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Assessment of Nutrient Status of Weed due to Mulch and Weed management Practices

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ABSTRACT: An experiment was carried out to study the "Assessment of nutrient status in weed due to mulch and weed management practices in chickpea" at Agronomy Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during *rabi* seasons of 2021-22 and 2022-23. This experiment aimed to know how much nutrients were removed by weeds from the chickpea field. The experiment was laid out in randomized block design with the factorial concept with twelve treatment combinations comprising of two levels of mulch *viz.*, M_0: No mulch and M_1: Sugarcane trash mulch @ 5 t ha^{-1}, six levels of weed management practices *viz.*, T_1: Pendimethalin @ 450 g ha^{-1} PE, T_2: Pendimethalin @ 450 g ha^{-1} PE *fb* hand weeding at 30 DAS, T_3: Quizalofop-ethyl @ 40 g ha^{-1} PoE, T_4: Pendimethalin @ 450 g ha^{-1} PE *fb* Quizalofop-ethyl @ 40 g ha^{-1} PoE, T_5: Interculture *fb* hand weeding at 20 and 40 DAS and T_6: Weedy check with three replications. The soil of the experimental field was clayey in texture, medium in available nitrogen and phosphorus and rich in available potassium with normal electrical conductivity. Results find that chickpea weeds' N, P and K content was insignificant. In contrast, the uptake of N, P and K by weeds was significantly affected by mulch as well as weed management practices during both the years and in pooled analysis, respectively.

Keywords: Sugarcane trash mulch, pendimethalin, quazalofop-ethyl, weed management, no mulch.

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is India's most important *rabi* pulse crop. In India, the chickpea crop ranks first among pulses, occupying about 30% of the total cultivated area of pulses and contributing 40% of total pulse production. Chickpea is a poor competitor to weeds because of its slow growth rate and limited leaf development at an early crop growth and establishment stage. Invasive and noxious weed species are the main challenge for crop production and compete with crop plants for space, water and nutrients; hence, its adverse effect is observed on plant growth and yield. The major weeds in the chickpea crop are *Chenopodium album, Medicago denticulata, Echinocloa colona, Parthenium hysterophorus, Cynodon dactylon*, etc. These weeds compete with chickpea crop growth for nutrition, space and moisture content. For that, proper and timely management is very important. The present experiment was carried out in South Gujarat condition, where the chickpea crop faced a lot of losses in yield due to weed problems and a decline in seed production and quality. In this experiment, sugarcane trash residue was used with different weed management practices to find out how sugarcane trash mulch ultimately declines in weed population and weed dry weight during the crop growth period (Torki *et al.*, 2012; Govindappa and Seenappa 2014).

MATERIAL AND METHOD

This experiment was conducted during 2021-22 and 2022-23 at College Agronomy Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari (Gujarat). The experimental field was infested by predominant monocot weeds *viz.*, *Chloris barbata, Brachiaria mutica, Digitaria sanguinalis, Echinochloa crusgalli, Sorghum halepense and Cynodon dactylon,* dicot weeds, *viz.*, *Agrostemma githago, Anagallis arvensis, Cassia occidentalis, Alternanthera sessilis, Digera arvensis, Abutilon theophrasti, Amaranthus viridis and Euphorbia hirta*, and sedges *Cyperus rotundas* were predominantly present in unweeded control plot during experimentation. The experiment was laid out in randomized block design with the factorial concept with twelve treatment combinations comprising of two levels of mulch *viz.*, M_0: No mulch and M_1: Sugarcane trash mulch @ 5 t ha^{-1}, six levels of weed management practices *viz.*, T_1: Pendimethalin @ 450 g ha^{-1} PE, T_2: Pendimethalin @ 450 g ha^{-1} PE *fb* hand weeding at 30 DAS, T_3: Quizalofop-ethyl @ 40 g ha^{-1} PoE, T_4: Pendimethalin @ 450 g ha^{-1} PE *fb* Quizalofop-ethyl @ 40 g ha^{-1} PoE, T_5: Interculture *fb*

hand weeding at 20 and 40 DAS and T_6: Weedy check with three replications.

The nitrogen content was determined with Kjeldhal's method. Phosphorus content in the weed plant was determined by Venedomolybdo phosphoric yellow color method using a spectrophotometer at 470 nm. It was expressed as a percentage of phosphorous and potassium extracted by normal neutral ammonium acetate and then determined by the Flame photometer method described by Jackson (1973).

$$\text{Nutrient uptake by weed (kg/ha)} = \frac{\text{Nutrient content in weed (\%)} \times \text{Weed dry weight (kg/ha)}}{100}$$

The statistical analysis for different characters during the study was carried out through the procedure appropriate to the Randomized Block Design with the Factorial concept of the experiment as described by Panse and Sukhatme (1967). A 5 % significance level was used to test the significance of the results. The critical differences were calculated when the differences among treatments were found significant in the 'F' test. In the remaining cases, only the standard error of means was worked out.

RESULTS AND DISCUSSION

Nutrient content (%). The data on the content of N, P and K in weeds in chickpea fields was not significantly affected by mulch and without mulch practices during both the years of study as well as in pooled analysis. At the same time, numerically higher content of N, P and K at pooled basis was recorded higher under no mulch practices compared than to sugarcane trash mulch @ 5 t ha^{-1}, which were 1.65, 0.28 and 1.76 % during pooled basis.

Similarly, weed management practices also do not statistically affect the N, P and K content in weeds during the years of investigation and in pooled analysis. The highest values of N, P and K content in weeds were recorded in the weedy check treatment (T_6), which were 1.68, 0.30 and 1.77 % compared to the rest of the treatments during pooled results.

Nutrient uptake (kg ha^{-1}). The results data showed in Table 2 indicated that nutrient uptake by weed was affected by sugarcane trash mulch practices @ 5 t ha^{-1} than no mulch practices in chickpea during 2021-22, 2022-23, and in pooled analysis. The data reveals that there was significant variation in nutrient uptake by weeds. Significantly, weeds' highest N, P and K uptake was recorded with no mulch treatment (M_0) over sugarcane trash mulch @ 5 t ha^{-1} treatment (M_1). M_0 treatment noted the values of N, P and K uptake were 9.9, 1.73 and 10.7 kg ha^{-1} on a pooled basis, respectively.

The results revealed that the nutrient uptake by weed significantly differed by various weed management practices during the individual years of experimentation and in pooled analysis. Significantly higher values of N, P and K uptake by weed were recorded in the weedy check treatment (21.0, 3.89 and 22.8 kg ha^{-1}) compared to the rest of the treatments on a pooled basis. Meanwhile, treatment of interculture *fb* hand weeding at 20 and 40 DAS recorded the lowest values of K uptake by weed (0.5, 0.08 and 0.6 kg ha^{-1}) on pooled results, respectively. A similar finding was recorded by Ratnam *et al.* (2011): Goud *et al.* (2013); Chandrakar *et al.* (2018); Jangade *et al.* (2019). The findings revealed that NPK content and their uptake by weeds was lowest in T_5 treatment (Intercultural *fb* hand weeding at 20 and 40 DAS) and in T_2 treatment.

Table 1: Effect of mulch and weed management on N, P and K content in weed of chickpea field.

Treatments	N content			P content			K content		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Mulching treatment (M)									
M_0	1.66	1.64	1.65	0.28	0.28	0.28	1.75	1.77	1.76
M_1	1.62	1.61	1.61	0.26	0.27	0.27	1.72	1.74	1.73
SEm±	0.02	0.02	0.01	0.01	0.01	0.00	0.02	0.01	0.01
CD at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS
Weed management (T)									
T_1	1.66	1.64	1.65	0.27	0.28	0.27	1.76	1.76	1.76
T_2	1.62	1.61	1.62	0.26	0.27	0.27	1.71	1.72	1.71
T_3	1.67	1.65	1.66	0.28	0.28	0.28	1.74	1.75	1.75
T_4	1.62	1.60	1.61	0.26	0.27	0.26	1.71	1.77	1.74
T_5	1.56	1.59	1.58	0.25	0.28	0.26	1.72	1.74	1.73
T_6	1.73	1.64	1.68	0.30	0.30	0.30	1.76	1.78	1.77
SEm±	0.04	0.03	0.02	0.01	0.01	0.01	0.04	0.03	0.02
CDat 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS
Interaction effect (M × T)									
SEm±	0.05	0.05	0.04	0.01	0.02	0.01	0.05	0.04	0.03
CDat 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	5.43	5.10	5.27	9.11	10.90	10.06	5.12	3.56	4.40

Note: M_0: No mulch and M_1: Sugarcane trash mulch @ 5 t ha^{-1}, six levels of weed management practices *viz.*, T_1: Pendimethalin @ 450 g ha^{-1} PE, T_2: Pendimethalin @ 450 g ha^{-1} PE *fb* hand weeding at 30 DAS, T_3: Quizalofop-ethyl @ 40 g ha^{-1} PoE, T_4: Pendimethalin @ 450 g ha^{-1} PE *fb* Quizalofop-ethyl @ 40 g ha^{-1} PoE, T_5: Interculture *fb* hand weeding at 20 and 40 DAS and T_6: Weedy check.

(Pendimethalin @ 450 g ha^{-1} PE *fb* hand weeding at 30 DAS), it was highest in weedy check (T_6) due to more weed competition and higher weed dry matter; more nutrients were uptake by the weed in weedy check compared to herbicidal and hand weeding treatment during both the years and in pooled results, respectively.

Table 2: Effect of mulch and weed management on N, P and K uptake in weed of chickpea field.

Treatments	N uptake			P uptake			K Uptake		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Mulching treatment (M)									
M_0	10.0	9.9	9.9	1.74	1.71	1.73	10.8	10.7	10.7
M_1	8.8	8.7	8.7	1.48	1.48	1.48	9.3	9.3	9.3
SEm±	0.27	0.26	0.19	0.05	0.05	0.04	0.32	0.24	0.20
CD at 5 %	0.79	0.76	0.53	0.16	0.13	0.10	0.94	0.70	0.57
Weed management (T)									
T_1	12.0	12.3	12.2	1.98	2.07	2.02	12.9	13.2	13.0
T_2	2.3	2.2	2.2	0.37	0.37	0.37	2.4	2.3	2.4
T_3	15.1	15.1	15.1	2.54	2.52	2.53	15.9	16.1	16.0
T_4	5.1	4.9	5.0	0.83	0.81	0.82	5.4	5.4	5.4
T_5	0.5	0.5	0.5	0.08	0.09	0.08	0.5	0.6	0.5
T_6	21.3	20.7	21.0	3.85	3.72	3.79	23.0	22.5	22.8
SEm±	0.47	0.45	0.32	0.09	0.08	0.06	0.56	0.41	0.35
CDat 5 %	1.37	1.32	0.92	0.27	0.23	0.17	1.63	1.21	0.99
Interaction effect (M x T)									
SEm±	0.66	0.64	0.46	0.13	0.11	0.09	0.79	0.58	0.49
CDat 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	12.21	11.85	12.04	14.06	12.14	13.14	13.58	10.09	11.97

Note: M_0: No mulch and M_1: Sugarcane trash mulch @ 5 t ha^{-1}, six levels of weed management practices *viz.*, T_1: Pendimethalin @ 450 g ha^{-1} PE, T_2: Pendimethalin @ 450 g ha^{-1} PE *fb* hand weeding at 30 DAS, T_3: Quizalofop-ethyl @ 40 g ha^{-1} PoE, T_4: Pendimethalin @ 450 g ha^{-1} PE *fb* Quizalofop-ethyl @ 40 g ha^{-1} PoE, T_5: Interculture *fb* hand weeding at 20 and 40 DAS and T_6: Weedy check.

CONCLUSIONS

The results concluded that the weeds' lower nutrient removal or uptake in the treatment of sugarcane trash mulch @ 5 t ha^{-1} and interculture *fb* hand weeding at 20 and 40 DAS treatment during the study.

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