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BIO-EFFICACY AND PHYTOTOXICITY OF TRIAFAMONE AND ETHOXYSULFURON IN TRANSPLANTED RICE (ORYZA SATIVA)

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Abstract:

A field experiment was conducted during rabi season 2012-2013 at Annamalai University, Tamilnadu, India. To study the effect of bio efficacy and phytotoxicity of different pre and post emergence herbicides along with hand weeding at 20 and 40 days after planting and untreated control check on transplanted rice. The herbicides triafamone + ethoxysulfuron at (200g/ml/ha and 225 g/ml/ha), triafamone (225 g/ml/ha) and two hand weeding was recorded the zero weed counts of individual species viz., grasses, sedges and broad leaf weeds, weed dry matter production and weed control index favoring to induce higher grain yield of (5.37, 5.42, 5.12 and 5.25t/ha), respectively. Triafamone + ethoxysulfuron (175 g/ml/ha) and Ethoxysulfuron (150g/ml/ha) was recorded the least weed count, weed dry matter and cent percent weed control index at 42 days after application. No phytotoxicity was observed in the treatments including the recommended dose of triafamone + ethoxysulfuron (450 g/ml/ha and 225 g/ml/ha) in respect of leaf chlorosis, tip burning, necrosis, epinasty, hyponasty, vein clearing, wilting and rosetting.

Key Words: Rice, Bio-Efficacy, Phytotoxicity, Triafamone & Ethoxysulfuron.

Introduction:

Rice is the world's most important stable food crop for more than half of the world population. More than 90 per cent of the world's rice is grown and consumed particularly in Asia. Rice is the key factor of normal food security system accounts about 35 to 75 per cent calories consumed for more than 3 billions in Asians and about three fourth of their protein intake. It is a key factor of normal food security system. India holds the leading position in rice cultivated area and next to China in production. In India, rice is cultivated over an area of 45 million hectares with a production of 100 million tones (Veerakumar, 2013). In Tamil nadu, it is cultivated over an area of 2.2 million hectares with a production of 8.55 million tones. In India, estimated rice production of 2013 in around 104.3 mt and it would be 150 mt during 2020 (Anonymous, 2013). The losses caused by weeds exceed the losses caused by any other category of agricultural pests. Of the total annual loss in agriculture produce, weeds account for 45%, insect 30%, disease 20% and other pests 5%. The direct seeded rice is subjecting to greater weed competition than transplanted rice because both weed and crop seeds emerge at the same time and compete with each other from germination ,resulting yield reduction by 50 to 100% (Rao*et al* .,2007). Accordingly research programme on vegetation management strategies capable of minimizing weed infestation and simultaneously favouring sustainable crop production that is economical and environmentally acceptable strategies for alleviating yield losses due to pests, including weeds, insects and diseases. The above facts in view, an experiment were conducted to study the bio efficacy and phytotoxicity of Triafamone and Ethoxysulfuron on weeds and transplanted rice.

Materials and Methods:

A field experiment was conducted at Experimental Farm, Faculty of Agriculture, Annamalai University, Tamilnadu, India during rabi seasons of 2012-2013, to study the effect of different herbicides compared on weed control practices for transplanted rice. The soils of the experimental site clayey loam with a pH of 7.8 and EC of 0.46 m.mhos/cm^{-1}, low in available nitrogen (210 $kgha^{-1}$), medium in available phosphorus (17.96$kgha^{-1}$) and high in available potassium (320.8 $kgha^{-1}$). The experimental farm located at 11º 24' N latitude, 79 º 41' E longitudes at an altitude of + 5.79m above mean sea level. Ten different treatments comprising viz., Untreated control (Water Spray), Two hand weeding at 20 and 40 DAP, Pretilachlor 50 EC (1250 ml/ha), Pyrazosulfuron ethyl (Saathi) 10 WP (150 ml/ha), Butachlor 50% EC (2500 ml/ha), Ethoxysulfuron 15% WG (150 g/ml/ha), Triafamone 20% SC (225 ml/ha), Triafamone 20% + Ethoxysulfuron 10-30% WG (225 g/ml/ha), Triafamone 20% + Ethoxysulfuron 10-30% WG (200 g/ml/ha), Triafamone 20% + Ethoxysulfuron 10-30% WG (175 g/ml/ha) compared and were laid out in randomized block design with four replications. The transplanting of CO-43 paddy variety was done at 20 x 15 cm spacing. The recommended dose of 150 kg N, 50 kg P_2O_5 and 50kg K_2O was applied along with farmyard manure (FYM) at12.5 tha^{-1}. The whole quantity of P_2O_5, FYM and half dose of nitrogen and potassium were applied at the time of field preparation. Remaining half dose of N and K_2O was applied at 45 and 60 DAP. The herbicides were sprayed three DAP of pre-emergence and 15 DAP of post emergence by using knapsack sprayer fitted with flood jet nozzle spray volume of 300 lit/ha as per the treatments. The treatments as of triafamone and ethoxysulfuron, when sprayed after 24 hrs irrigate immediately. Weed population was recorded by using 0.25 m^2 quadrate at 42 DAS in all the treatments and then converted into number of weeds/m^2. The weeds were dried in oven till a constant weight was observed and then transformed into g/m^2 by using the appropriate formula. The data on total weed count and weed control index were subjected to square root transformation to normalize their distribution (Gomez and Gomez, 1984). Weed control efficiency (Mani *et al.,* 1973) and different indices (Devasenapathy*et al.,* 2008) were worked out by the formula as below.

$$WCE(\%) = \frac{WDC - WDT}{WDC} x100$$

Where: WCE: Weed control efficiency; WDC: Weed dry matter in control; WDT: Weed dry matter in treatment.

The phytotoxicity symptoms were observed in respect of leaf chlorosis, tip burning, necrosis, epinasty, hyponasty, vein clearing, wilting and rosetting.

Results and Discussion:

Effect on Weeds:

The predominant weeds of experimental field were infested with *L.chinensis*, *E.colonum* and *C.dactylon* of grasses, *Cyperus*Sp and *Scirpus*Sp of sedges and broad leaf weeds of *E.alba, B.capansis and T.portulacastrum* etc. Triafamone + ethoxysulfuron (200 g/ml/ha and 225 g/ml/ha), triafamone (225 g/ml/ha) and two hand weeding were recorded the zero weed counts, weed dry matter and cent percent weed control index (Table 1, 2 and 3) at 42 DAA. Triafamone + ethoxysulfuron (175 g/ml/ha and ethoxysulfuron 150 g/ml/ha) were next in order. Butachlor at (2500 ml/ha), pyrazosulfuron ethyl at (150 ml/ha) and pretilachlor at (1250 ml/ha) had higher weed density and weed dry weight than ethoxysulfuron at (150 ml/ha). All the treatments were significantly superior than untreated control. Untreated control recorded the

highest weed population and weed dry matter of grasses, sedges and broad leaf weeds at 42 DAA. The results are conformity with the findings of (Sushma*et al.,* 2013).

Effect on Crop:

The highest grain yield of (5350, 5210 and 5250 kg/ha) was recorded with the treatments of triafamone + ethoxysulfuron (200 g/ml/ha and 225 g/ml/ha) and two hand weeding. Triafamone + Ethoxysulfuron 175 g/ml/ha and Triafamone 225 ml/ha were next in order. Triafamone + ethoxysulfuron all the doses performed significantly superior to butachlor, pyrazosulfuron ethyl and pretilachlor. These all the treatments were significantly superior than the untreated control that recorded the least grain yield of 2300kg/ha. This is conformity with the chemical control of weeds (Jha*et al.,* 2007; Gangwar and Singh 2010 and Jha*et al.,* 2011). The better performance of triafamone + ethoxysulfuron is attributed to efficient and safe weed control. No phytotoxity was observed in all the treatments including the recommended dose of triafamone + ethoxysulfuron (450 g/ml/ha and 225 g/ml/ha) in respect of leaf chlorosis, tip burning, necrosis, epinasty, hyponasty, vein clearing, wilting and rosetting.

Two season experimentations, it could be concluded that application of triafamone + ethoxysulfuron (200 g/ml/ha and 225 g/ml/ha) and two hand weeding at 20 and 40 DAP is more efficient practically convenient and economically feasible method for weed control in transplanted rice and without causing any phytotoxic injury at the tested dosages.

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Table 1: Effect of different herbicide sprayed on weed count at 42 DAA (m^{-2})

Treatments	Grasses			Sedges		Broad leaf weeds		
	L. chinensis	*E. colonum*	*C. dactylon*	*Cyperussp*	*Scirpussp*	*E.alba*	*B.capansis*	*T.portulacastrum*
Triafamone 20% + Ethoxysulfuron 10-30% WG (175 g/ml/ha)	(2.0) 1.58	(2.5) 1.73	(2.0) 1.58	(2.0) 1.58	(1.0) 1.22	(1.5) 1.41	(1.0) 1.22	(1.0) 1.22
Triafamone 20% + Ethoxysulfuron 10-30% WG (200 g/ml/ha)	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01
Triafamone 20% + Ethoxysulfuron 10-30% WG (225 g/ml/ha)	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01
Triafamone 20%SC (225 ml/ha)	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01
Ethoxysulfuron 15% WG (150 g/ml/ha)	(3.0) 1.87	(4.0) 2.12	(3.0) 1.87	(5.0) 2.34	(3.0) 1.87	(2.0) 1.58	(1.0) 1.22	(1.0) 1.22
Butachlor 50% EC (2500 ml/ha)	(4.0) 2.12	(5.0) 2.34	(5.0) 2.34	(5.5) 2.44	(5.0) 2.34	(4.0) 2.12	(2.0) 1.58	(1.0) 1.22
Pyrazosulfuron ethyl (Saathi) 10 WP (150 ml/ha)	(5.0) 2.34	(4.0) 2.12	(4.0) 2.12	(4.5) 2.23	(4.0) 2.12	(4.0) 2.12	(3.0) 1.87	(2.0) 1.58
Pretilachlor 50 EC (1250 ml/ha)	(6.0) 2.54	(5.0) 2.34	(4.5) 2.23	(5.0) 2.34	(5.0) 2.34	(4.5) 2.23	(3.5) 2.00	(2.5) 1.73
Hand weeding at 20 and 40 DAP	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01	(0.00) 0.01
Untreated control (Water Spray)	(17.0) 4.18	(19.0) 4.41	(15.0) 3.93	(17.0) 4.18	(12.0) 3.53	(14.0) 3.80	(13.0) 3.67	(12.0) 3.53
$S.E_D$	0.14	0.19	0.14	0.38	0.32	0.08	0.18	0.18
CD (P=0.05)	0.29	0.39	0.29	0.79	0.65	0.17	0.36	0.36

Figures in parenthesis indicate original values before subjecting them to transformation using the formula $\sqrt{(X+0.5)}$

Table 2: Effect of different herbicide sprayed on weed dry matter production (g) at 42 DAA (m^{-2})

Treatments	Grasses			Sedges		Broad leaf weeds		
	L. chinensis	*E. colonum*	*C. dactylon*	*Cyperuss p*	*Scirpus sp*	*E.alba*	*B.capansis*	*T. portulac astrum*
Triafamone 20% + Ethoxysulfuron 10-30% WG (175 g/ml/ha)	42.0	40.0	82.0	56.0	47.0	70.5	67.0	73.0
Triafamone 20% + Ethoxysulfuron 10-30% WG (200 g/ml/ha)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triafamone 20% + Ethoxysulfuron 10-30% WG (225 g/ml/ha)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triafamone 20%SC (225 ml/ha)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ethoxysulfuron 15% WG (150 g/ml/ha)	68.0	61.0	87.0	65.0	51.0	73.0	71.0	75.0
Butachlor 50% EC (2500 ml/ha)	73.0	69.0	93.0	69.0	59.0	77.0	73.0	83.0
Pyrazosulfuron ethyl (Saathi) 10 WP (150 ml/ha)	57.0	76.0	86.0	70.30	62.0	70.7	69.0	79.0
Pretilachlor 50 EC (1250 ml/ha)	77.0	70.0	91.0	70.0	67.0	81.0	70.0	81.0
Hand weeding at 20 and 40 DAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Untreated control (Water Spray)	257.0	130.0	125.0	110.0	117.0	120.0	145.0	180.0
$S.E_D$	2.50	4.0	3.0	2.0	2.0	1.50	2.0	1.0
CD (P=0.05)	5.0	8.0	6.0	4.0	4.0	3.0	4.0	2.0

Table 3: Effect of different herbicide sprayed on weed control index at 42 DAA (m^{-2}) and grain yield kg/ha

Treatments	Grasses			Sedges		Broad leaf weeds			Grain Yield (Kg/ha)
	L. chinensis	*E. colonum*	*C. dactylon*	*Cyperussp*	*Scirpussp*	*E.alba*	*B.capansis*	*T.portulac astrum*	
Triafamone 20% + Ethoxysulfuron 10-30% WG (175 g/ml/ha)	(83.65) 66.14	(69.23) 56.30	(34.40) 35.91	(49.09) 44.47	(59.82) 50.66	(41.25) 39.96	(53.79) 47.17	(59.44) 50.44	5250
Triafamone 20% + Ethoxysulfuron 10-30% WG (200 g/ml/ha)	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	5370
Triafamone 20% + Ethoxysulfuron 10-30% WG (225 g/ml/ha)	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	5425
Triafamone 20%SC (225 ml/ha)	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	5120
Ethoxysulfuron 15% WG (150 g/ml/ha)	(73.54) 59.04	(53.07) 46.76	(30.40) 33.46	(40.90) 39.75	(56.41) 48.68	(39.16) 38.73	(51.03) 45.60	(58.33) 49.80	5070
Butachlor 50% EC (2500 ml/ha)	(71.59) 57.80)	(46.92) 43.23	(25.60) 30.39	(37.27) 37.62	(49.57) 44.75	(35.83) 36.40	(49.65) 44.80	(53.88) 47.22	4980
Pyrazosulfuron ethyl (Saathi) 10 WP (150 ml/ha)	(77.82) 61.90	(41.53) 40.12	(31.20) 34.0	(36.09) 37.0	(47.0) 43.28	(41.08) 39.90	(52.41) 46.38	(56.11) 48.50	4740
Pretilachlor 50 EC (1250 ml/ha)	(69.44) 56.43	(46.15) 42.79	(27.20) 31.43	(36.36) 37.08	(42.73) 40.81	(32.5) 34.75	(46.20) 42.9	(55.0) 47.90	4960
Hand weeding at 20 and 40 DAP	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	(100) 90.0	5250
Untreated control (Water Spray)	-	-	-	-	-	-	-	-	2500
$S.E_D$	3.55	4.70	1.22	2.35	0.98	0.61	0.78	1.35	27.50
CD (P=0.05)	7.10	9.50	2.44	4.71	1.97	1.23	1.57	2.70	55.0

Figures in parenthesis indicate original values before subjecting them to angular transformation.