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RESEARCH ARTICLE

Weed management with Triafamone herbicide in transplanted rice ecosystem

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ABSTRACT

Field experiments were conducted during *Rabi 2018-19 (September to January) and Kharif* 2019 (May to September). Medium duration rice cv. CO(R) 51 was used as a test variety at Tamil Nadu Agricultural University, Coimbatore, India to study the effect of Triafamone on broad spectrum weed control in transplanted rice. Triafamone was applied at two times. First set of treatments (30, 40,50 and 100 g/ha) applied two to three leaf stage of weeds and second set treatments imposed (30, 40,50 and 100 g/ha) at three days after transplanting of the rice crop. These treatments were compared with Pyrazosulfuron ethy 10% WP @ 15 g/ha, Pretilachlor 5% EC @ 750 g/ha, hand weeding @ 20 and 40 days after transplanting and unweeded control. The major grasses were *Echinochloa crus-galli* (L.) and *E. colonum* (L.) while the sedge weed included *Cyperus nutans* (L.). Among the broad leaved weeds *Eclipta alba* (L.) and *Bergia ammanioides* were the dominant species. In both the seasons of the study, lesser population of grass was recorded with the pre and early post emergence application of triafamone herbicide 40 g a.i. ha^{-1} (1.41 and 1.41 per m^{-2} at 28 and 42 DAA for both the seasons respectively) and it was closely followed by application of triafamone herbicide 50 g a.i. ha^{-1} and application of PE Pretilachlor at 0.75 kg a.i. ha^{-1} and EPOE Pyrazosulfuron ethyl at 15 g a.i. ha^{-1}. The same trend was observed for broad leaved weeds and their weed dry weights. Application of triafamone herbicide at 40 g a.i. ha^{-1} as pre emergence and early post emergence application recorded highest weed control efficiency of 100, 97.7 and 99.6 % and 97.8% at 42 DAA during both years of experimentation and also resulted in higher grain yield (8052 and 8182 kg ha^{-1} during *rabi* 2018-19 and 9018, 9175 kg ha^{-1} during *Kharif* 2019). Further, it is noticed that, there was no residual toxicity of herbicide to the succeeding crops. Hence, application of Triafamone 40 g a.i. ha^{-1} either pre or early post emergence herbicide has higher productivity and no residues in transplanted rice ecosystem.

Keywords: Triafamone, Efficacy, Weeds and Transplanted rice ecosystem

INTRODUCTION

The world population will increase to over more than 50% with the existing population by 2050 and it is imperative to increase the food production by more than 70 percent to meet the demand (FAO, 2009). Among the different food crops, rice plays a vital role as primarily food for many developing countries, especially for Asians. The area and cultivation transplanted rice is more when compare to other food crops. Several biotic factors are affecting the transplanted rice ecosystems and among them, weeds are acting pivotal role in reducing the productivity of the transplanted rice. At present, there is a great paucity of labour forces elsewhere which leads to hindrance of different farm activities in particular to weed management. The transplanted rice ecosystem has resource rich environment, the vigorous growth of weeds also been noticed in the fields. There is no way to the farming community to use herbicides for effective weed control.

There are several selective herbicides are used by the farmers in the transplanted rice, but all herbicides has their own limitation either application time nor weed control efficiency, as a result negative effect of crop weed interaction exists. It is imperative to identify the best herbicide for the transplanted rice fields to control broad spectrum weeds and different time of application, which will help to the farmers if they are not able to mobilize the inputs at appropriate times (Menon 2016). Under this circumstance, Triafamone was identified as a new specialized rice herbicide and shown to control ALS (SU) resistant biotypes of key weeds in transplanted rice ecosystems. Triafamone is easily degradable in wide range of agricultural fields and especially in paddy soils and has

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half life of less than ten days. Triafamone herbicide has a low vapor pressure and therefore it will not be volatile from soil or plants surfaces. This herbicide is classified as based on their adsorption to the soil as "intermediate". (Briggs, 1973).

Hence, Triafamone is not contaminating the ground water. Therefore, the present study was undertaken to evaluate the performance and their efficacy of Triafamone 200 SC over broad spectrum weed control in transplanted rice.

MATERIALS AND METHODS

Field experiments were conducted during *Rabi 2018-19 (September to January) and Kharif* 2019 (May to September). Medium duration rice cv. CO(R) 51 was used as a test variety and recommended seed rate of 40 kg ha^{-1} after soaking in water for 24 hours and keeping in dark for 24 hours. The seeds were treated with carbendazim at 2.0 g kg^{-1} of seed to protect the seedlings from seed borne diseases. Twenty five days old rice seedlings were transplanted, with 2 seedlings per hill. The crop geometry of 20 x 15 cm was adopted.

Recommended dose of N: P: K at 150:50:50 kg ha^{-1} in the form of urea (46 percent N), Diammonium phosphate (18 percent N, 46 per cent P_2O_5) and muriate of potash (60 percent K_2O) were applied. Fifty percent of the nitrogen and full dose of phosphorus and potassium were applied basally before transplanting. The balance fifty percent of nitrogen was top dressed thrice at equal proportions at active tillering, panicle initiation and heading stages of rice crop. The other crop management packages *viz*, irrigation and plant protection measures were adopted as recommended in Crop Production Guide (2019).

Weed density

The weed count was recorded species wise using 0.25 m x 0.25 m quadrat from four randomly fixed places in each plot and the weeds falling within the frames of the quadrat were accounted, recorded and the mean values were expressed in number m^{-2}. The densities of grasses, sedges and broad leaved weeds and the total weeds were recorded at 28 and 42 DAHA (Days After Herbicide Application) expressed in number m^{-2}.

Weed dry weight

The weeds falling within the frames of the quadrats were collected, categorized into grasses, sedges and broad leaved weeds, shade dried and later dried in hot-air oven at 80º c for 72 hours. The dry weight of grasses, sedges and broad leaved weeds were recorded separately at 28 and 42 DAHA and expressed in g m^{-2}.

Weed control efficiency (WCE)

The weed control efficiency was calculated as per the procedure suggested by Mani et al. (1973)

$$\mathrm{WCE}(\%) = \frac{\begin{array}{c}\text{Dry weight of weeds in control plots}\\ -\text{Dry weight of weeds in treated plot}\end{array}}{\text{Dry weight of weeds in control plot}} \times 100$$

Four border rows around each experimental plot were first harvested and then the net plot area was harvested respectively. The grain from net plot produce was threshed, cleaned and weighed and grain weight was adjusted to 14 percent moisture. Straw weight was also recorded after sun drying.

The data on various characters studied during the course of investigation were statistically analyzed as suggested by Gomez and Gomez (1984). Data on weed density showed high variation and hence the data are subjected to square root transformation ($\sqrt{x+2}$) and analyzed statistically. Wherever statistical significance was observed, critical difference (CD) at 0.05 level of probability was worked out for comparison. Non – significant comparison was indicated as 'NS'.

RESULTS AND DISCUSSION

Weed flora of the experimental field predominantly consisted of three species of grasses, two species of sedges and five species of broad leaved weeds. The major grasses were *Echinochloa crus-galli* (L.) and *E. colonum* (L.) while the sedge weed included *Cyperus nutans* (L.). Among the broad leaved weeds *Eclipta alba* (L.) and *Bergia ammanioides* were the dominant species.

Total grass weeds density

Preemergence and early post emergence application of herbicides at different doses had sound effect on the total grass weed density at all stages of rice growth during both the season of experiments and presented in Table 1. In both the season of the study, lesser population of grass was recorded with the pre and post emergence application of Triafamone herbicide 40 g a.i. ha^{-1} (1.41 and 1.41 per m^{-2} at 28 and 42 DAA for both the seasons respectively) and it was closely followed by application of Triafamone herbicide 50 g a.i. ha^{-1} and application of PE Pretilachlor at 0.75 kg a.i. ha^{-1} and EPOE Pyrazosulfuron ethyl at 15 g a.i. ha^{-1} recorded lesser density of grasses which was comparable with Triafamone herbicide 50 g a.i. ha^{-1} at all stages of observation. Triafamone was very effective against grass species. In the experimental field *Echinocloa sps* are predominant weeds, its effectively controlled by the Triafamone herbicide either as pre emergence or early

Table 1: Effect of Triafamone on density of total grass and BLWs weed density (No/m²) in transplanted rice

	Treatments	Total grass weed density (No. m^{-2})				Total BLWs density (No. m^{-2})			
		Rabi 2018-19		*Kharif 2019*		*Rabi 2018-19*		*Kharif 2019*	
		28 DAA	42 DAA	28 DAA	42 DAA	28 DAA	42 DAA	28 DAA	42 DAA
T_1	EPOE Triafamone 200SC @ 30 g a. i/ha	2.42 (11.27)	2.03 (7.60)	2.94 (18.93)	3.07 (21.60)	2.02 (7.5)	2.35 (10.5)	2.46 (11.68)	2.82 (16.72)
T_2	EPOE Triafamone 200SC @ 40 g a. i/ha	1.41 (0.33)	1.41 (0.33)	0.00 (1.00)	0.00 (1.00)	1.41 (0.0)	0.10 (1.1)	1.41 (0.00)	0.18 (1.20)
T_3	EPOE Triafamone 200SC @ 50 g a. i/ha	2.07 (7.93)	1.89 (6.60)	2.83 (16.93)	2.66 (14.26)	1.70 (5.5)	1.99 (7.3)	2.09 (8.08)	2.43 (11.32)
T_4	EPOE Triafamone 200SC @ 100 g a. i/ha	1.53 (4.60)	0.96 (2.60)	1.53 (4.60)	3.06 (21.27)	1.21 (3.4)	1.44 (4.2)	1.50 (4.48)	1.78 (5.92)
T_5	EPOE Pyrazosulfuron ethyl 10% WP @ 15 g a. i/ha	2.42 (11.27)	2.26 (9.60)	2.63 (13.93)	2.85 (17.27)	2.26 (9.6)	2.61 (13.6)	2.73 (15.28)	3.10 (22.12)
T_6	PE Triafamone 200SC @ 30 g a. i/ha	2.11 (8.27)	1.08 (2.93)	2.33 (10.27)	2.42 (11.27)	2.12 (8.4)	2.46 (11.7)	2.57 (13.12)	2.94 (18.88)
T_7	PE Triafamone 200SC @ 40 g a. i/ha	1.41 (0.33)	1.41 (0.00)	1.41 (0.67)	1.41 (0.33)	0.10 (1.1)	1.41 (0.0)	0.18 (1.20)	1.41 (0.00)
T_8	PE Triafamone 200SC @ 50 g a. i/ha	1.98 (7.27)	1.96 (7.13)	1.53 (4.60)	2.73 (15.27)	2.14 (8.5)	2.54 (12.7)	2.59 (13.32)	2.96 (19.22)
T_9	PE Triafamone 200SC @ 100 g a. i/ha	1.28 (3.60)	1.08 (2.93)	0.96 (2.60)	2.33 (10.27)	1.33 (3.8)	1.57 (4.8)	1.65 (5.20)	1.95 (7.00)
T_{10}	PE Pretilachlor 5% EC @ 750 g a. i/ha	2.33 (10.26)	2.15 (8.60)	2.79 (16.27)	2.51 (12.27)	1.96 (7.1)	2.28 (9.8)	2.39 (10.96)	2.75 (15.64)
T_{11}	Two hand weeding on 20 and 40 DAT	1.41 (0.00)	1.41 (0.00)	1.41 (0.00)	1.41 (0.00)	1.08 (3.0)	1.27 (3.6)	1.32 (3.76)	1.58 (4.84)
T_{12}	Unweeded Control	2.98 (19.60)	3.06 (21.27)	3.29 (26.93)	3.45 (31.60)	2.68 (14.6)	3.05 (21.1)	3.17 (23.92)	3.56 (35.08)
	SEd	0.28	0.21	0.23	0.29	0.24	0.25	0.23	0.26
	CD (P=0.05)	0.59	0.55	0.51	0.59	0.51	0.52	0.49	0.54

EPOE – Early Post Emergence (2-3 leaf stage of weed), PE – Pre emergence (0-3 days after transplanting), DAA – Days After Application

post emergence application. (Hossain and Malik 2017) These treatments were comparable with hand weeding twice at 20 and 40 DAT of the rice.

Total broad leaved weeds density

Triafamone herbicide application at different doses had sound effect on the total broad leaved weed density at all stages of rice growth during both the season of experiments and presented in Table 1. It was observed in the study that, lesser population of broad leaved weeds was recorded with the pre and post emergence application of Triafamone herbicide 40 g a.i. ha^{-1} (1.41, 0.10 and 1.41, 0.18 per m^{-2} at 28 and 42 DAA for both the seasons respectively) and it was closely followed by application of Triafamone herbicide 50 g a.i. ha^{-1} and application of PE Pretilachlor at 0.75 kg a.i. ha^{-1} and EPOE Pyrazosulfuron ethyl at 15 g a.i. ha^{-1} recorded lesser density of broad leaved weeds which was comparable with Triafamone herbicide 50 g a.i. ha^{-1} at all stages of observation. The broad leaved weeds are very effectively controlled by the Triafamone because of their selectivity. Further, it also prevents the germination of the second flush of weeds in the transplanted rice and favours the crops grow freely without any competition for nutrients and other resources. Kailkhura et.al., 2015 and Manhas et.al., 2012 also confirmed that, the similar mode of action herbicide had recorded lesser weed density in the transplanted rice. These herbicide treatments were comparable with hand weeding twice at 20 and 40 DAT of the rice.

Total weed dry weight (Table 2)

Significant variation in grass, sedge and broad leaved weeds dry weight were observed among the weed control treatments presented in Table 2. During *rabi 2018-19*, lesser weed density was observed with the application of Triafamone herbicide 40 g a.i. ha^{-1} (1.41 each for all weed species in both the seasons) and it was closely followed by application of Triafamone herbicide 50 g a.i. ha^{-1} and application of PE Pretilachlor at 0.75 kg a.i. ha^{-1} and EPOE Pyrazosulfuron ethyl at 15 g a.i. ha^{-1} recorded lesser density of grasses which was comparable with Triafamone herbicide 50 g a.i. ha^{-1} at all stages of observation. The lesser total weed dry weight might be due to lower weed counts observed in the above herbicide treatments. Further, applied herbicide had role reducing the accumulation of translocation of synthates to the sink area (Kumar and Ladha 2011). Deivasigamani (2016) found that application of triafamone + ethoxy sulfuron recorded lower weed density and dry matter at 42 days after application in direct seeded rice.

Weed control efficiency (Table 4)

Different herbicide application practices recorded weed control efficiency of 43.5 % to 100 % at 42 DAA. The

Table 2: Effect of Triafamone on density of total weeds dry weight (g/m²) in transplanted rice

	Treatments	*Rabi 2018-19*			*Kharif 2019*		
		Grasses	Sedges	BLWs	Grasses	Sedges	BLWs
T_1	EPOE Triafamone 200SC @ 30 g a. i/ha	0.47 (1.60)	0.11 (1.12)	1.11 (3.03)	1.56 (4.75)	1.41 (0.56)	1.58 (4.85)
T_2	EPOE Triafamone 200SC @ 40 g a. i/ha	1.41 (0.07)	1.41 (0.00)	1.41 (0.32)	1.41 (0.22)	1.41 (0.00)	1.41 (0.35)
T_3	EPOE Triafamone 200SC @ 50 g a. i/ha	0.33 (1.39)	1.41 (0.70)	0.75 (2.12)	1.14 (3.14)	1.41 (0.35)	1.19 (3.28)
T_4	EPOE Triafamone 200SC @ 100 g a. i/ha	1.41 (0.55)	1.41 (0.84)	0.20 (1.22)	1.54 (4.68)	1.41 (0.42)	0.54 (1.72)
T_5	EPOE Pyrazosulfuron ethyl 10% WP @ 15 g a. i/ha	0.70 (2.02)	0.23 (1.26)	1.37 (3.94)	1.33 (3.80)	1.41 (0.63)	1.86 (6.41)
T_6	PE Triafamone 200SC @ 30 g a. i/ha	1.41 (0.62)	1.41 (0.70)	1.22 (3.39)	0.91 (2.48)	1.41 (0.35)	1.70 (5.48)
T_7	PE Triafamone 200SC @ 40 g a. i/ha	1.41 (0.00)	1.41 (0.00)	1.41 (0.00)	1.41 (0.07)	1.41 (0.00)	1.41 (0.00)
T_8	PE Triafamone 200SC @ 50 g a. i/ha	0.40 (1.50)	0.23 (1.26)	1.30 (3.68)	1.21 (3.36)	1.41 (0.63)	1.72 (5.57)
T_9	PE Triafamone 200SC @ 100 g a. i/ha	1.41 (0.62)	1.41 (0.84)	0.34 (1.40)	0.81 (2.26)	1.41 (0.42)	0.71 (2.03)
T_{10}	PE Pretilachlor 5% EC @ 750 g a. i/ha	0.59 (1.81)	0.43 (1.54)	1.05 (2.85)	0.99 (2.70)	1.41 (0.77)	1.51 (4.54)
T_{11}	Two hand weeding on 20 and 40 DAT	1.41 (0.00)	1.41 (0.14)	0.04 (1.04)	1.41 (0.00)	1.41 (0.07)	0.34 (1.40)
T_{12}	Unweeded Control	1.50 (4.47)	0.74 (2.10)	1.81 (6.11)	1.94 (6.95)	0.05 (1.05)	2.32 (10.17)
	SEd	0.22	0.22	0.13	0.14	0.15	0.21
	CD (P=0.05)	0.46	0.42	0.23	0.27	0.28	0.43

EPOE – Early Post Emergence (2-3 leaf stage of weed), PE – Pre emergence (0-3 days after transplanting), DAA – Days After Application

Table 3: Effect of Triafamone on weed control efficiency (percent) in transplanted rice at 42 DAA

	Treatments	Weed control efficiency (%)							
		Rabi 2018-19				*Kharif 2019*			
		Grasses	Sedges	BLWs	Total WCE	Grasses	Sedges	BLWs	Total WCE
T_1	EPOE Triafamone 200SC @ 30 g a. i/ha	64.3	46.7	50.4	53.8	31.6	47.1	52.3	43.7
T_2	EPOE Triafamone 200SC @ 40 g a. i/ha	98.4	100.0	94.8	97.7	96.8	100.0	96.6	97.8
T_3	EPOE Triafamone 200SC @ 50 g a. i/ha	69.0	66.7	65.2	67.0	54.9	66.4	67.7	63.0
T_4	EPOE Triafamone 200SC @ 100 g a. i/ha	87.8	60.0	80.1	76.0	32.7	59.5	83.1	58.4
T_5	EPOE Pyrazosulfuron ethyl 10% WP @ 15 g a. i/ha	54.8	40.0	35.6	43.5	45.4	40.2	36.9	40.8
T_6	PE Triafamone 200SC @ 30 g a. i/ha	86.2	66.7	44.5	65.8	64.3	65.3	46.2	58.6
T_7	PE Triafamone 200SC @ 40 g a. i/ha	100.0	100.0	100.0	100.0	98.9	100.0	100.0	99.6
T_8	PE Triafamone 200SC @ 50 g a. i/ha	66.5	40.0	39.7	48.7	51.7	39.7	45.2	45.5
T_9	PE Triafamone 200SC @ 100 g a. i/ha	86.2	60.0	77.1	74.4	67.5	59.8	80.0	69.1
T_{10}	PE Pretilachlor 5% EC @ 750 g a. i/ha	59.6	26.7	53.4	46.6	61.2	27.0	55.4	47.9

EPOE – Early Post Emergence (2-3 leaf stage of weed), PE – Pre emergence (0-3 days after transplanting), DAA – Days After Application

data pertaining to weed control efficiency was presented in Table 3 and Fig. 1 and 2. Among the herbicidal weed management practices, application of Triafamone herbicide at 40 g a.i. ha^{-1} as pre emergence and early post emergence application recorded highest weed control efficiency of 100, 97.7 and 99.6 % and 97.8% at 42 DAA during both year of experimentation. The same trend of weed control efficiency was recorded for the major grasses *Echinochloa crus-galli* (L.) and *E. colonum* (L.) Sedge weed: *Cyperus nutans* (L.). Broad leaved weeds *Eclipta alba* (L.) and *Bergia ammannioides* for the both season of experiments. Yadav Dharam Bir, 2019 and Menon 2014 findings also in accordance with the above results. Lowest weed control efficiency was registered by the treatment consisting of EPOE Pyrazosulfuron ethyl at 15 g a.i. ha^{-1} with values of 43.4 and 40.8 % at 25, 50 and 75 DAT respectively.

Effect of triafamone on grain yield of transplanted rice and their residues

The data on grain yield indicated that different weed control methods did exert significant influence on grain yield (Table 4). Among the weed control practices evaluated, pre emergence and early post emergence application of Triafamone at 40 g a.i. ha^{-1} resulted in higher grain yield

Table 4: Effect of Triafamone on yield of transplanted rice

	Treatments	*Rabi 2018-19*		*Kharif 2019*	
		Grain Yield (kg ha^{-1})	Straw Yield (kg ha^{-1})	Grain Yield (kg ha^{-1})	Straw Yield (kg ha^{-1})
T_1	EPOE Triafamone 200SC @ 30 g a. i/ha	5292	8083	5927	9781
T_2	EPOE Triafamone 200SC @ 40 g a. i/ha	8052	8944	9018	10823
T_3	EPOE Triafamone 200SC @ 50 g a. i/ha	5458	8269	6113	10005
T_4	EPOE Triafamone 200SC @ 100 g a. i/ha	6146	8194	6883	9915
T_5	EPOE Pyrazosulfuron ethyl 10% WP @ 15 g a. i/ha	5033	7954	5637	9624
T_6	PE Triafamone 200SC @ 30 g a. i/ha	4458	8306	4993	10050
T_7	PE Triafamone 200SC @ 40 g a. i/ha	8182	9291	9175	11242
T_8	PE Triafamone 200SC @ 50 g a. i/ha	7263	8457	8134	10233
T_9	PE Triafamone 200SC @ 100 g a. i/ha	6125	7963	7187	9635
T_{10}	PE Pretilachlor 5% EC @ 750 g a. i/ha	6417	8491	6930	10274
T_{11}	Two hand weeding on 20 and 40 DAT	6188	7981	6860	9657
T_{12}	Unweeded Control	3071	6059	3439	7332
	SEd	212	285	242	325
	CD (P=0.05)	536	678	611	773

EPOE – Early Post Emergence (2-3 leaf stage of weed), PE – Pre emergence (0-3 days after transplanting), DAA – Days After Application

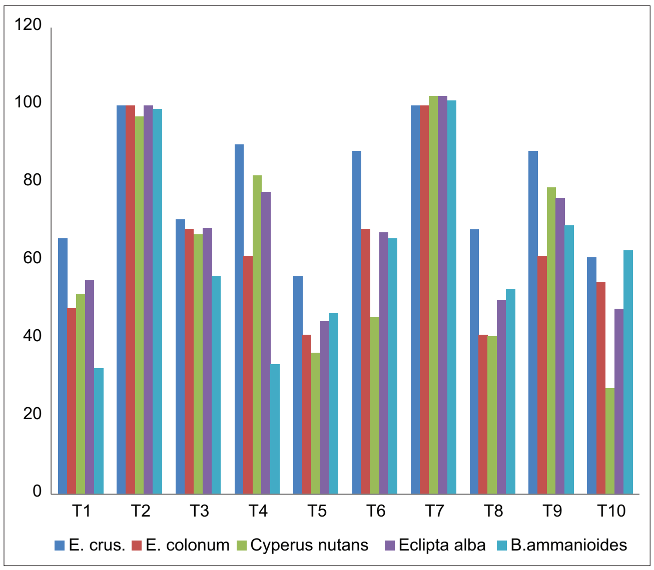

Fig 1. Effect of Triafamone herbicide on Weed Control Efficiency in transplanted rice (Rabi 2018-19).

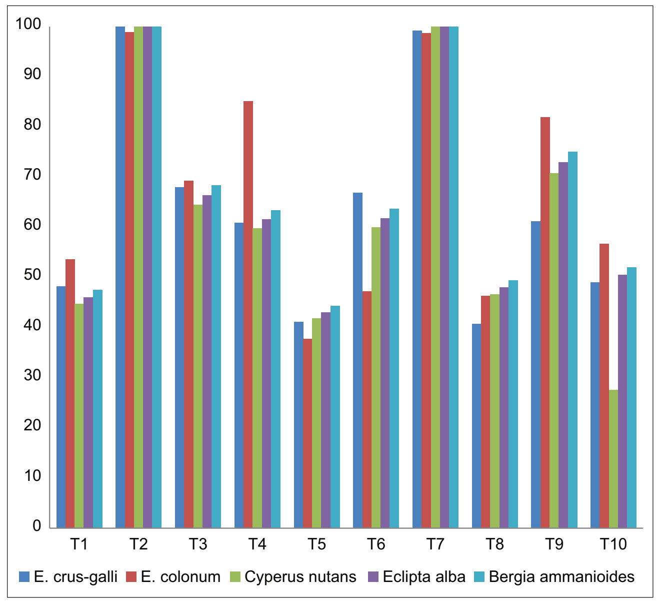

Fig 2. Effect of Triafamone herbicide on Weed Control Efficiency in transplanted rice (Khairf 2019).

(8052 and 8182 kg ha^{-1} during *rabi* 2018-19 and 9018, 9175 kg ha^{-1} during *Kharif* 2019) and this was followed by pre-emergence application of pretilachlor at 0.75 kg a.i. ha^{-1} (6417and 6930 kg ha^{-1}). These two treatments recorded significantly higher grain yield over rest of the weed management practices. The yield increase under these two treatments ranged from 161 – 164 per cent over unweeded check (3071 and 3439 kg ha^{-1}). The higher grain yield increased might be due to lesser weed density and dry weight which favoured the transplanted rice plant to grow without any stress during crop weed interaction period and as a result, it was produced more synthates and translocated effectively from source to sink. Duary, 2015 found that, application of herbicides increased the productivity of transplanted rice with reduced weed growth. The increased grain and straw yield clearly indicated the influence of weed free environment on grain production. Because of weed free condition in transplanted rice ecosystem, the competition for light, space and nutrient was reduced resulting in better availability of required nutrients and uptake by the crop. This conducsive environment leads to production more tillers in the rice plant which leads to more productive tillers and higher accumulation of photosynthates. This favourable environment resulted in higher plant dry matter production with the highest plant height, LAI, number of productive tiller and other yield bearing attributes. The cumulative effect of all these, enhanced the performance of the transplanted rice crop under the favourable weed free condition leading to higher grain and straw yield. Wang et.al. 2017 found that triafamone was applied to rice crop; this was predominantly distributed in the paddy soil and water, and then rapidly dissipated in accordance with the first-order rate model, with half-lives of 4.3–11.0 days. At the senescence stage of rice crop, rice had incurred triafamone at a concentration of 0.0016 mg/kg, but the hazard quotient was <1, suggesting that long-term consumption of the triafamone-containing rice is relatively safe and actively metabolized in the agricultural environment. No phytotoxicity symptoms were observed in all the treatments including Triafamone at the rate of 100 g a.i. ha^{-1}

CONCLUSION

From the experiments, it is concluded that, application of Triafamone at the rate of 40 g a.i. ha^{-1} either as pre emergence or early post emergence application significantly recorded higher growth and yield of transplanted rice without any residues and not affecting succeeding black gram growth and yield.

Hence, application of Triafamone at the rate of 40 g a.i/ha with a wider application window of either pre emergence or early post emergence might be recommended to get higher productivity in transplanted rice crop.

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