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IMPACT OF WEED CONTROL METHODS ON YIELD AND QUALITY OF SUGARCANE CROP

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ABSTRACT

The experiment in hand was planned at the research area, Sugarcane Research Institute, Faisalabad, Pakistan during spring season 2017-18 with the objective to find out the most effective combination of weed control in sugarcane by using integrated weed management (IWM) method. The trial was laid out in Randomized Complete Block Design and replicated thrice. According to the results, the treatment T_6 (Manual weeding 30 DAP (days after planting) + one mechanical weeding 60 DAP + earthing up 90-100 DAP) have lowest number of weeds (17.30 m^{-2}) which shows 91.10% weed mortality with higher cane yield (103.22 t/ha) followed by T_3 (Scope 80 W.P @ 1 kg /acre pre-emergence + Sunstar @ 20 g /acre post-emergence + one mechanical weeding 60 days after planting + earthing up 90-100 DAP) which gave cane yield of 102.78 t/ha. However, minimum cane yield (66.05 t/ha) was recorded from T_7 (control).

Key words: Earthing-up, integrated, pre-emergence, sunstar, weeding.

INTRODUCTION

Sugarcane crop is being grown all over the world. USA produces 52.3% of the world sugarcane followed by Asia (39.9%), African (5.7%) and Oceania (2.2%). Enhancement in area and production is observed in horizontally as well as vertically during the last one and a half decade in the world. Sugarcane (*Saccharum officinarum* L.) a crop of tropical and subtropical areas, provides around 80% of the world production of sugar and 35% of the ethanol (4).It has a sucrose content of 10-18% and fibre content of 10-15% at harvest (1).

Many factors are responsible for the declining sugarcane yield (9). Weed infestation and poor agronomic practices (8) are some of the important factors for the reduction in weeds. Sugarcane being a perennial crop (3-4 years in the same field) having all types of weeds, seasonal, annual and perennials (11).

The kind of weed species and the duration of its infestation have an impact on number and size of tillers, number of millable cane and yield of sugarcane crop. Weeds which emerge only during rainy season are Echinochloa colonum and E. crusgalli (grasses), Amaranthus viridis and Celosia argentia (broad leaved weeds) (9, 10). Weeds which emerge before the start of monsoon are Cyperus rotundus (sedge), Cynodon dactylon and Sorghum halepense (grasses), Annual weeds like Chenopodium album, Lathyrus sativa, Vicia spp., Angallis arvensis and Fumaria parviflora ,Parasitic weeds Partial root parasite – Striga lutea (5, 11).

In world, the cane yield losses due to weeds range from 12 to 70%. If weeds are not properly controlled in the initial stages, the yield loss could go up to 10-15 t/ha. Twining weeds like Ipomoea sp. which twine around clumps affect cane growth and cause around 25% loss in yield. Twining weeds enhanced cost of cultivation and cause serious harvesting problem. Weeds infestation also deteriorate quality of cane produce (3, 4).

The losses caused by weeds are estimated to be much higher than pests and diseases put together. Weeds remove 4 times of N and P and 2.5 times of K as compared to sugarcane during the first seven weeks period. Bermuda grass (Cynodon dactylon), the cogan grass (Imperata cylindrica) and other graminacious weeds are known to be alternate hosts to Ratoon Stunting Disease (RSD) of sugarcane (10).

Similarly different herbicides were evaluated for their efficacy in managing summer weeds of sugarcane belonging three different categories i.e. broad leaved, narrow leaved (grasses) and narrow leaved (sedges). It was found that the best control of all three types of

weeds was seen in two treatments i.e. Orcus+ Ametryn+Atrazine and Orcus+Dual Gold controlling more than 90% of weed flora in target fields without any negative effect on cane crop. This study showed that Orcus+ Ametryn+Atrazine and Orcus+Dual Gold may be the best combinations for chemical of all three types of weeds in sugarcane (13).

The modern day technology is the integrated weed control, including the use of cultural and chemical means. As, for a long growing season crop like sugarcane single, method of hoeing or chemical weed control is not sufficient to attain the goal of complete weed control (5,6).

Therefore, the main objective of this study is to determine the best option for weed control that can minimize weed population in crop field and give an optimum cane yield to improve the economic statue of the sugarcane farming community in the Pakistan.

MATERIALS AND MENTHODS

Description of study area

The field experiment was conducted during 2017-18 at research & farm area of Sugarcane Research Institute, Faisalabad. It is sited at the Latitude of 31° 25' N and Longitude of 73° 05' E. The soil is loamy with pH of 7.8, EC (0.36 dsm^{-1}) and organic matter of 0.90 (%) 184 m (604 Ft) above sea level. The rainfall recorded during the study year was 340 mm and the temperature range between minimum of 4.1 ^{o}C and maximum of 41 ^{o}C.

Experimental layout

The experiment was laid out in randomized complete block design with three replications wherein 07 treatments *viz.*, T_1: Dual gold @ 800 ml/acre pre-emergence + one mechanical weeding 60 DAP (Days after planting) + earthing up 90 DAP, T_2 : Scope 80 W.P @ 1 kg /acre pre-emergence + one mechanical weeding 60 DAP + earthing up 90 DAP, T_3: Scope 80 W.P @ 1 kg /acre pre-emergence + Sunstar @ 20 gm /acre post-emergence + one mechanical weeding 60 DAP + earthing up 90 DAP, T_4: Falisto gold @ 1000 ml/acre post-emergence + one mechanical weeding 60 DAP + earthing up 90 DAP, T_5: Atrazine @ 1000 ml/acre post-emergence + one mechanical weeding 60 DAP + earthing up 90 DAP, T_6: Manual weeding 30 DAP + one mechanical weeding 60 DAP + earthing up 90 DAP, T_7: Control. All other agronomic of practices were followed by recommended package.

Establishment

Field clearing was carried out before ploughing, harrowing and ridging at Farm area of SRI, Faisalabad. Each plot consisted of 5 rows measuring 5 m long and inter-row spacing of 1.2 m (4 feet) making a sub-plot size of 30 m^2. Three-eyed budded setts were laid at the rate of 50000 TBS/ha on the ridges horizontally end to end. Cultural practice such as earthing up, irrigation and other maintenance operations were carried during the growing period of the crop.

Weed survey

The survey was carried out to assess the weed composition with the aid of a quadrat measuring 0.25 x 0.25 m, placed at four random locations within the net plot during the sampling period of 15 and 45 DAP. The weed seedlings emerged were observed, counted.

Sucrose analysis

Using a hand held extractor, cane juice was extracted from randomly selected stalks from the net plot and placed on a hand held refractor meter for Brix determination. Randomly selected cane stalks samples were crushed using a JEFFCO cane grinder. 5.2 g of the juice sample extracted was diluted with distilled water into a 100 mL Kohrash volumetric flask. The dissolved sample was made up to the mark of 100 mL with distilled water. Sufficient clarifying agent (lead sub acetate) was added and filtered through Whatman # 91 filter paper with Celite filter aid. The filtered sample was measured and placed in a Polari meter, % polarity was determined by multiplying the recorded value by five.

Data collection

Data on sugarcane emergence and number of tillers were collected at different sampling periods. Total canes emerged from each plot were counted at 25 DAP, 45 DAP and 60 DAP. Tillers from the net plot (30 m^2) were counted and recorded at 90 DAP. Data on cane yield and yield component were collected at 12 MAP.

Analysis of variance

Data collected were subjected to analysis of variance (ANOVA) using Gen-stat Statistical Package (Discovery Edition 3) and where F-ratios were significant ($P \leq 0.05$), means were separated using the (LSD) least significance difference (8).

RESULTS AND DISCUSSION

Weed Control

The data presented in table 1 show that all the treatments decreased weed population significantly over control. Statistically higher numbers of weed plants (190.45 m^{-2}) were recorded in weedy check plot. Lowest number of weeds (17.30 m^{-2}) was recorded for T_6: Manual weeding 30 DAP + one mechanical weeding 60 DAP + earthing up 90-100 DAP which shows 91.10% weed mortality. It was non-significantly followed by T_5: Atrazine @ 1000 ml/acre post-emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP with 85.73% weed mortality. A significant weed mortality due to chemical and cultural control measures has also been reported by Aslam *et al*., 2008 (17).

Tillers per Plant:

Data presented in the table showed that 3.05 tillers per plant were observed in T6 (Manual weeding 30 DAP + one mechanical weeding 60 DAP + earthing up 90-100 DAP) which are the maximum tillers per plant. These are at par with T2 (Scope 80 W.P @ 1 kg /acre pre-emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP) and T3(Scope 80 W.P @ 1 kg /acre pre-emergence + Sunstar @ 20 g /acre post-emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP) with 2.88 and 2.86 tillers per plant in the sequence. While minimum number of tillers was seen in the treatments T4 (Falisto gold @ 1000 ml/acre post-emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP) (2.35 tillers) and T7 control (2.18 tillers). These results are at par with Aslam *et al* 2008 (13).

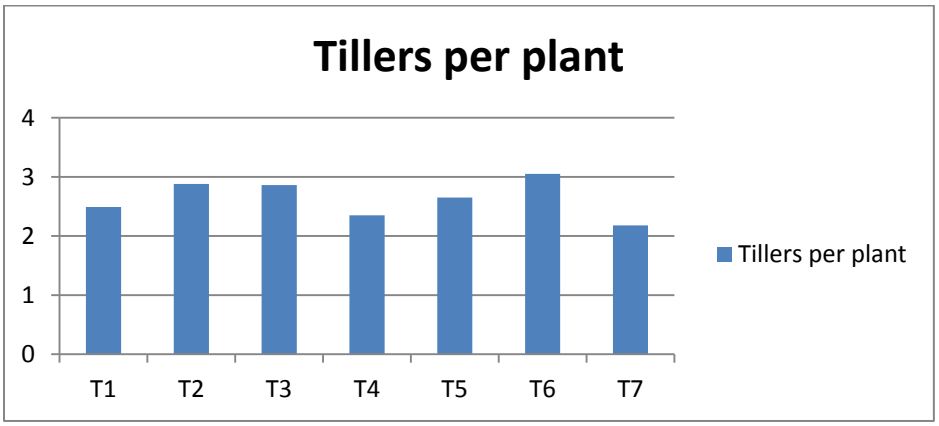

Fig.1

Number of Canes (000 ha^{-1})

Maximum number of canes per hectare were noticed 102.28 thousand canes in T6 (Manual weeding 30 DAP + one mechanical weeding 60 DAP + earthing up 90-100 DAP) that is at par with T3 (Scope 80 W.P @ 1 kg /acre pre-emergence + Sunstar @ 20 g /acre post-emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP) with 100.48 thousand canes per hectare. Minimum number of canes per hectare were observed in T1 (81.28 thousand canes per hectare) and T7 control (64.45 thousand canes per hectare). These results are at par with Aslam *et al.* 2008 (13).

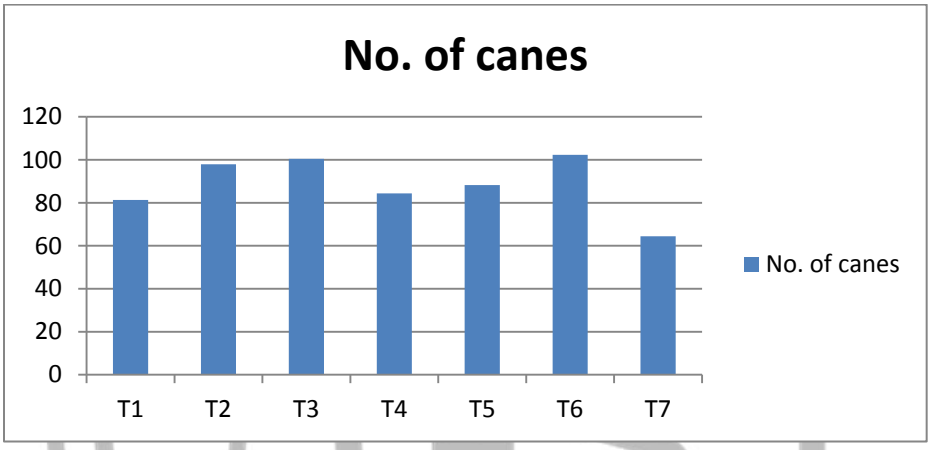

Figure 2

Cane Height (m):

Maximum cane height of 2.92 m and 2.78 m was observed in the treatment T6 (Manual weeding 30 DAP + one mechanical weeding 60 DAP + earthing up 90-100 DAP) and T3 (Scope 80 W.P @ 1 kg /acre pre-emergence + Sunstar @ 20 g /acre post-emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP) respectively. While minimum cane height of 2.27 m was seen in T7 (control). These results are in line with Farooq M.A. Et al (12)

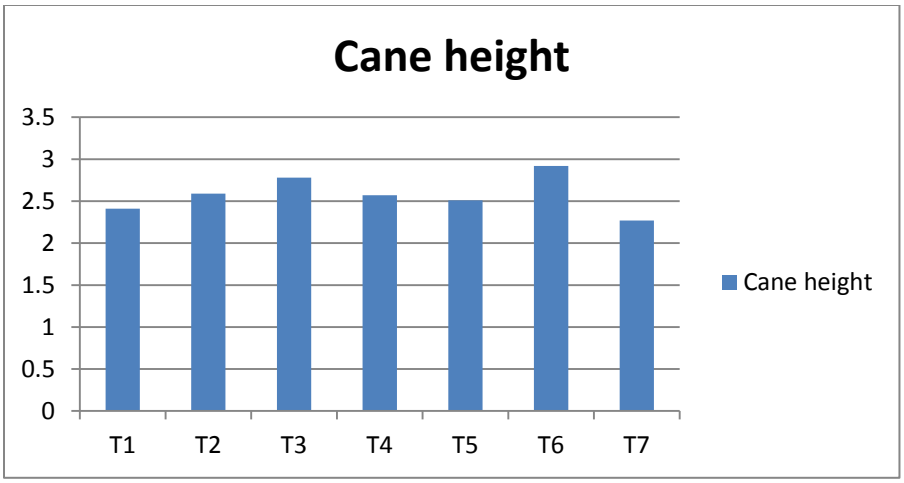

Figure 3

Cane Yield (T. ha^{-1}):

According to the data in the table, the treatment T_6 (Manual weeding 30 DAP + one mechanical weeding 60 DAP + earthing up 90-100 DAP) gave significantly higher cane yield (103.22 t/ha) followed by T_3 (Scope 80 W.P @ 1 kg /acre pre-em + Sunstar @ 20 g /acre post em + one mechanical weeding 60 DAP + earthing up 90-100 DAP) which gave cane yield of 102.78 t/ha. However, minimum cane yield (66.05 t/ha) was recorded from T_7 (control). Similar results were reported by Farooq M. A. *et al*.(12)

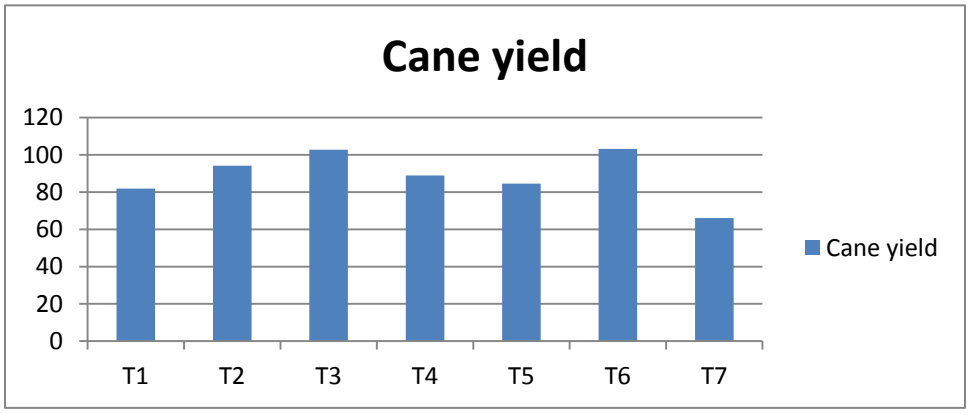

Figure 4

Table 1:- **Integrated Weed Management in Sugarcane**

Treatment	Weeds / m^{-2}	Tiller/ plant	No. of canes (000 ha^{-1})	Cane height (m)	Cane yield (t ha^{-1})
T_1: Dual gold @ 800 ml/acre pre-emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP.	31.18d	2.49 d	81.28 e	2.41 c	81.86 e
T_2 : Scope 80 W.P @ 1 kg /acre pre- emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP	47.10c	2.88 b	97.95 b	2.59 b	94.15 b
T_3: Scope 80 W.P @ 1 kg /acre pre- emergence + Sunstar @ 20 g /acre post em + one mechanical weeding 60 DAP + earthing up 90-100 DAP	65.23b	2.86 b	100.48 ab	2.78 ab	102.78 a
T_4: Falisto gold @ 1000 ml/acre post- emergence. + one mechanical weeding 60 DAP + earthing up 90-100 DAP	39.13cd	2.35 e	84.35 d	2.57 b	88.95 c
T_5: Atrazine @ 1000 ml/acre post- emergence + one mechanical weeding 60 DAP + earthing up 90-100 DAP	27.18d	2.65 c	88.22 c	2.51 bc	84.55 d
T_6: Manual weeding 30 DAP + one mechanical weeding 60 DAP + earthing up 90-100 DAP	17.30e	3.05 a	102.28 a	2.92 a	103.22 a
T_7: Control	190.45a	2.18 f	64.45 f	2.27 d	66.05 f
LSD (P ≤ 0.05)	**15.53**	**0.15**	**3.22**	**0.17**	**2.15**

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