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Influence of weed control practices on nutrients uptake in cotton plant

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ABSTRACT

A field experiments was conducted at Professor Jayashankar Telangana State Agricultural University, Rajendranagar during *kharif* 2017 for the evaluation of diuron in two different soils. The treatments consisted of diuron 80% WP at 0.5, 0.75 and 1.0 kg ha^{-1} along with registered formulation of pendimethalin 38.7% CS at 677 g ha^{-1}, intercropping with green manure crop, mechanical weeding thrice at 20, 40, 60 days after sowing and unweeded control. The experiment was carried out in a randomised block design replicated thrice. The weed flora of the experimental field in red soil was dominated by *Cynodon dactylon*, *Rottboellia exaltata, Parthenium hysterophorus, Trianthema portulacastrum* and *Commelina benghalensis*. While in case of black soil predominant flora was *Cynodon dactylon, Cyperus rotundus, Parthenium hysterophorus*, *Euphorbia geniculata*, *Tridax procumbens*, *Cyanotis cristata*, *Digera arvensis* and *Celosia argentea.* The macronutrient contents in cotton crop were higher in polymulch, mechanical weeding thrice at 20, 40 and 60 DAS and this was comparable to pre emergence application diuron at 1.0 kg ha^{-1} followed by post emergence application of pyrithiobac sodium + quizalofop *p* ethyl in red soil and post emergence application diuron at 1.0 kg ha^{-1} followed by post emergence application of pyrithiobac sodium + quizalofop p ethyl and diuron at 0.75 kg ha^{-1} black soil. The minimum weed competition facilitated higher DMP and nutrient uptake by the plant. The nutrient removal by weeds also was minimal in polymulch, mechanical weeding thrice at 20, 40, 60 DAS, diuron at 1.0 kg ha^{-1} pre emergence application of pyrithiobac sodium + quizalofop p ethyl followed by post emergence application of diuron at 0.75 kg ha^{-1} in both red and black soil.

Introduction

Cotton has a unique place in the economy of India as it plays an important role in the agrarian and industrial activities of the nation, being grown in an area of 11.76 M ha in India (Stone, 2011).

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India is one of the most important cotton producers accounting for about 18 per cent of the world cotton production. Yield level in cotton keeps fluctuating year after year depending upon the biotic stresses that are closely associated with the climatic conditions in the region (Pandey et al. 2017). Among different agronomic manipulations that would influence the productivity of cotton, management of weeds is considered to be an important step for achieving higher productivity (Manalil et al. 2017). Weeds primarily compete for nutrients, moisture and sunlight during the early crop growth period than at later stage. Weeds consume 5 to 6 times of nitrogen, 5 to 12 times of phosphorus and 2 to 5 times of potash more than cotton crop at the early growth stages (Mahar et al. 2007) and could be very destractive for cotton production systems. Weed infestation in cotton has been reported to offer severe competition causing yield reduction to an extent of 74 per cent (Shelke and Bhosle, 1990), 50 to 85 per cent (Sharma, 2008) depending upon the nature and intensity of weeds. The critical period of weed competition in cotton was found to be 15 to 60 days (Sharma, 2008). Thus, if proper weed control measures are followed, there would be greater availability of nutrients and moisture for the benefit of crop. Weeds in cotton field can be effectively killed or paralysed its growth at the germination stage itself by the use of suitable herbicide. They are capable of giving the crop a relatively better weed free situation in the early stage of crop. Preemergence use of different herbicides such as Pendimethalin and Oxyflurofen could be control the weeds in early stages and thereby ensure efficient utilization of inputs put in by the farmers. Weed management systems should prevent weed interference, be economical and sustainable, reduce weed seed bank in soil, prevent weed resistance and neither injure cotton nor reduce quantity of lint yield diminution. This study was conducted to evaluate the effects of weed control practices on nutrient uptake in cotton plant.

Materials and methods

An experimental study was conducted at College farm, College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Telangana State during *kharif*, 2017. The experiment was conducted in red and black soils and carried out in a randomised block design with three replications.

Treatments

The treatments included as follow:

A- Diuron 80% WP 0.5 kg ha^{-1} followed by pyrithiobac sodium 10% EC 62.5 g ha^{-1} + quizalofop p ethyl 5% EC 50 g ha^{-1}.

B- Diuron 80% WP 0.75 kg ha^{-1} followed by pyrithiobac sodium 10% EC 62.5 g ha^{-1} + quizalofop p ethyl 5% EC 50 g ha^{-1}.

C- Diuron 80% WP 1.0 kg ha^{-1} followed by pyrithiobac sodium 10% EC 62.5 g ha^{-1} + quizalofop p ethyl 5% EC 50 g ha^{-1}.

D- Pendimethalin 38.7% CS at 677 g ha^{-1} followed by pyrithiobac sodium 10% EC 62.5 g ha^{-1} + quizalofop p ethyl 5% EC 50 g ha^{-1}.

E- Cotton + sunhemp.

F- Mechanical weeding at 20, 40, 60 DAS.

G- Control (unweeded).

H- Polymulch of 0.25 mm thickness.

The treatments included three doses of pre emergence application of diuron (0.5, 0.75 and 1.0 kg ha^{-1}), pendimethalin 38.7% CS at 677 g ha^{-1} as followed by sequential application of pyrithiobac sodium 10% EC 62.5 g ha^{-1} + quizalofop p ethyl 5% EC 50 g ha^{-1}, intercropping of cotton with green manure crop (sunhemp), mechanical weeding thrice at 20, 40 and 60 DAS (weed free), polymulch and unweeded control.

Mallika *Bt* cotton seeds was sown with a seed rate of 2.5 kg ha^{-1}. One-two seeds per hill were sown at a spacing of 75cm X 75 cm facilitating the use of power weeder in both directions in case of mechanical weeding. Diuron 80% W.P. at 0.5 kg ha^{-1}, diuron 80% W.P. at 0.75 kg ha^{-1}, diuron 80% WP 1.0 kg ha^{-1}, pendimethalin 38.7% CS 677 g ha^{-1} were sprayed on the third day, pyrithiobac sodium 10% EC 62.5 g ha^{-1}+ quizalofop-p-ethyl 5% EC 50 g ha^{-1} were sprayed at 2-3 leaf stage of the weeds. In the intercropping treatment the intercrop sunhemp was sown along with cotton. Polymulch was spread 8 DAS after emergence of the seedling. Mechanical weeding at 20, 40, 60 DAS was done with power weeder and an unweeded check was maintained.

The crop samples were collected for estimation at 30, 60, 90 DAS and at harvest. The weed samples collected for estimation of dry matter production at 30, 60 and 90 DAS were used for analysis. The crop samples collected at 30, 60, 90 DAS and at final harvest were ground using Willey mill and used for estimation of N, P and K to work out uptake of major nutrients.

Nitrogen uptake (kg ha^{-1})

Firstly the nitrogen content (%) in the plant and weed samples was estimated by the micro Kjeldhal method using Kelplus N analyser after digesting the samples with H_2SO_4 and H_2O_2 (Piper, 1966). The uptake was calculated by the formula:

$$N\ Uptake = \frac{\text{Nitrogen content}}{100} \times Yield(kgha^{-1})$$

Phosphorus uptake (kg ha-1)

The tri-acid (HNO_3, $HCLO_4$ and H_2SO_4) in the ratio of (9:3:1) respectively digested plant and weed samples were analyzed for phosphorus content by Vanado-molybdo phosphoric acid. The intensity of yellow colour developed was measured by using spectrophotometer at 420 nm (Piper, 1966). Finally the uptake was calculated by the formula:

$$P\ Uptake = \frac{\text{Phosphorus content}}{100} \times Yield(kgha^{-1})$$

Potassium uptake (kg ha-1)

Potassium content in the tri-acid was determined with flame photometer (Piper, 1966). The uptake was calculated by formula:

$$K\ Uptake = \frac{\text{Potassium content}}{100} \times Yield(kgha^{-1})$$

Results and discussion

Weed Flora

The weed flora observed in both the soils was recorded. In the red soil, among the grasses *Cynodon dactylon*, *Rottboellia exaltata*, *Dactyloctenium aegyptium* and *Dinebra retroflexa* were noticed. *Cyperus rotundus* was the only sedge present in the field. Among the broad leaved weeds, *Parthenium hysterophorus*, *Euphorbia geniculata*, *Trianthema portulacastrum*, *Trichodesma indica*, *Commelina benghalensis*, *Digera arvensis*, *Tridax procumbens*, and *Phyllanthus niruri* were observed in the field. In the black soil, among the grasses *Cynodon dactylon*, *Rottboellia exaltata* and *Echinochloa colonum*, *Dactyloctenium aegyptium* were noticed. *Cyperus rotundus* was the only sedge present in the field. Among the broad leaved weeds, *Parthenium hysterophorus*, *Euphorbia geniculata*, *Trianthema portulacastrum*, *Trichodesma indica*, *Cyanotis cristata*, *Digera arvensis* and *Celosia argentea* were observed in the field. Weeds compete with the crops for moisture, nutrients, light and CO_2 and thereby affect the yield. Thus the nutrient uptake by crop is an important factor to be determined to know the effect of the control practices. The data regarding N uptake is presented in table 1.

Uptake of Nitrogen (kg ha-1)

Red soil

Nitrogen is the most important nutrient required for the vegetative growth of the crop which determines the yield. At 30 DAS, polymulch (15.7 kg ha^{-1}), mechanical weeding thrice (10.87 kg ha^{-1}) and diuron 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl as (12.27 kg ha^{-1}) recorded significantly higher at N uptake. Diuron 0.75 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl was comparable to diuron 1.0 kg ha^{-1}. Similar results were observed at 60 DAS. At 90 DAS, polymulch (174.26 kg ha^{-1}) and mechanical weeding thrice (165.00 kg ha^{-1}) recorded significantly superior at N uptake. Among the herbicides, diuron 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl (131.18 kg ha^{-1}) was comparable to mechanical weeding. Diuron at 0.75 kg ha^{-1}, 0.5 kg ha^{-1}, pendimethalin followed by pyrithiobac sodium + quizalofop p ethyl and intercropping with green manure was comparable. At every stage of the crop growth, unweeded control has resulted in significantly lowest N uptake.

Black soil

At 30 DAS, polymulch (8.55 kg ha^{-1}), mechanical weeding thrice (8.41 kg ha^{-1}), all the doses of diuron and pendimethalin followed by pyrithiobac sodium + quizalofop p ethyl (7.69, 7.25, 6.14 kg ha^{-1} respectively at 1.0, 0.75 and 0.5 kg ha^{-1}) were on par with each other statistically and recorded higher N uptake. At 60 DAS, polymulch (40.05 kg ha^{-1}) and mechanical weeding thrice (39.39 kg ha^{-1}) recorded significantly greater N uptake. Among the herbicides, diuron 0.75 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl (34.13 kg ha^{-1}) was comparable to mechanical weeding and diuron at 1.0 kg ha^{-1} (33.17 kg ha^{-1}). At 90 DAS, polymulch (139.17 kg ha^{-1}), mechanical weeding thrice (132.29 kg ha^{-1}) and diuron 0.75 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl (114.98 kg ha^{-1}) were comparable with each other and recorded significantly superior N uptake. Similar results as that of 60 DAS was observed even at harvest. At all stages, unweeded control registered the significantly least N uptake which can be attributed to the weed competition faced by the crop.

Table 1. Nitrogen uptake (kg ha^{-1}) as influenced by the weed control options in cotton.

Treatments	Nitrogen							
	Red soil				Black soil			
	30 DAS	60 DAS	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	Harvest
A	7.07	36.89	74.95	119.34	6.12	24.14	73.58	129.79
B	9.47	40.71	90.81	156.47	7.69	34.13	114.98	194.29
C	12.27	47.30	131.18	176.64	7.25	33.17	112.42	173.17
D	10.82	36.20	89.62	118.71	6.14	29.45	75.12	130.96
E	6.37	27.26	83.65	75.42	5.02	22.56	44.41	81.41
F	10.87	50.82	165.00	213.54	8.41	39.39	132.29	216.23
G	4.09	13.50	36.40	38.61	2.64	16.20	41.87	41.54
H	15.70	54.00	174.26	227.56	8.55	40.05	139.17	240.10
SE(m)±	1.57	3.23	12.84	6.84	0.83	1.76	8.06	10.00
C.D. (p=0.05)	4.83	9.90	39.34	20.94	2.53	5.30	24.67	30.62

Uptake of Phosphorus (kg ha^{-1})

Phosphorus is required for the root growth and development, sugar translocation and disease resistance. Hence the uptake of P by the crop is important factor to be analysed and data on P uptake is presented in table 2.

Red soil

At 30 DAS, polymulch (0.98 kg ha^{-1}), mechanical weeding thrice (0.78 kg ha^{-1}) and diuron 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl (0.82 kg ha^{-1}`) recorded significantly superior P uptake. Diuron 1.0 kg ha^{-1}, 0.75 kg ha^{-1} and pendimethalin followed by pyrithiobac sodium + quizalofop p ethyl as were comparable to each other in P uptake. At 60 DAS, polymulch (12.73 kg ha^{-1}), mechanical weeding thrice (11.97 kg ha^{-1}) recorded significantly superior P uptake. Among the herbicides, diuron 1.0 kg ha^{-1} and 0.75 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl were comparable to mechanical weeding thrice. While at 90 DAS, polymulch (22.27 kg ha^{-1}), mechanical weeding thrice (22.30 kg ha^{-1}), diuron 1.0 kg ha^{-1} (21.84 kg ha^{-1}) and 0.75 kg ha^{-1} (21.81 kg ha^{-1}) followed by pyrithiobac sodium + quizalofop p ethyl recorded significantly superior P uptake. At harvest, polymulch (71.76 kg ha^{-1}) and mechanical weeding thrice (68.29 kg ha^{-1}) recorded significantly higher P uptake. Among the herbicides, diuron 1.0 kg

ha^{-1} and 0.75 kg ha^{-1} registered significantly greater uptake. Significantly lowest amount of P uptake was observed in unweeded control at all stages of crop growth.

Black soil

Significantly superior P uptake was observed in polymulch (0.81 kg ha^{-1}), mechanical weeding thrice (0.84 kg ha^{-1}) and diuron 1.0 kg ha^{-1} (0.60 kg ha^{-1}) and 0.75 kg ha^{-1} (0.60 kg ha^{-1}) followed by pyrithiobac sodium + quizalofop p ethyl while rest of the treatments followed them at 30 DAS. At 60 DAS, polymulch (11.86 kg ha^{-1}), mechanical weeding thrice (11.66 kg ha^{-1}) and diuron 0.75 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl (11.60 kg ha^{-1}) recorded significantly greater P uptake and among the herbicides, diuron 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl was on par diuron 0.5 kg ha^{-1} and pendimethalin followed by pyrithiobac sodium + quizalofop p ethyl. At 90 DAS, Polymulch (23.56 kg ha^{-1}), mechanical weeding thrice (23.56 kg ha^{-1}), diuron 0.75 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl (22.53 kg ha^{-1}) were on par in the phosphorus uptake and were statistically superior over the other treatments. At harvest, polymulch (82.33 kg ha^{-1}) and mechanical weeding thrice (73.63 kg ha^{-1}) registered higher P uptake. Among the herbicides, diuron 0.75 kg ha^{-1} and 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl recorded significantly higher P uptake.

Table 2. Phosphorus uptake (kg ha^{-1}) as influenced by the weed control options in cotton.

Treatments	Phosphorus							
	Red soil				Black soil			
	30 DAS	60 DAS	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	Harvest
A	0.44	8.98	19.13	36.67	0.63	10.24	19.50	38.97
B	0.64	11.75	21.81	51.87	0.60	11.60	22.53	60.21
C	0.82	11.85	21.84	56.61	0.60	10.61	22.01	56.85
D	0.60	9.42	19.44	37.15	0.44	10.40	19.82	39.27
E	0.36	7.01	12.81	24.67	0.22	6.82	13.62	27.31
F	0.78	11.97	22.30	68.29	0.84	11.66	23.52	73.63
G	0.23	2.72	8.77	12.04	0.18	2.45	8.73	14.17
H	0.98	12.35	22.27	71.76	0.81	11.86	23.56	82.33
SE(m)±	0.09	0.13	0.23	2.40	0.08	0.28	0.13	2.89
C.D. (p=0.05)	0.26	0.39	0.70	7.36	0.23	0.86	0.41	8.85

Uptake of Potassium (kg ha^{-1})

Potassium is essential for the food translocation, activation of many enzymes required for the various metabolic processes and also impacts disease resistance. The data regarding the K uptake is given table 3.

Red Soil

At 30 DAS, polymulch (11.50 kg ha^{-1}) and mechanical weeding thrice (8.92 kg ha^{-1}) recorded significantly superior K uptake. Among the herbicides, diuron 1.0 kg ha^{-1}, diuron 0.75 kg ha^{-1} and pendimethalin followed by pyrithiobac sodium + quizalofop p ethyl. While at 60 and at 90 DAS, polymulch, mechanical weeding thrice and diuron 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl were significantly superior over the treatments. Diuron 0.75 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl was comparable to diuron 1.0 kg ha^{-1}. At harvest, polymulch (240.10 kg ha^{-1}) and mechanical weeding thrice (216.23 kg ha^{-1}) recorded significantly greatly K uptake. Among the herbicides, diuron 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl (194.29 kg ha^{-1}) was comparable to mechanical weeding and diuron 0.75 kg ha^{-1}. At ever stage of the crop growth, unweeded control has resulted in significantly lowest K uptake.

Black soil

Polymulch (6.24 kg ha^{-1}), mechanical weeding thrice (6.24 kg ha^{-1}) and diuron 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl (5.52 kg ha^{-1}) were on par with each other statistically and recorded significantly higher K uptake. Among the herbicides, diuron 0.75 kg ha^{-1} and diuron 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl recorded higher K uptake. At 60 DAS, polymulch (29.92 kg ha^{-1}) and mechanical weeding thrice (29.12 kg ha^{-1}) recorded significantly superior uptake compared to the herbicidal treatments. Among the herbicidal treatments, diuron 0.75 kg ha^{-1} and 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl recorded significantly higher K. At 90 DAS, polymulch, mechanical weeding thrice and diuron 0.75 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl were comparable and recorded significantly higher K uptake. Among the herbicides, diuron 0.75 kg ha^{-1} and 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl were comparable to mechanical weeding. At harvest, similar results as that of 60 DAS were observed. At all stages, unweeded control registered the significantly least K uptake which can be attributed to the weed competition faced by the crop.

Table 3. Potassium uptake (kg ha^{-1}) as influenced by the weed control options in cotton.

Treatments	Potassium							
	Red soil				Black soil			
	30 DAS	60 DAS	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	Harvest
A	4.75	26.91	54.19	129.79	4.47	17.48	54.67	137.93
B	6.88	30.18	68.54	173.17	5.52	24.71	85.22	206.66
C	7.98	34.29	94.27	194.29	5.08	24.69	82.46	189.01
D	6.77	25.00	70.06	130.96	4.24	21.34	54.81	138.44
E	4.19	19.69	59.28	81.41	2.50	16.49	33.42	90.12
F	8.92	37.07	120.59	216.23	6.24	29.12	102.82	248.97
G	2.74	8.04	26.05	41.54	1.92	11.09	31.04	48.87
H	11.50	39.79	121.56	240.10	6.24	29.92	98.42	272.04
SE(m)±	1.07	2.20	9.46	10.00	0.31	1.08	5.26	8.49
C.D. (p=0.05)	3.26	6.72	28.94	30.62	0.96	3.31	16.13	26.01

In the entire three nutrient uptakes by the crop, polymulch and mechanical weeding registered superior rate of uptake which might be due to reduced weed density and hence the nutrients were available to the crop. While polymulch has an added advantage of moisture conservation and thereby nutrient availability is increased. Diuron followed by post emergence application of herbicides resulted in higher uptake nutrients by the crop reducing the crop weed competition. Intense growth of weeds in weedy check extended severe competition for N, P and K with the result that crop was deprived off by 5 to 6 times of nitrogen, 5 to 12 times of phosphorus and 2 to 5 times of potassium (Singh et al. 2013). Similar results were noticed by Malarkodi (2017), Chander et al. (1994), Arunvenkatesh et al. (2017).

Nutrient removal by weeds

Nutrients are removed by the weeds which pose competition to the crop. The treatment with lowest removal of nutrients is considered as the best.

Red soil

The data regarding the nutrient removal by weeds in red soil is presented in table 4. The perusal of data at all stages i.e. 30, 60, 90 DAS indicated that similar trend was observed in the removal of the three nutrients (N, P, K). Significantly lowest removal of N, P, K was recorded in mechanical weeding thrice, polymulch, diuron 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl

and diuron 0.75 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl which can be attributed to the minimum weed competition and were followed by diuron 0.5 kg ha^{-1} as followed by pyrithiobac sodium + quizalofop p ethyl, pendimethalin followed by pyrithiobac sodium + quizalofop p ethyl and intercrop with sunhemp. The statistically maximum removal of nutrients is found to be in unweeded control at all stages of the crop.

Table 4. Nutrient removal (kg ha^{-1}) by weeds as influenced by weed control options in red soil.

Treatments	Nitrogen			Phosphorus			Potassium		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
A	8.35	12.50	31.61	0.47	8.94	6.15	5.88	9.17	21.50
B	3.86	6.98	18.69	0.24	4.84	4.55	2.57	5.78	13.75
C	2.51	6.48	14.49	0.18	4.37	3.87	4.15	4.76	10.40
D	10.17	17.42	20.73	0.76	9.14	7.59	6.71	12.53	12.60
E	10.84	17.78	35.22	0.79	9.61	7.33	7.09	11.96	24.09
F	1.87	3.32	10.38	0.13	2.00	2.28	1.27	2.09	7.23
G	20.19	31.94	69.18	1.02	14.58	10.81	12.22	21.29	49.39
H	2.04	2.81	10.45	0.17	2.07	2.15	1.61	2.14	7.46
SE(m)±	0.83	1.50	2.39	0.07	1.25	0.67	0.69	1.19	3.12
C.D. (p=0.05)	2.53	4.59	7.32	0.21	3.85	2.06	2.12	3.63	9.57

Black soil

The data regarding the nutrient removal by weeds in black soil is presented in table 5. Similar results as that of red soil are registered even in case of black soil. Weeds remove 5-6 times more nitrogen, 5-12 time more phosphorous and 2-5 times more potassium than crop in the early stages of crop growth leading to lower yield. Similar results were reported by Srinivasarao et al. (2014).

Table 5. Nutrient removal (kg ha^{-1}) by weeds as influenced by weed control options in black soil.

Treatments	Nitrogen			Phosphorus			Potassium		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
A	10.03	19.71	16.83	0.58	10.28	5.08	6.69	13.14	10.85
B	2.40	6.78	7.55	0.16	7.08	3.55	1.49	4.25	5.24
C	1.74	4.44	5.87	0.15	5.76	3.31	1.21	3.12	4.81
D	9.79	20.33	20.13	0.69	13.81	7.70	6.71	13.97	13.64
E	13.47	16.07	20.63	0.82	12.49	4.91	8.93	10.01	13.76
F	1.45	3.57	5.18	0.07	4.63	2.99	0.79	2.90	5.01
G	33.32	35.82	45.41	2.06	14.43	9.53	22.64	24.04	32.49
H	1.27	4.38	5.31	0.09	6.24	3.30	0.85	4.05	4.75
SE(m)±	1.69	1.34	1.70	0.07	1.24	0.25	0.90	0.99	1.61
C.D. (p=0.05)	5.19	4.10	5.22	0.22	3.81	0.77	2.76	3.03	4.94

Conclusion

The macronutrient contents in cotton crop were higher in polymulch, mechanical weeding thrice at 20, 40, and 60 DAS and this was comparable to diuron at 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl in red soil and diuron at 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl, diuron at 0.75 kg ha^{-1} black soil. The minimum weed competition facilitated higher DMP and nutrient uptake by the plant. The nutrient removal by weeds also was minimal in polymulch, mechanical weeding thrice at 20, 40, 60 DAS, diuron at 1.0 kg ha^{-1} followed by pyrithiobac sodium + quizalofop p ethyl, diuron at 0.75 kg ha^{-1} in both red and black soil.

Conflict of Interest

Authors declare no conflict of interest.

References

Arunvenkatesh S, Kumar R.V, Rajsekhar M. 2017. Evaluation of integrated weed management in cotton. Environ Ecol. 35: 215-218.

Chander S, Kahal S.K, Panwar B.S. 1994. Nutrient uptake by american cotton and weeds under different fertility levels and methods of weed control. Harayana J Agron. 10: 237-239.

Mahar G.M, Oad F.C, Buriro U.A, Solangi G.S. 2007. Effect of Post-Emergence Herbicides on the Growth and Yield of Up-Land Cotton. Asian J Plant Sci. 6: 1282-1286.

Malarkodi N. 2017. Integrated weed management effect on weeds and seed cotton yield. Int J Environ Agric Biotech. 2: 597-606.

Manalil S, Coast O, Werth J, Chauhana B.S. 2017. Weed management in cotton (*Gossypium hirsutum* L.) through weed-crop competition: A review. Crop Prot. 95: 53-59.

Pandey P, Irulappan V, Bagavathiannan M.V, Senthil-Kumar M. 2017. Impact of Combined Abiotic and Biotic Stresses on Plant Growth and Avenues for Crop Improvement by Exploiting Physio-morphological Traits. Front Plant Sci. 8: 537.

Piper CS. 1966. Soil and Plant Analysis. Hans Publisher, Bombay.

Singh M.C, Sairam C.V, Hanji M.B, Prabhukumar S. 2013. Comparative efficiency of weed control methods and nutrient losses in cotton under different ecosystems of Karnataka. J Cotton Res Dev. 27: 209-212.

Sharma R. 2008. Integrated weed management in field crops. Crop Care. 35: 41-46.

Shelke D.K, Bhosle R.H. 1990. Determination of critical period of crop-weed competition in rainfed cotton. Journal of Maharashtra Agricultural Universities. 15: 257-258.

Srinivasarao M, Anupam H, Pramanick M. 2014. Efficacy of glyphosate 71% (ammonium salt) on weed management in tea (*Camellia sinensis* (L). Kuntez). The Ecoscan. 4: 91-95.

Stone G.D. 2011. Field versus Farm in Warangal: Bt Cotton, Higher Yields, and Larger Questions. World Dev. 39: 387-398.

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