

S U M M A R Y A N D C O N C L U S I O N S

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S U M M A R Y

1. Jute is the most important cash crop of India in as much as it employs around 3 million directly or indirectly and earns more than 20 per cent of the total foreign exchange through export.
2. This important crop is cultivated in the eastern states of India, 50 per cent of the area being ⁱⁿ West Bengal. The crop is harvested anywhere between 135 to 150 days. It is sown between late February and May, whenever nor-wester showers are received and is followed by a dry spell before break of monsoon.
3. The dry spell is important since removal of weeds and thinning of the crop is convenient and are ^{the} two essential pre-requisite to successful growth of the crop. Inadequate or incomplete weeding or too close a stand, results in poor crop growth despite use of optimum quantities of fertilizers and the best variety seed.
4. The 'weeding & thinning' operation is done simultaneously and is done entirely by a small implement operated manually. The weeding operation requires to be repeated once or twice and thus accounts for 32 to 40 per cent of the total cost of cultivation.

5. Reduction in cost of cultivation in jute is a pressing need today since in order to hold its own in the importing countries, jute goods must be cheaper to stand competition from substitutes.
6. The present work gives the details of the investigations aimed at substitution of manual weeding, partially or wholly, by herbicides.
7. Ecological survey of the weeds of jute field show that the main weeds are grasses and sedges. Broadleaved weeds are not many and are not a menace.

The important grassy weeds are :

- (i) Eleusine indica (ii) Dactyloctenium aegyptiacum (iii) Echinochloa colonum (iv) Eragrostis tenella (v) Imperata cylindrica (vi) Leptochloa chinensis (vii) Brachiaria repens (viii) Eragrostis unioloides (ix) Finbristylis dichotoma (x) F. aestivalis (xi) Axonopus compressus (xii) Paspalum scorbiculatum.

The important sedges are :

- (i) Cyperus rotundus (ii) C. iria (iii) C. alulatus.

Of these C. rotundus is a pernicious weed. Their succession is different in upland, midland and low-land jute fields.

8. These weeds have one characteristic in common that they germinate simultaneously with jute thrive more vigorously than the crop and

completes life cycle before harvest of jute. The life span of Cynodon dactylon & Cyperus rotundus are the longest while the latter is particularly pernicious because of its tubers which help perennation incredibly.

9. Autecological studies of different jute field weeds show that grassy weeds like Eleusine indica, Dactyloctenium aegyptiacum, Echinochloa colonum, Leptochloa chinensis were the main competitors which deprived the jute crop for its nutrient. Cyperus rotundus was equally responsible for depletion of nutrient and thus suppressing jute growth.

10. The weeds affected the crop in various manners. It was observed that -

- (i) The depletion of moisture was more in unweeded plots than it was in weed free plots ; such depletion of moisture was more acute when the dry spell prolonged.
- (ii) In absence of irrigation the population of jute seedlings was reduced much in unweeded plots. With application of large doses of nitrogen such reduction in population was accentuated when weeds were not removed.
- (iii) Absence of irrigation or moisture deficit affected both crop and weeds but less so the former. Nutsedge was least affected.

(iv) Increasing doses of nitrogen increased the growth and population of nutsedge, more so under irrigated condition.

(v) Growth of jute measured in term of height and base diameter of stem, total accumulation of dry matter and expressed in terms of absolute and relative growth, show that weeds considerably affect the same.

It was simultaneously observed that much of the nutrients were removed by the weeds initially.

(vi) The percentage of nitrogen in composite samples of weeds and jute increased with increasing levels of nitrogenous fertilizers at all stages. But dry matter accumulation was much faster by weeds in weed crop competition, reaching the warning phase near the time of harvest of jute.

Initial uptake of nitrogen by jute under weedfree condition was much less than it was by both crop and weed in unweeded plots ; later on when jute plants were well established, the rate of increase was much faster.

(vii) Like nitrogen weeds removed more P and K than jute.

Thus there was no favourable point in the weed and crop association and weeds warranted control.

ii. A number of herbicides were screened and the test crop varieties were JRO 632 and JRO 7835 (Corchorus olitorius) and JRC 7447

(C. capsularis). The soil types where trials were conducted were sandy loam and clay loam.

12. The different groups of herbicides screened were :

- I. Phenoxy acids.
- II. Benzoic acids.
- III. Carbamates and thiocarbamates.
- IV. Amides.
- V. Triazines.
- VI. Urethanes.
- VII. Aliphatic acids.
- VIII. Substituted Phenols.
- IX. Organo-arsenicals.

13. The following herbicides showed promise with jute since they had least phytotoxic effect on jute and controlled to a greater degree a large number of the weeds listed above.

1. Sirmate (Formerly UC- 22463)
2. TFP-Sodium (Frenoek AC 60)
3. MSMA (Ansar 529)
4. DSMA (Ansar 529P)
5. Dalapon (Dowpon)

14. The following herbicides were found effective in controlling

nutsedge in bare land (i.e. without jute crop) :

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| (i) Bladex 'G' | (v) Aminotriazol |
| (ii) Dicotox | (vi) Tillam |
| (iii) Cornox | (vii) EPTC |
| (iv) Bladex 'P' | (viii) Odran |

15. The methods of application of the herbicides were adjusted to suit the mode of action of the herbicides used. They were :

- (i) Pre-plant application in opened up soil.
- (ii) Pre-plant application in open soil followed by incorporation with help of a power tiller.
- (iii) Pre-emergence spray on soil.
- (iv) Post-emergence blanket spray.
- (v) Post-emergence directed spray between rows of crop.

16. The herbicides used showed different degrees of selectivity to jute. Some inflicted non-recoverable injury to the crop while with some there was some phytotoxic effects from which the jute crop recovered slowly. In certain cases spraying had to be done between rows involving skilled labour consequently more expenditure. Since 90 per cent of the total area under jute is still broadcast the emphasis naturally goes to such herbicide which is applied in soil prior to sowing, has selectivity to jute and controls largest number of the weeds.

17. (i) In respect to (16) above Frenock AC 60 has been found to be most efficient in possessing selective action to jute, controls grasses (100 per cent) and sedges (30-40 per cent). At the rate of 4 kg. a.i./ha. Frenock AC 60 seems to be the immediate choice, when applied 10 days before sowing of jute in open field and incorporated. Action on sedges was better when it was sprayed at a higher rate as pre-emergence spray.
- (ii) Dowpon at 6 kg. a.i. per hectare applied as post-emergence directed spray at 3 weeks old crop gave effective control of grasses including Cynodon dactylon ; but Cyperus rotundus (Motha) is not affected.
- (iii) Ansar 529 or Daconate each at 4.5 kg. a.i. per hectare may be applied as post-emergence directed spray when jute is at 3 weeks old. The chemicals are not effective when Cynodon dactylon (Doob) is a problem.
- (iv) A mixture of 3 kg. a.i. of Dowpon and 2.5 kg. a.i. of Ansar 529 per hectare used as post-emergence directed spray in jute of 3 weeks age, where nutsedge and grasses including Cynodon dactylon was a problem, offered adequate control.
- (v) Sirmate as pre-emergence spray gives good control of

grasses and sedges with exception of Cyperus rotundus and Cynodon dactylon.

- (vi) About 3-4 wheel hoeings are necessary with either chemical weeding or conventional weed control for promoting tilth and soil aeration.
- (vii) Ansar 529 at 4.5 kg. a.i. per hectare gave economical yield; a mixture of Dowpon and Ansar 529 at 3 kg. a.i. and 2.25 kg. a.i. respectively also gave good returns. From the point of view of investments and return, control of weed by herbicide was better than Hand Weeding.

The above did not affect jute yield in as much as they were at par with yields obtained by conventional manual weeding excepting (v).

Action of other herbicides are recorded in this paper and may be fruitfully utilized when required. Suitable manipulation of informations gathered will equip the cultivator towards efficient control of jute weeds.

C O N C L U S I O N

Other agronomical recommendations about variety, fertilizer, method and time of sowing etc. remaining same, it is now possible to recommend use of herbicide coupled with some inter-tillage with wheel hoe for weed control and improving soil tilth. This would materially assist in bringing down the cost on weed control and increase production, efficiently and timely. This would also reduce dependence on manual labour in different size of farm units in West Bengal.

The limits of hazards are now known and method of application has been defined. The cost of using herbicides is not prohibitive ; rather it is much cheaper to use chemical weed killers than to depend entirely on manual labour.