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Climbing weed management in sugarcane

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Abstract
In Agriculture sector, sugarcane share is about 7% and occupied 2.6% of India's gross cropped area with functioning of 527 sugar factories. India occupies an important place among the sugarcane producing country and has a neck to neck race with Brazil. The most critical period for the weed competition in sugarcane is up to 4-5 months after which crop growth is better which suppress the weed growth. Weed removes 4 times of N and P and 2.5times of K in sugarcane. After earthing up, just before it enters its grand growth period, a healthy crop smother any new weed seedling but Ipomoea spp., *Convolvulus arvensis* and the other trailing weed species, may however still survive by climbing the cane plants and grow luxuriantly. These trailing weeds are severe in ratoon and disturb the harvesting. Climbing weed cause a severe problem interfering on the growth and harvest of the sugarcane. Hence, to manage these weeds in ratoon; the management includes the reduction of weed seed bank of climbers post - emergence herbicides (metribuzin 1.5 kg/ha +2,4-D 0.2% and 2,4-D 0.2% alone) was chosen. Sugarcane crop which was heavily infested with climbing weed (Ipomoea) in a ratoon field was chosen at Sugarcane Research Station, Cuddalore. Metribuzin 1.5 kg/ha +2,4-D amine (Tank mix combination) and 2,4-D amine alone was sprayed on 26.6.2024 separately to assess the efficiency. Drying was started on 3 DAS (Das after spray) and complete control was observed in 6 DAS(Days after spraying). Both the herbicides have controlled the climbing weed effectively however, the drying was quick and complete in tank mix combination of metribuzin +2,4-D amine.

Keywords: Climbing weed - metribuzin 1.5 kg/ha +2,4-d amine 0.2% - sugarcane - tank mix - 100% control

Introduction
In Agriculture sector, sugarcane share is about 7% and occupied 2.6% of India's gross cropped area with functioning of 527 sugar factories. India occupies an important place among the sugarcane producing country and has a neck to neck race with Brazil. Sugarcane is cultivated in an area of 4.44 mha in India with the annual production of 306.07 lakh tonnes and cane productivity of around 69.0 t/ha with an average sugar recovery of approximately 10%. Weed causing a yield loss is to the tune of 12%- 72% in sugarcane. Unlike other crops, wider spacing, slow growth and one year for harvest favours the weed infestation. During the initial 100-120 days period, the growth of sugarcane crop is lesser. Taking advantage, weeds grow luxuriantly and cause serious damage. Most common weeds of sugarcane are *Cyperus rotundus (sedge), Cynodon dactylon, Digitaria sanguinalis, Dinebra retroflexa, Eleusine indica, Panicum spp., Dactyloctenium aegyptium (among grasses), Trianthema portulacastrum, convolvulus arvensis, Amaranthus viridis, A blitum, Digera arvensis, Portulaca oleracea, Lactuca runcinata, Euphorbia hirta, Euphorbia geniculata, Eclipta alba, Commelina benghalensis, Digera arvensis, Phyllanthus niruri* and *Ipomoea spp*. (among broad leaved weeds) etc.
If these weeds are not controlled from very beginning the reduction in sugarcane yield may be severe. The most critical period for the weed competition in sugarcane is up to 4-5 months after planting beyond which the crop smoothers the weed flora by itself. Weed removes 4 times of N and P and 2.5times of K in sugarcane. Physical methods work out to be costly. Because of this, farmers face lot of problems in attending to the important operation of timely weeding. In a crop like sugarcane, herbicides plays a major role in cost effective weed management. Effective weed control in sugarcane can be achieved by adopting various known approaches of weed management.

The weed management module for the main crop includes the following recommendation

1. The pre emergence application of atrazine at 1.0 kg a.i. ha-1 on 3 DAP followed by post emergence directed application of glyphosate @ 1.0 lit ha-1on 45 DAP with hood+ one hand weeding on 90 DAP registered the maximum cane yield.
2. If pre-emergence spray is not carried out, apply post-emergence spray of Grammaxone 1.0 litre + 2,4-D sodium salt 2.5 kg/ha in 600 liter of water on 21st day of planting.
3. Hand weeding and partial and full earthing up for ratoon weed management.

After earthing up, just before it enters its grand growth period, a healthy crop smother any new weed seedling but Ipomoea spp., *Convolvulus arvensis* and the other trailing weed species, may however still survive by climbing the cane plants and grow luxuriantly. These trailing weeds are severe in ratoon and disturb the harvesting. Climbing weed cause a severe problem interfering on the growth and harvest of the sugarcane. Hence, to manage these weeds in ratoon; post - emergence herbicides (metribuzin 1.5 kg/ha +2,4-D0.2% and2,4-D0.2% alone) was tried in this experiment. For better reduction in weed seed bank of climbing weeds the post emergence herbicides should be sprayed before flowering.

The following herbicides are used worldwide for controlling the climbing weeds

SI. No	Herbicide	Mode of action	Time of application	Classification	Reason for selection	Trade name
1	Atrazine	by binding to the plastoquinone-binding protein in photosystem II.	Pre - mergence 3DAP	Systemic	Pre - emergence is necessary to manage the early weed growth and the initial depletion of weed seed bank	Atrataf
2.	Halosulfuron methyl	ALS inhibiting	25 DAP EPOE	Systemic	To manage the escaped and germinated weed after application of Pre emergence Selective for sugarcane	Sempra
3.	Metribuzin	inhibiting photosystem II of photosynthesis by disrupting electron transfer	25 DAP EPOE	Systemic	Selective for sugarcane	Tata metri Sencor
4.	Glufosinate ammonium	Glufosinate controls weeds by inhibiting glutamine synthetase	150 DAP POE	Systemic	Non - Selective Systemic using hood the initial 120 DAP should be weed free.	Sweep power
5.	2,4-D	Synthetic Auxin - Uncontrolled and Unsustainable growth	150 DAP POE	Systemic	To kill broad leaved weeds in sugarcane	Weedar 64
6.	Carfentrazone ethyl	controls weeds through the process of membrane disruption which is initiated by the inhibition of the enzyme protoporphyrinogen oxidase	150 DAP POE	Contact	Reported that Ipomoea was effectively controlled	Affinity

Materials and Methods

Sugarcane crop which was heavily infested with climbing weed (Ipomoea) (in a ratoon field) was chosen at Sugarcane Research Station, Cuddalore. Metribuzin 1.5 kg/ha +2,4-D amine 0.2% (Tank mix combination) and 2,4-D amine (0.2%) alone was sprayed on 26.6.2024 separately to assess the efficiency on controlling climbing weeds. Drying was started on 3 DAS (Das after spray) and complete control was observed in 6 DAS (Days after spray). Both the herbicides have controlled the climbing weed effectively however, the drying was quick and complete in tank mix combination of metribuzin +2,4-D amine.

Results

Metribuzin 1.5 kg/ha +2,4-D amine 0.2% (Tank mix combination) and 2,4-D amine (0.2%) alone was sprayed on 26.6.2024 separately to assess the efficiency against climbing weeds. Drying was started on 3 DAS (Das after spray) and complete control was observed in 6 DAS(Days after spray).Tank mix application of Metribuzin 1.5kg/ha +2,4-D Na 0.2% effectively (100%) controlled the climbing weeds and drying was also observed in application of 2,4- D Na 0.2% but the intensity of drying was better in tank mix application of Metribuzin 1.5kg/ha +2,4-D Na 0.2%. Hence, this can be widely recommended for controlling climbing weeds in sugarcane before flowering of the climbing weeds inorder to arrest the seed production of weeds and further loaded in the soil as weed seed bank. This was corroborates with the finding that post-emergence application of metribuzin at 1.25 kg/ ha + 2,4-D sodium salt at 2 kg/ha reduced weed biomass significantly (Sarala *et al*., 2015) [2]. Sulfosulfuron 25 g/ha, sulfosulfuron+ metsulfuron (ready-mix) 32 g/ha, mesosulfuron+ iodosulfuron (ready-mix) 14.4 g/ha or pinoxaden 50 g/ha provided effective control (83-97%) of weeds including *Phalaris minor* over the years. These treatments provided higher grain yield of wheat (4.65-4.93 t/ha) and cane yield (85.5-91.1 t/ha) of sugarcane (Dharam Bir Yadav *et al*., 2020) [1]. By adopting effective weed management strategies, sugarcane farmers can achieve sustainable cultivation, maximizing yield while minimizing environmental impact and ensuring a successful harvest (Rajbir *et al*., 2024) [3]. Pre-emergence application of atrazine @ 1.0 kg a.i/ha followed by post-emergence application of metribuzin @ 0.75 kg/ha 60 days after planting has effectively controlled the weeds and dry weight which resulted in higher yield attributing characters compared to control. (Thrivarassan *et al*., 2023) [4].

Ipomoea in ratoon sugarcane before spray

Metribuzin 1.5 kg/ha +2,4-D amine 0.2% (Tank mix combination) sprayed plot with complete drying

Summary and Conclusion

Sugarcane crop which was heavily infested with climbing weed (Ipomoea) in a ratoon field was sprayed with Metribuzin 1.5 kg/ha +2,4-D amine 0.2% (Tank mix combination) and 2,4-D amine 0.2% alone on 26.6.2024. Drying was started on 3 DAS (Days after spray) and complete control was observed in 6 DAS (Days after spray). Both the herbicides have controlled the climbing weed effectively however, the drying was quick and complete in tank mix combination of Metribuzin 1.5 kg/ha +2,4-D amine 0.2%. Hence, this can be widely recommended for controlling climbing weeds in sugarcane before flowering of the climbing weeds inorder to arrest the seed production of weeds and further loaded in the soil as weed seed bank.

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