



Review Article

Weeds of Sugarcane and Its Management : A Review

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Sugarcane, an important cash crop and a good source for substance of largest agro-industry, is being cultivated in most part of tropical and sub-tropical India. India has known as the original home of sugarcane and sugar. Sugarcane (*Saccharum officinarum* L.) is a widely grown cash crop in India responsible for the overall socio-economic development of the farming community and main feedstock for sugar production and it is cultivated about 5.2 (FAOSTATE 2018-19) million hectare area in the world, Uttar Pradesh is an important sugarcane growing belt of India with 119 working sugar mills, and 118.22 lack tones sugar production with 11.34 % sugar recovery (ISMA 2019-20). In the subtropical region, occupying around 56 percent of area and western part of Uttar Pradesh attain premier position regarding production, sugar recovery and cultivation of sugarcane. It is an important cash crop under irrigated condition and also long duration nutrient exhaustive crop is being cultivated in most part of tropical and sub-tropical India.

Introduction

Weeds, the undesired, unwanted plants compete for space (land), light, moisture nutrients etc and thereby cause serious damage to the main crop thus adversely affects human welfare. They can survive and in the face of many obstacles such as drought, low temperature, frost etc. They are strong competitors and may develop a special adaptation which affects Survival of the fittest, (Klingman 1963). They can also be referred as plants out of place. Weeds are important factor in the management of all land and water resources, but their effects are greatest on agriculture. There is no reliable study of worldwide damage due to weeds. However, it is widely known that losses caused by weeds exceed the losses from any other category of agricultural pests like insects, nematodes, diseases, rodents etc. According to V.S. Rao Principal of weed science (1987) book reprint of the total annual losses of agricultural produce from various pests in India, weeds account for 45 %, insects 30 %, disease 20 % and other pests 5 %.

Weed Flora in Sugarcane

Weed identification is as essential as the control of weeds itself because it aids in their effective control (Isom 1976, Cramer and Burnside, 1980, Thakur et al 1991) In Sugarcane , weeds get optimum conditions for their rapid growth as the crop is grown in well spaced moist and fertilized soil. Johari and Singh (1991) surveyed and classified 45 most common

species of weeds in sugarcane field in Uttar Pradesh. They are observed purple nut sedge (*Cyperus rotundus* L.) the most dominant weed of the state. Sathyavelu et al (1993) Verma 2000 classified 60 main weeds species found in sugarcane fields in India and observed purple nut sedge (*Cyperus rotundus* L. and *Gynaphalium peregrinum*) Fermland in the pre winter season. The weed flora that emerged in the initial stages of autumn sugarcane was altogether different than those emerged in spring planted sugarcane in sub-tropical India. Rajendra Kumar et al reported (2017), the dominant weeds, which were prevalent during the three rabi seasons after the sugarcane and wheat planting were *Phalaris minor*, *Chenopodium album*, *Anagalis arvensis*, *Rumex dentatus*, *Cyperus rotundus*, *Euphorbia simplex*, *Convolvulus arvensis* , *Vicia sativa*, *Melilotus alba*, *Trigonella polycerta*, *Lepidium Sativum*, *Fumaria parviflora*, and *Spergula arventis*.



Fig. A *Cyperus rotundus* (Motha)



Fig. B *Ipomoea* (Morning glory)

Critical Period of Crop Weed Competition

Weeds and sugarcane plants have the basic requirements for light, moisture and nutrients for their existence. Therefore the yield is influenced by the density and completion ability of the two for these inputs. Rangiah et al (1988) reported that initial 90 days period was found critical for crop weed competition in sugarcane ratoon. Singh and Verma reported (1969) that the summer weeds caused maximum damage to the sugarcane crop. Spring planted sugarcane requires weed free condition up to 90 days after planting reported Singh et al 1980, Rangiah et al 1988. Agrawal et al (1977) observed weed competition during germination and early shoot formation stage did not reduce the yield markedly; however, the weeds of tillering phase were most deleterious. After the onset of monsoon the losses due to weeds were negligible. Blanco et al (1982) found that controlling the weeds in sugarcane during the first and second months after sprouting gave as good yield as from weed free control when the weeds were not controlled until second month the yield was depressed.

Reduction in Crop Yield

Weeds compete with plant crop plants for nutrients, soil moisture, and sunlight. The intensity of weed competition depends upon 1. type of weed species, 2. severity of infestation, 3. duration of weed infestation, 4. Competition ability of plants, and 5. Climatic condition which affects weed and crop growth. Reduction in crop yield has a direct correlation with weed competition. Generally, a one kilogram of weed growth corresponds to reduction in one kilogram of crop growth according to V.S. Rao (1987). Weeds remove plant nutrition more efficiently than plant crop. In drought situation, they thrive better than crop plants. When left uncontrolled, some weeds are taller than the crop plants and inhibit tillering and branching. They can curtail sunlight and adversely

affect photosynthesis and plant productivity.

Sugarcane is planted in wide spaced; (trench planting system) well prepared moist and fertilized soil. The weeds thus get optimal conditions for their rapid growth. They germinate with sugarcane crop and compete for their fertilizer, sun light, space and water, etc, which in turn, reduce the yield of sugarcane. The losses due to weeds in sugarcane are exceedingly higher and often beyond expectation. Singh and Verma (1969) and Agrawal et al (1970) reported that the summer weeds cause maximum loss to the sugarcane crop. The weed competition during germination did not reduce the yield, but at the tillering, it had the most deleterious effects, Singh et al (1980) observed that sugarcane required weed free condition up to 120 days. Rolin and Cristoffoleti (1982) reported this period from 30 to 90th days after planting. Blanco et al (1982) found that controlling the weed in sugarcane during the first and second months after sprouting gave as good yield as obtained from weed free control. When the weeds were not controlled until 2nd months the yield was depressed. Verma and Bhardwaj (1958), Mathur (1962) and Johari and Singh (1989) reported losses in cane yield due to weeds varied from 8-63 %. Singh and Verma (1969) obtained 48 % more yield of cane by controlling weeds in sugarcane Singh and Singh (1978) found that weeds during monsoon reduced the yield of sugarcane by 35 %. Weed management in an intercropping system has always been an issue and concentrated efforts are required to provide weed free environments at regular intervals to both main/base crop and component crop for attaining higher productivity levels (Shah 2011). Reduction in yield due to weeds both in sole and intercropped sugarcane, have been estimated to vary from 26%-75% (Shah 2011).

Integrated Weed Management in Sugarcane

Weed management in sugarcane plays a huge role in the maximization of crop production with sugarcane the problem is that a weed infestation can pose is unique from other crops, and this is why it can become so severe. The weed problem in sugarcane can be more severe due to sugarcane's wide spacing, its slow essential growth and its increased water and nutritional requirements. Control of weeds in sugarcane is most essential for obtaining maximum mechanical, cultural and chemical methods. Each of these methods has certain merits and progressive farmers can make use of one means or a combination of them to control the weeds efficiently and economically. The various methods of control and eradication of weeds are grouped under three broad categories i. e. cultural, mechanical and chemical.

1. **Cultural Methods:** Cropping and cultural practices play an important role to control weeds in sugarcane. Crop rotation, crop completion, good crop canopy and trash mulching are the most important aspects for minimizing losses due to weeds. Khan and Rana (1956) reported cultural method to be most effective for controlling weed in sugarcane, leading to improvement in quality and quantity also. Khan and Rana (1956) reported better yield of sugarcane by applying 4 hoeing, however the quality was not affected. Gill (1963) observed that 17 cm thick trash applied between two rows of sugarcane suppressed the all types of weeds and conserved moisture. Effective weed control by trash mulch has been reported by many workers. Babu et al (1963) found suppressed weeds by the use of blank polythene film. Saini et al (1983) says 47.8 % increased yield by three hoeing, while one hoeing between pre and post emergence spray of sencor produced 84.7 % higher cane yield over check (unweeded). Agrawal et al (1986) reported that preparatory operations are not very essential, if intercultural operation or 10 cm thick trash mulch or pre and post emergence spray of 2.25 kg simazine per hectare are followed.
2. **Mechanical Method:** Control of weed in sugarcane in mechanical methods, tillage operations are done either manually or by bullock/ tractor drawn implements which are not eliminates the weeds but also stir up the soil which intern, increase soil aeration. Tillage operations have beneficial effects on soil physical properties and on the basis of large amount of experimental evidence, it is generally accepted and reported by Dilip Johari et al (2002) that mechanical method is the best one controlling weeds in sugarcane. The deeply rooted weeds suffer only a temporarily set back which unable the sugarcane plans to enjoy maximum amount of moisture, light, nutrients and space etc. Chauhan and Das (1990) reported that hoeing treatments increases the number of millable canes, sucrose % and yield. Agrawal et al (1990) found that the best control of weeds plant growth, cane and sugar production along with handsome net profit by hoeing during November and each during March, April and May. Verma reported (2000) generally three hoeing each done after first to third or fourth irrigation during tillering phase of crop check the crop weed completion.
3. **Chemical method:** Hand weeding is although most efficient method of weed control in sugarcane yet it is time consuming and costly. Now days, manual labour is becoming lack. Further wages paid to the hired labours narrow down the benefits of farmers. The chemical method of weed control is easier, cheaper, less time consuming then weeding by paid labors. In India the work of chemical control started in 1984 by Bonsale (1950), which fallowed series of experiments by different workers. Since then a number of herbicides belonging to different groups Viz., triazines, urea derivatives, amides, carbomates and thiocarbomates, urecils, and organophosphorus compounds have been tested for their suitability and controlling weeds in sugarcane fields Herbicides are either contact or translocated. The contact herbicides are traslocated to a little extent and kill weed plant due to local action. For example. Gramoxone has a strong affinity with the cellulose, and thus affects the photosynthesis by blocking the sun light induced electron transport system in the thylkoid membrane of chloroplast (Brown and Nix 1975 Boger 1985). The systemic herbicides belonging to the phenoxy, triazine and substituted urea group, on the other hand are absorbed by the roots as well as foliage of weeds and traslocated to the major extent. They ultimately destroyed the vascular bundles, specially the living phloem tissue of the plants (Kingman 1963, Joshi 1974). weed control recommendations made for sole sugarcane crop using atrazin and metribuzin (Singh and Kumar 2013) or even that used in ratoon crop using diuron (Kumar et al 2014). According to Mehar Chand et al (2014) halosulfuron methyl 75 % WG at 67.5 g.a.i./ha at 45 days after showing was realized to the optimum dosd for effective control of A *Cyperus rotundus* (Motha) in sugarcane crop.
May not hold well in an intercropping system due to operational and phyto-toxicity issues. Weed control recommendations on the basis of many experiments held at U P Council of sugarcane research Shahjahanpur is Atrazin (50 % WP) @ 2 kg/ha or metribuzin (70 % WP) @ 1 kg/ha ai/ha as per emergence fallowed by 2, 4 D sodium salt (80 % WP) or 2, 4 D amino salt (58%) 800 ml/ha at 60 days after planting of sugarcane.



Fig . C : Spray of Metribuzin (70 % WP) + 2,4 D (80 % W P)

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