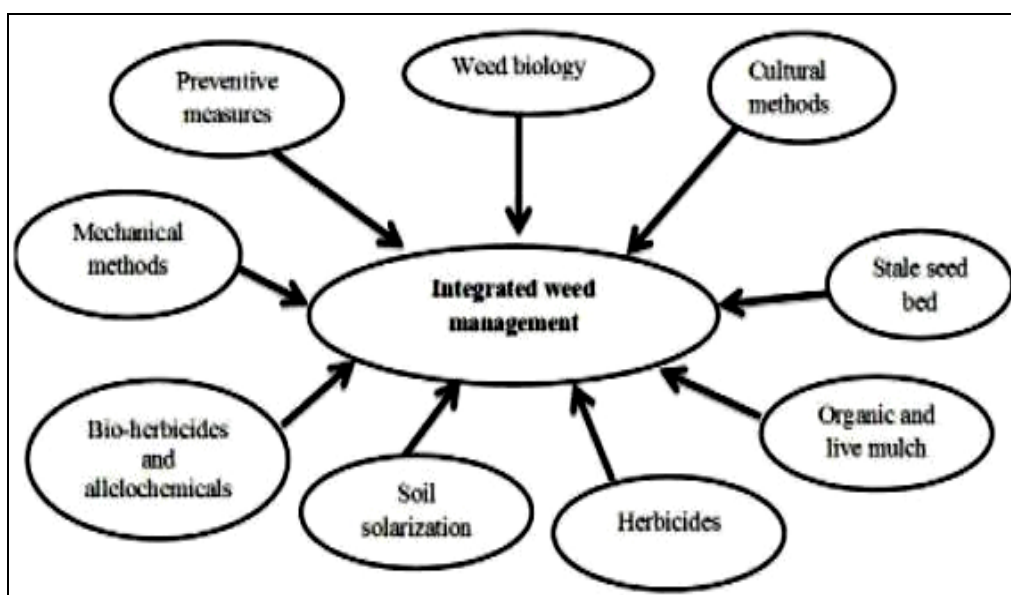


Fig 30: Integrated weed management (Kumar *et al*)

8.1 Integration of herbicides and hand weeding

- Das *et al.* (1994) ^[11] observed that the application of pendimethalin at 0.75 kg ha⁻¹ one day prior to sowing, followed by hand weeding at 35 days after sowing, was the most effective treatment for weed management, resulting in superior fibre yield and a higher benefit-cost ratio compared to other herbicidal options.
- Application of fluchloralin at 1.0 kg ha⁻¹ as a pre-plant spray three days before sowing, followed by a single hand weeding at 35 DAS, produced fibre yields similar to those obtained with two manual weedings carried out at 21 and 35 DAS (Asokaraja and Jeyaraman, 1995; Mishra and Bhol, 1996) ^[3, 32].
- Ghorai *et al.* (2008) ^[14] reported that applying butachlor at 1.0-3.0 kg ha⁻¹, 7-10 days prior to sowing, in combination with one hand weeding at 25-30 DAS effectively suppressed all weed species in the jute field, including *Cyperus rotundus*.
- The Director's Report of ICAR-CRIJAF (2009) ^[22] indicated that the application of butachlor 50% EC at 0.83-1.0 kg a.i. ha⁻¹, applied from seven days before sowing up to three days after sowing, effectively reduced weed pressure for about three weeks and successfully controlled *Cyperus difformis* infestation in jute-growing regions.
- Majumdar *et al.* (2010) ^[29] reported that the combined use of one hand weeding with trifluralin at 0.75 kg a.i. ha⁻¹ resulted in a significantly higher fibre yield compared to the untreated control. This treatment also maintained considerably greater levels of available nutrients than the other herbicide-based treatments.
- Datta *et al.* (2017) ^[13] found that the application of quizalofop-ethyl at 100 g ha⁻¹ at 30 DAS, supplemented with hand weeding at 15 DAS, produced the highest fibre yield and achieved the maximum benefit-cost ratio among all herbicidal treatments
- Das *et al.* (2008) ^[10] reported that mulching with wheat straw at 10 t ha⁻¹ resulted in the highest
- Benefit-cost ratio, while the intercropping system of jute

with red amaranthus ranked second in terms of economic returns.

8.2 Integration of tillage and method of sowing

Ghorai *et al.* (2010) demonstrated that perennial weeds such as *Cyperus rotundus* can be effectively managed in jute through the combined use of appropriate tillage and sowing practices. Land preparation using a rotavator followed by ridge and furrow formation with a cultivator facilitates the exposure of *Cyperus* tubers. These tubers remain shallowly positioned on the ridges and can be easily removed manually during their germination stage, around 8-10 DAS.

8.3 Integration of stale seedbed and herbicides

This approach is effective in reducing infestation by a wide range of weed species. Adoption of a stale seedbed for 20 days, followed by the application of glyphosate at 1.25 kg ha⁻¹ along with 2% ammonium sulphate, significantly suppressed weed growth and did not cause injury to jute seedlings even when sowing was done two days after application. In stale seed bed technique the following herbicides are applied on established composite weed flora at about 10 days before sowing of jute:

- Glyphosate - 2.5 Kg / ha
- Glyphosate - 2.5 kg / ha + 2,4 - D : 2 kg /ha
- Glyphosate - 2.5 kg / ha + pyrazosulfuron ethyl: 60 g/ha.

9. Future strategies for weed management in jute cultivation

In our country, weeds found in jute fields play an important role as a potential source of fodder, especially because there is very limited fallow land available for grazing. Utilizing weeds removed during jute thinning can help reduce the shortage of fodder for dairy farming. In addition, tender jute plants are widely consumed as vegetables in both rural and urban areas. However, if chemical weed control methods are applied, neither the weeds nor jute leaves can be safely used for fodder or human consumption due to harmful chemical residues. Therefore, greater emphasis should be placed on cultural practices along with physical and mechanical weed control methods.

Under cultural weed management, the following practices can be adopted:

- **Use of clean and pure seed:** Jute seeds should be free from weed contamination, as seeds are a common source of weed introduction into fields.
- **Adjustment of sowing time:** Since weed germination is influenced by seasonal conditions, modifying the sowing date of jute can help suppress weed emergence.
- **Selection of weed-tolerant cultivars:** Different jute varieties show varying levels of competitiveness against weeds; therefore, cultivars with better weed tolerance should be preferred.
- **Proper crop rotation:** Growing crops that are not associated with specific jute weeds can help break weed cycles and reduce their infestation.
- **Optimum but economical seed rate:** Using a relatively higher seed rate can promote dense crop cover, which suppresses weed growth and lowers weeding costs. Excess young jute plants can then be harvested and utilized as vegetables.

Conclusion

It is concluded that no single weed management technique is sufficient to keep the number of weeds in jute production under control. To keep the weeds under control and increase jute yield, a careful combination of multiple techniques (Integrated Weed management) is required. In order to effectively control weeds in jute and achieve the desired yield, attention should be paid to integrated weed management packages that include appropriate herbicides in addition to human or mechanical weeding. The highest fibre yield in jute could be achieved with 2 hand weeding at 21 DAE and 35 DAE as a mechanical weed control option. Among the chemical weed management treatments, application of quizalofop ethyl 5% EC @60g a.i. ha⁻¹ and Ethoxysulfuron @100g ha⁻¹ at 20 DAS when applied alone could effectively control all the categories of weeds with reduction in cost of production than manual weeding. In case of integrated weed management, quizalofop ethyl 5% EC @ 60g a.i. ha⁻¹ + Ethoxysulfuron @ 100g ha⁻¹ at 20 DAS + 1 hand weeding at 35 DAS treatment could provide the best and cost effective weed control with obtaining statistically at par fibre yield with the manual weeding twice.

Acknowledgement

I would like to express my special thanks of gratitude to Dr. Pritam Ghosh who gave the golden opportunity to do this wonderful project on the topic "Weed Management of Jute", which help me to learn a lot of things related to weeds of jute and their management strategies.

References

1. Adenawoola AR, Aladesanwa RD, Adenowuro TD. Effects of frequency of weeding on the growth and yield of long-fruited jute (*Corchorus olitorius*) in a rainforest area of southwestern Nigeria. *Crop Protection*. 2005;24(5):407-411.
2. Ali MH, Islam MS, Karim MF, Masum SM. Influence of weed control methods and plant spacing on the yield of white jute (*Corchorus capsularis*). *Pakistan Journal of Weed Science Research*. 2012;18:1-6.
3. Asokaraja N, Jeyaraman S. Weed management in olitorius jute. *Madras Agricultural Journal*. 1995;82(1):26-28.
4. Banerjee *et al.* Nail weeder: a newly invented tool to control weeds in jute. *Kisan e Patrika*. 2020.
5. Biswas DK. Screening of new herbicides in jute (*Corchorus olitorius*). *Biologist*. 1986;18(2):22-25.
6. Biswas DK. Tolerance of jute cultivars to soil-applied herbicides with and without farmyard manure. *Indian Biologist*. 1995;27(2):13-16.
7. Caldwell B, Mohler CL. Stale seedbed practices for vegetable production. *HortScience*. 2001;36(4):703-705.
8. Chalker-Scott L. Impact of mulches on landscape plants and the environment: a review. *Journal of Environmental Horticulture*. 2007;25(4):239-249.
9. Crutchfield DA, Wicks GA, Burnside OC. Effect of winter wheat (*Triticum aestivum*) straw mulch level on weed control. *Weed Science*. 1986;34(1):110-114.
10. Das K, Guha B, Zaman ASN. Productivity and profitability of tossa jute (*Corchorus olitorius*) under different weed management practices in jute-toria cropping system. *Madras Agricultural Journal*. 2008;95(7-12):353-358.
11. Das K, Guha B, Patgiri OK, Thakuria K, Borgohain B. Weed management in tossa jute (*Corchorus olitorius*). *Indian Journal of Agronomy*. 1994;39(1):87-92.
12. Das TK. *Weed science: basics and applications*. 1st ed. New Delhi: Jain Brothers; 2008.
13. Datta MK, Halder P, Biswas U, Kundu CK. Effect of different weed management practices on growth and yield of tossa jute (*Corchorus olitorius*) in the new alluvial zone of West Bengal, India. *International Journal of Current Microbiology and Applied Sciences*. 2017;6(11):1118-1123.
14. Ghorai AK. Integrated weed management in jute (*Corchorus olitorius*). *Indian Journal of Agronomy*. 2008;53(2):149-151.
15. Ghorai AK, Chakraborty AK, Pandit NC, Mandal RK. Integrated weed management in jute (*Corchorus* spp.). *Indian Journal of Weed Science*. 2006;38(1-2):163-164.
16. Gogoi AK, Kalita H. Crop-weed competition in capsularis jute. *Indian Journal of Weed Science*. 1992;24(3-4):74-76.
17. Gogoi AK, Kalita H, Pathak AK, Deka J. Chemical weed control in capsularis jute. *Indian Journal of Weed Science*. 1992;24(3-4):68-70.
18. Guha B, Das K. Cultural management of weeds in capsularis jute. *Annals of Agricultural Research*. 1998;19(3):330-332.
19. Ghorai AK. Weed management of jute (*Corchorus olitorius*) by soil solarization. *Indian Journal of Agricultural Sciences*. 2007;77(6):390-392.
20. Ghorai AK *et al.* Technology for weed management in jute. *Indian Farming*. 2013;63(6):12-14.
21. Heatherly LG, Wesley RA, Elmore CD, Spurlock SR. Net returns from stale seedbed plantings of soybean (*Glycine max*) on clay soil. *Weed Technology*. 1993;7:972-980.
22. ICAR-CRIJAF. Director's report 2009. ICAR-Central Research Institute for Jute and Allied Fibres; 2009.
23. Islam M. Research advances of jute field weeds in Bangladesh: a review. *ARPJ Journal of Science and Technology*. 2014;4(4):254-268.
24. Kumar M, Ghorai AK, Nandy U, Mitra S, Kundu DK. Effect of stale seedbed and subsequent application of herbicides on weeds and productivity of jute (*Corchorus olitorius* L.). *Journal of AgriSearch*. 2018;5(1):8-12.
25. Kumar M, Kundu DK, Ghorai AK, Mazumdar SP, Naik MR. Weed density and diversity in jute under long-term experiment in jute-rice-wheat cropping system. *Indian Journal of Weed Science*. 2015;47(1):16-20.
26. Kumar M, Ghorai AK, Singh A, Kundu DK. The critical period for weed competition in relation to fibre yield of jute (*Corchorus olitorius* L.). *Journal of AgriSearch*.

- 2015;2(3):225-228.
27. Kumar M, Ghorai AK, Majumder B, Mitra S, Kundu DK. Integration of stale seedbed with herbicides for weed management in jute (*Corchorus olitorius*) and their impact on soil microbes. *Journal of AgriSearch*. 2015;2(1):24-27.
 28. Laycock D, Danso AK, Adri AK. Preliminary report on herbicides for weed control in bast fibres. *Proceedings of the Seventh Meeting of the Ghana Weed Science Committee*. 1978:70-75.
 29. Majumdar B, Saha AR, Sarkar S, Maji B, Mahapatra BS. Effect of herbicides and fungicides application on fibre yield and nutrient uptake by jute (*Corchorus olitorius*), residual nutrient status and soil quality. *Indian Journal of Agricultural Sciences*. 2010;80(10):878-883.
 30. Mukherjee A, Malik U, Chattopadhyay C, Barik A. Allelopathic effects of the weed, *Polygonum orientale* L. on jute. *Indian Journal of Agricultural Research*. 2014;48(4):278-286.
 31. Mohler CL. Mechanical management of weeds. In: Liebman M, Mohler CL, Staver CP, editors. *Ecological management of agricultural weeds*. Cambridge: Cambridge University Press; 2001. p.139-209.
 32. Mishra GC, Bhol BB. Effect of weed management practices on growth and fibre yield of jute (*Corchorus capsularis*). *Indian Journal of Agronomy*. 1996;41(1):132-135.
 33. Oliver LR, Klingaman TE, McClelland M, Bozsa RC. Herbicide systems in stale seedbed soybean (*Glycine max*) production. *Weed Technology*. 1993;7:816-823.
 34. Rasmussen IA. The effect of sowing date, stale seedbed, row width and mechanical weed control on weeds and yields of organic winter wheat. *Weed Research*. 2004;44:12-20.
 35. Sarak SR, Chavan PP, Daware NA, Deshmukh KY, Katkhede VG, Chavan RV. Effect of integrated weed management practices on growth characters of jute (*Corchorus olitorius*). *International Journal of Research in Agronomy*. 2024;7(10):565-569.
 36. Singh MV, Singh B, Prakash V. Integrated weed management in jute. *Annals of Plant and Soil Research*. 2015;17(3):277-279.
 37. Saraswat VN, Mukerjee N. Occurrence and habitat of weeds of jute fields. *Philippine Agriculturist*. 1983;66(3):324-333.
 38. Sarkar S. Weed management in jute (*Corchorus olitorius* L.) by post-emergence herbicides. *Journal of Tropical Agriculture*. 2006;44(1-2):71-73.