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Research Communication

Weed growth and productivity of sweet corn (*Zea mays*) as influenced by weed management practices under rainfed condition

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ABSTRACT

The field experiment was conducted at School of Agricultural Sciences, Nagaland University, during the *kharif* 2022 to study the different weed management practices on the growth, yield and economics of sweet corn (*Zea mays* saccharata). The experiment was laid out in Randomized Block Design consisting of 8 treatments. Results showed that two hand weeding at 20 DAS and 40 DAS proved to be the most effective in controlling weed density and influencing the growth and yield of sweet corn. However, among the integration treatments, application of atrazine at 1 kg/ha as PE *fb* one hand weeding at 20 DAS showed the lowest weed density and weed dry-matter, cob yield (8.05t/ha) and green fodder yield (19.31 t/ha). However, from an economic point of view, atrazine at 1 kg/ha as PE *fb* tembotrione at 0.12 kg/ha as PoE gave the highest B: C ratio (3.54) followed by atrazine at 1 kg/ha as PE *fb* one hand weeding. Higher cost of hand weeding can be replaced by application of herbicides which can result in higher profitability of the sweet corn production.

Key words: Atrazine, Hand weeding, Sweet corn, Tembotrione, Weed management

Sweet corn (*Zea mays* L.) is a special type of corn that consists of a thin pericarp layer, translucent, creamy texture with sugary endosperm and is a highly nutritive crop. The scope of sweet corn production is constantly increasing due to its taste and high nutritional value (Olabode and Sangodele, 2015). However, weed interference is a severe problem in corn and the main factor for luxuriant weed growth in maize is not only due to congenial environmental conditions but also due to its early slow growth and wide row spacing (Singh *et al*. 2017). Hence, weed infestation is supreme importance among the biotic factors that are responsible for low maize grain yield. Herbicides usage for weed control is an important alternative to manual weeding being cheaper and faster. The effective and economic control of weeds in maize cultivation can be achieved through the efficient and right use of pre and post emergence herbicides (Hossain *et al*., 2019). But due to the awareness on over use of chemicals, scientists are trying to integrate other ways to control weeds through mulching, brown manuring and other cultural practices. Therefore, keeping in view the importance of weeds management and to increase the profitability, the present study was undertaken.

A field experiment was carried out in the experimental research farm of School of Agricultural Sciences (SAS), Nagaland University, during the *kharif* season of 2022. The experiment was conducted on the farm located at Medziphema, a foot hill of Nagaland situated at an altitude of 25°45'43" N and 95°53'04" E at an elevation of 310 meters above mean sea level. The experiment was laid out in Randomized Block Design with three replications consisting of 8 treatments. The treatments used were weedy check, two hand weeding at 20 and 40 DAS, Atrazine at 1 kg/ha as PE *fb* one hand weeding at 20 DAS, Atrazine at 1 kg/ha as PE *fb* tembotrione at 0.12 kg/ha as PoE at 20 DAS, Atrazine at 1 kg/ha as PE *fb* rice straw mulching at 5t/ha, Atrazine at 1 kg/ha as PE *fb* banana pseudostem mulching @ 5t/ha, Black gram as inter crop between the rows + atrazine at 1 kg/ha as PE and brown manuring (*Sesbania* at 25 kg/ha) at 25 DAS. Sweet corn variety 'Sugar 75'was sown at the rate of 2 seeds/ hill with a spacing of 60 cm × 20cm on 8 July, 2022. Nutrient levels were applied at the rate of 100-60-40 kg N-P-K/ha

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Table 1. Effect of weed management on weed dynamics (at 60 DAS), grain yield, straw yield and economics of sweet corn

Treatment	Weed density (no/m^2)				Total weed biomass (g/m^2)	Weed control efficiency (%)	Cob yield (t/ha)	Green fodder yield (t/ha)	Net return (× 10^3 ₹ /ha)	Benefit Cost: ratio
	BLW	Sedges	Grasses	Total						
Weedy check	11.14 (123.66)	5.39 (28.66)	6.69 (44.33)	14.03 (196.66)	9.11 (82.66)	-	3.13	7.56	41.36	0.93
Hand weeding at 20 & 40 DAS	4.44 (19.33)	1.87 (3.00)	3.29 (10.33)	5.75 (32.66)	3.44 (11.4)	86.19	8.33	19.99	167.38	2.75
Atrazine at 1 kg/ha as PE *fb* one hand weeding at 20 DAS	5.07 (25.33)	2.19 (4.33)	4.01 (15.66)	6.76 (45.33)	4.03 (15.83)	80.83	8.05	19.31	166.58	3.09
Atrazine at 1 kg/ha as PE *fb* tembotrione @ 0.12 kg/ha as PoE at 20 DAS	5.13 (26.00)	2.60 (6.33)	4.14 (16.66)	7.02 (49.00)	4.30 (18.06)	78.12	7.68	18.43	164.03	3.54
Atrazine at 1 kg/ha as PE *fb* rice straw mulching at 5 t/ha	5.52 (30.00)	3.18 (9.66)	4.37 (18.66)	7.64 (58.00)	4.67 (21.40)	74.11	7.49	17.98	154.43	3.04
Atrazine at 1 kg/ha as PE *fb* banana pseudostem mulching at 5 t/ha	5.48 (29.66)	3.13 (9.33)	4.48 (19.66)	7.66 (58.33)	4.54 (20.23)	75.51	7.56	18.14	156.84	3.12
Black gram as inter crop between the rows + atrazine at 1 kg/ha as PE	6.25 (38.66)	3.24 (10.00)	4.97 (24.33)	8.57 (73.00)	4.99 (24.50)	70.34	7.37	17.69	155.66	3.36
Brown manuring (*Sesbania* at 25 kg/ha) at 25 DAS	9.16 (83.66)	4.59 (20.66)	6.22 (38.33)	11.96 (142.66)	7.43 (54.83)	33.65	6.57	15.76	134.30	2.94
SEm±	0.14	0.04	0.06	0.10	0.07	-	0.14	0.34	-	
CD (P=0.05)	0.43	0.13	0.20	0.31	0.23	-	0.43	1.04	-	

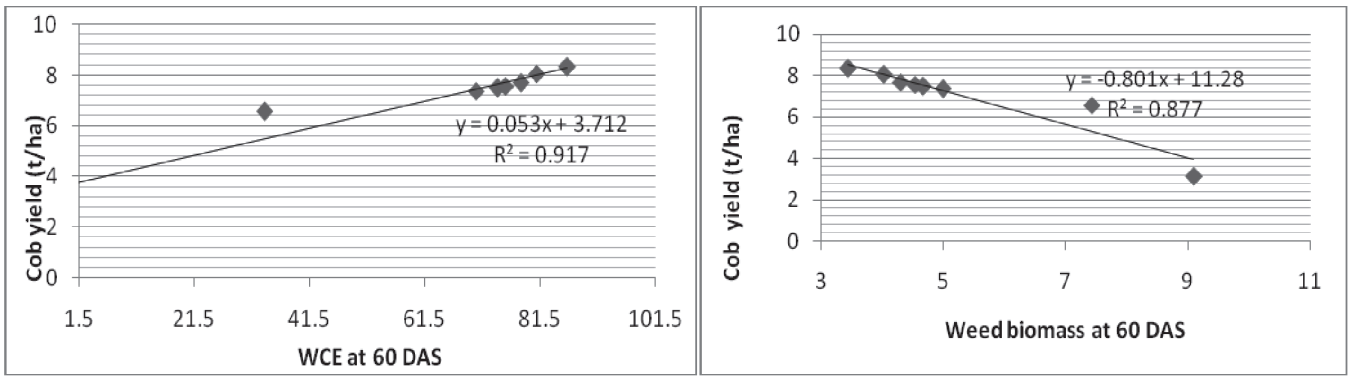

Fig. 1. Correlation between cob yield, weed biomass and weed control efficiency (WCE) at 60 DAS

through urea, SSP and MOP respectively. Half dose of nitrogen and entire dose of phosphorus and potassium were applied at sowing. The rest of the nitrogen was top-dressed at 25 DAS. Observation on weed species was recorded and expressed as count/m^2. The data was then converted to number per square meter and was transformed using square root transformation ($\sqrt{X+0.5}$) to normalize their distribution. The crop was harvested from all the plots separately after 75 days of sowing. The harvested plant from each plot were labelled and kept separately.

Different weed management practices significantly affected the weed density and dry biomass at 60 DAS (Table 1). Data showed that the minimum density of broad- leaved weeds, sedges and grasses was recorded with two hand weeding which was followed by atrazine at 1 kg/ha as PE *fb* one hand weeding at 20 DAS and atrazine at 1 kg/ha as PE *fb* tembotrione at 0.12 kg/ha as PoE at 20 DAS. Similar observation was also recorded in weed dry biomass. Hand weeding operation removes all the categories of weeds and the emergence of weeds after the operation takes time which resulted in the lowest density and ultimately the biomass Raghuwanshi *et al.* (2023). The weed density and biomass were reduced by 59.07% and 62.24% respectively by twice hand weeding as compared to weedy plot. Application of atrazine as pre-emergence might have controlled the majority of the weeds through its mode of action affecting the photosystem -II in the early crop growth stage and hand weeding at 40 DAS have removed the weeds that have emerged later. Growing of black gram as intercrop in between the rows of maize could reduce weed density by 38.92% at 60 DAS. This might be due to shading of space by black gram which could reduce the density of weeds to some extent (Nongmaithem *et al*. 2012). It can be observed from the data that brown manuring of sesbania could give 14.75 % weed reduction compared to weedy plot. This might be because there was no integration of other management with this treatment and possibly could not reduce the density and biomass to greater extent. The highest weed control efficiency (86.19%) was recorded in twice hand weeding due to complete weed removal of all categories of weeds at 20 and 40 DAS. However, in integration treatment, application of atrazine at 1 kg/ha as PE *fb* one hand weeding at 20 DAS showed highest weed control efficiency of 80.83% (Table 1) and it was closely followed by atrazine at 1 kg/ha as PE *fb* tembotrione at 0.12 kg/ha as PoE at 20 DAS (78.12%). Roy *et al*. (2024) also found effective weed control with the application of tembotrione in maize. The highest cob yield (8.33 t/ha) and green fodder yield (19.99 t/ha) was recorded in two hand weeding at 20 and 40 DAS and was found to be statistically at par with atrazine at 1 kg/ha as PE *fb* one hand weeding at 20 DAS (8.05 t/ha). This was probably due to improved weed management practices that enabled lower weed densities to compete with crop for growth supporting nutrients thereby resulting in higher cob and green fodder yields (Pawar *et al.,* 2021). However, the lowest cob yield was recorded in weedy plot (Mandi *et al*., 2019). The yield reduction in weedy plot compared to twice hand weeding was 62.42%. The highest net return recorded in 2 hand weeding may be due to good cob and green fodder yield obtained under this treatment. However, the highest benefit- cost ratio (BCR) was recorded in atrazine at 1 kg/ha as PE *fb* tembotrione at 0.12 kg/ha as PoE at 20 DAS (3.54). Shukla *et al.,* also reported highest B:C ratio with application of ateazine and tembotrione in maize. This might be due to the lowest cost of cultivation involved and the higher net return in this treatment (Barua *et al.* 2019).

There is a linear relationship between cob yield and weed biomass with R^2= 0.917 at 60 DAS (Fig.1). The results revealed that weed biomass showed a negative correlation with cob yield as the weed dry biomass increased, a decrease in cob yield was observed. Weed con-

trol efficiency followed a linear relationship with the cob yield of sweet corn ($R^2 = 0.877$ at 60 DAS) and showed a positive correlation with cob yield.

Based on experimental findings and from the economic point of view, it can be recommended that atrazine at 1 kg/ha as PE *fb* tembotrione at 0.12 kg/ha as PoE at 20 DAS is the best treatment as it resulted in highest B: C ratio.

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