

## SCIENTIFIC WEED MANAGEMENT FOR HIGHER PRODUCTION IN SUGARCANE

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### ABSTRACT

*Sugarcane's slow-growing nature during the initial growth stage and long duration provide ample opportunity for weeds to grow profusely with minimal competition from main crops. Weed problems cause serious damage to sugarcane crops by causing high pressure by utilizing nutrient and water input resources. The initial 120 days in sugarcane can be considered the critical period for crop-weed competition. In general, for most annual crops first 30-40 days weed-free period is very important. Adoption of integrated weed management practices may help to reduce weed competition without creating an ecological disturbance.*



### INTRODUCTION

Sugarcane is a long-duration crop which takes a long time for germination and the crop faces tough competition with weeds between 60 to 120 days of its planting which causes a heavy reduction in cane yield. So, weeding around 100-120 days or 120-150 days after planting cane is highly necessary for higher yield. There are many annual, perennial, narrow leaf weeds, broad leaf weeds, sedges, and binding weeds that affect sugarcane crops profusely. Sugarcane being a long duration and widely spaced (60 to 120 cm row distance) crop provides an ample opportunity for several weeds to grow in vacant space, right from planting to harvesting. In sugarcane, weeds have been estimated to cause a 12 to 72 % reduction in cane yield depending upon the severity of infestation.

The nature of weed problem in sugarcane cultivation is quite different from other field crops because of the following reasons:

- Sugarcane is planted with relatively wider row spacing.

- Initial slow growth and wider row spacing provide ample opportunity for weeds to occupy the vacant spaces between rows and offer serious crop-weed competition.
- The sugarcane growth is very slow in the initial stages. It takes about 30 - 45 days to complete germination and another 60-75 days for developing a full canopy cover
- The crop is grown under abundant water and nutrient supply conditions
- In the ratoon crop, very little preparatory tillage is taken up hence weeds that have established in the plant crop tend to flourish well.
- The critical period of crop-weed competition has been recorded to be 60-120 days after planting in spring cane and 150 days in autumn cane.
- Bermuda grass (*Cynodon dactylon*) cogon grass (*Imperata cylindrica*) and other graminaceous weeds are known to be alternate hosts to Ratoon Stunting Disease (RSD) of sugarcane.
- Twining weeds like *Ipomoea* spp. are becoming a problem in many sugarcane growing areas, escalating the cost of cultivation besides decreasing cane yields. The twining weeds also cause serious harvesting problems.

In North India, the predominant weed are *Cyconodon dactylon*, *Cyperus rotundus*, *Dactyloctenium aegyptium* *Echinochloa* spp, *Saccharum* sp among narrow-leaved and *Chenopodium album*, *Solanum nigrum*, *Convolvulus arvensis* *Trianthema* sp. *Digera arvensis*, *Anagallis arvensis*, *Fumania* sp. *Portulaca oleraceae* L. etc. among broad-leaved weeds.

### IMPORTANT WEEDS OF SUGARCANE



*Convolvulus arvensis*



*Hispida* spp.



*Trianthema monogyna*



*Cyprus rotundus*



*Launia Spp.*



*Sorghum halepense*



*Amaranthus viridis*



*Sugarcane crop with weed infestation*

## **PERIOD OF WEED GROWTH AND CRITICAL PERIOD OF CROP-WEED COMPETITION**

Weeds interfere with crops at any time they are present in the crop. The period at which maximum crop weed competition occurs is called as critical period which is the shortest time in the ontogeny of the crop when weeding results in the highest economic returns. As a thumb rule, the first  $\frac{1}{4}$  -  $\frac{1}{3}$  of the growing period in many crops is a critical period. The duration of a sugarcane crop is 12-16 months. So, in sugarcane, the initial 120 days can be considered as a critical period for crop-weed competition. In general for most annual crops first 30-40 days a weed-free period is very important. In a situation, where weeds germinate late, as in the case of sugarcane, the late-stage weeding is also more useful as early weeding. So, weeding around 100-120 days or 120-150 days after planting cane (variety dependent) is as important as early weeding done in the initial crop growing period (30-40 days), as weed seeds keep on germinating because of wide row spacing and sunlight reaching in the exposed inter-row spaces (until full crop canopy development). Subsequently, frequent irrigations, heavy fertilizer dose and high temperature induce many new flushes of weeds. Bermuda grass (*Cynodon dactylon*), nutsedge and several species of morning glories (*Ipomoea* spp., *Convolvulus* spp. etc) pose special weed problems in sugarcane in different areas.

## **WHAT IS INTEGRATED WEED MANAGEMENT**

Increased world population will demand more food production, which can only be achieved by increasing crop yields and applying a sustainable approach, i.e. more production with rational use of available resources, which also implies responsible use of land and water and enhanced food diversity. Efforts are needed to reduce crop losses due to pests through the implementation of Integrated Pest Management (IPM) (resistant crop varieties, rational use of pesticides, biocontrol and better cultural practices) without harmful side effects. Among the pests, weeds are considered an important biotic constraint to food production. Their competition with crops reduces agricultural output (quantity and quality) and increases external costs by spreading them across farm boundaries. It is also a major constraint to increased farmers' productivity, particularly in developing countries.

## **ECOLOGICAL IMPORTANCE OF IWM**

In most ecosystems, herbicides have become one of the most important components in weed control. There are two reasons to explain the increased use of herbicides, the first being the widespread adoption of high-yielding varieties which created economic incentives for

farmers to reduce weed infestation; and the second is the availability of cheap herbicides. Because of the availability of cheap herbicides, it is expected that herbicide usage will continue to increase, both in developed countries and even in developing countries. However, this does not indicate a lack of importance for hand-weeding. Manual weeding is still the dominant weed control method in many parts of Asia since management options for weed control are limited under diverse agroecological conditions.

However, intensive and repeated application of this type of herbicide has resulted in several negative effects, as follows:

- Evolving resistant weeds.
- Residual effects on the following crops

All these factors may well provide sufficient reason to attract public concern and anxiety regarding the negative effects of herbicides that might originate from intensive herbicide application in the environment. In this regard, an alternative to such a heavy dependence on herbicide is needed. Such an alternative might be found in the use of integrated weed management, which can reduce herbicide use in different cropping systems.

Weeds exist in many different forms and with different life spans; there are annual, biennial, and perennial weeds. Weeds are not always bad, and low density will result in no or small yield losses. Heavy manifestations of weeds, or establishment of perennial weeds, can result in large yield losses or can even take land out of production until the weeds are controlled. Weeds can also reduce yield quality and can be toxic when ingested by animals or humans. Weeds can also cause environmental damage and loss of agricultural biodiversity, by competing for inputs.

## **INTEGRATED WEED MANAGEMENT AIMS AT**

### ***PREVENTING WEEDS FROM SPREADING BY:***

- Cleaning farm machinery and vehicles before transporting, to avoid the risk of spreading weeds.
- Using only well-stored and rotted manure (4-5 months), possibly improve decomposition. Make sure that soil disturbances are immediately reseeded.
- When possible, practice weed control on all aspects of the farm, including irrigation canals, drainage ditches, fence lines, stockyards, and farm roads.
- Improving knowledge of the identification and effects of different types of weeds.

- Making control decisions based on full knowledge of potential damage, cost of control methods, and the environmental impact of the control strategy.
- Using combinations of (preferably biological) weed control strategies to reduce the weed populations, can include winter cover crops, mulching, crop rotations, natural competition, proper seedbed preparation, proper fertilizer application, stimulating bio-control by insects, hand weeding, and try to avoid herbicide application whenever possible.
- Evaluate and monitor the effectiveness and (environmental) effects of control strategies.

### ***INTEGRATED WEED MANAGEMENT IN SUGARCANE***

- Weed control could be achieved through crop rotations, crop competition, mulching, clean cultivation, trap cropping, etc.
- Crop rotation practices help in breaking the weed chain and thus help in the destruction of the particular type of weeds. For example, growing paddy in rotation needs a puddled soil condition by which effective reduction of monocot weeds is possible, which are otherwise difficult to control. Several twining weeds can be controlled by growing paddy in rotation.
- Intercropping also provides another means of reducing the weed population. Fast growing short duration intercrops are useful for this purpose. Mulching using sugarcane trash helps in suppressing weeds substantially.
- Agronomic practices could be used to reduce the chances of new weed introduction and further spread of weeds.
- Perennial weeds are difficult to manage such weeds can be managed by digging patches of weeds, collection and destruction of underground parts with the use of translocated herbicides like glyphosate.
- Moisture management is one of the important steps in the integrated weed management process. Adopt drip irrigation to minimize weed population.
- Summer deep ploughing exposes the fields to the heat of the sun for three to four weeks or more periods help in destroying perennial weeds.
- Optimum plant population may be maintained using good quality planting material and proper methods of planting.
- Crop rotation must be followed like cotton, soybean, green gram, cowpea, sun hemp, dhaincha or groundnut, etc.

- Water channels, bunds and surrounding areas must be free from weeds for avoiding the spread of weeds in the field.
- Use well-decomposed FYM or compost for minimizing the spread of weeds in the field. Band placement of recommended dose of fertilizer at the proper time for better crop growth and suppressing weeds.
- Adopt intercropping of the suitable crop as per planting season.
- Atrazine or simazine @ 2 - 2.5 kg a.i./ha as pre-emergence spray about 3 to 4 days after planting in the plant cane and after completion of basic requirements of ratoon management about 3 to 4 days after giving irrigation in the ratoon crop.
- It is required to give one hand weeding after 30 to 40 days after planting depending upon weed intensity.
- Application of Atrazine @ 1.0 -1.25 kg a.i/ha with 1000 liters of water after planting under moist condition-controlled weeds. To manage broad-leaved weeds, application of 2,4-D Sodium Salt @ 1.0 kg a.i/ha with 600 litres of water can be done up to 60 days after planting
- Application of trash mulching @ 10 t/ha in plant cane/ratoon to reduce weed growth and high productivity.

In case of intercropping of sugarcane with vegetables like cabbage, okra, potato, oilseeds or pulse crops use Fluchloralin (Basalin) @ 1 to 1.5 kg a.i/ha as a pre-emergence spray. One hand weeding if required after one month after planting.

## CONCLUSION

Sugarcane is long duration cash crop. Poor weed control practices may result in drastic yield reduction and cause heavy economic losses for sugarcane farmers. Heavy dependency only on chemicals for weed control may also reduce the soil's biotic life due to residual effects. Adoption of integrated weed management is more appropriate for higher yield of sugarcane and maintaining the ecological balance too.

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