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ECHINOCHLOA CRUSGALLI (L.) BEAUV COMPETITION AND CONTROL IN TRANSPLANTED RICE.

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Annual grass *Echinochloa crusgalli* (L.) Beauv was the major weed and competed with the rice. Weeds reduced the grain yield of rice 89% in both *kharif* and winter seasons. Herbicide mixtures of bntachlor, fluchloralin, oxadiazon and thiobencarb with 2,4-D EE was effective than individual application of the above herbicides. Pre-emergence application of thiobencarb + 2,4-D EE (1.0+0.5 kg/ha) gave higher rice grain yield of 5483 and 4828 kg/ha in *kharif* and winter seasons respectively.

Rice is the most important staple food crop in Asia. Limited supply of water promotes luxurient growth of weeds in transplanted rice. Since most of the weed flora are of C_4 plant type, they are aggressive and compete vigorously for nutrient, space and sunlight with rice crop. Based on a large number of multi-location trials, the yield losses in transplanted rice has been worked out to be 15 to 20 percent (Pillai and Rao, 1974).

For pre-emergence control of weeds, the herbicides like butachlor and thiobencarb are widely used. They control grasses effectively but their effect on sedges and broad leaved weeds is only moderate. The phenoxy herbicide like 2,4-D EE can be used in pre-emergence application for effective control of sedges and dicots and moderate control of grasses (Pande et al., 1981). A single herbicide may not be effective in controlling all types of weed flora. Moody (1982) recommended that herbicide mixtures could give a longer duration and wider sprectrum of weed control. So this study was taken up with a view to obtain a suitable weed control system for transplanted rice under intermittent irrigation.

METERIALS AND METHODS

The experiments were laid out under intermittent irrigation in clay loamy soil of average fertility at Tamil Nadu Agricultural University, Coimbatore, India. The rice variety was IR 50. Spacing of 15 cm between rows and 10 cm between plants was followed. A common fertilizer dose of 50 kg each of N, P_2O_5 and K_2O per hectare was applied at the time of transplanting in the form of urea, super phosphate and muriate

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of potash respectively. Fifty kg/ha of nitrogen was top dressed on tillering and panicle initiation stage in equal split. Twenty two days old seedling was transplanted.

Weed control treatments were the individual application of pre-emergence herbicides like butachlor 1.5 kg a.i/ha, fluchloralin 0.8 kg a.i/ha oxadiazon 0.75 kg a.i/ha, thiobencarb 1.5 kg a.i/ha and 2,4-D EE 0.8 kg a.i/ha with hand weeding and mixtures of 2,4-D EE 0.8 kg a.i./ha with mixtures of 2,4-D EE 0.5 kg a.i/ha with butachlor 1.0 kg a.i/ha, fluchloralin 0.50 kg/ha, oxadiazon 0.5 kg a.i/ha and thiobencarb 1.0 kg a.i/ha with or without hand weeding. These thirteen treatments were compared with farmer's practice of hand weeding twice, unweeded control and 2,4-D EE alone. Field experiments were laid out in randomised block design with three replications.

RESULTS AND DISCUSSION

Weed flora in both the seasons was the same. The grass weeds were more predominant in the weed flora than sedges, broad leaves or aquatics. Among the grasses, *Echinochloa crusgalli* (L.) Beauv was the most dominant constituting 35 per cent of the total weed population. The other predominant weed was *Cyperus difformis* L. in sedges and *Eclipta alba* (L.) Hassk in broad leaves.

Application of thiobencarb mixture reduced the *E. crusgalli* to the minimum of 12/m^2 in *kharif* and it was similar with other herbicide mixture whereas in winter the fluchloralin mixture controlled effectively. The intensity of *E. Crusgalli* was 104/m^2 *kharif* and 85/m^{-2} in winter. In *kharif* persistance of thiobencarb mixture was better as against fluchloralin mixture in winter. Further it is evident that herbicide mixtures are no less superior than the individual herbicides. The herbicides in mixtures are systemic in nature. They might have entered through root, shoot, and leaves leading to synergism in controlling the major grass weed. The same trend was noticed for other weed community and total weeds.

In mixtures 2.4-D EE had quick systemic action whereas other herbicides had residual systemic action there by they had prolonged weed control efficiency. Further the synergism between the herbicides and 2,4-D EE resulted in wider spectrum weed control. This result was in corroboration with the findings of Singh and Biswas (1981) and Mandel *et al.*, (1982). Among the individual herbicides 2,4-D EE was not effective and recorded higher weed counts. This may be due to the resistance of the major weed *E. crusgalli* to 2,4-D EE.

In both the seasons the lowest weed dry matter was in thiobencarb mixture which was similar with the rest of the mixtures. Next to unweeded plot 2,4-D EE recorded maximum dry weight due to the robust

Table 1. Effect of treatments on weed flora (No/m²) at 30 days after planting

Treatment	Dose kg a. i. (or) a.e/ha		Kharif			Winter		
			E. Crusgalli	B. Leaves and aquatics	Total	E. Crusgalli	B. leaves and aquatics	Total
Butachlor fb HW	1.5	O	19	39	97	11	19	52
		T	1.29	1.61	2.00	1.04	1.32	1.73
Fluchloralin fb HW	0.8	O	17	33	80	9	15	45
		T	1.23	1.54	1.91	0.97	1.12	1.67
Oxadiazon fb HW	0.75	O	19	34	87	8	14	42
		T	1.27	1.31	1.95	0.89	1.15	1.65
Thiobencarb fb HW	1.5	O	16	30	83	9	17	49
		T	1.21	1.51	1.93	0.95	1.24	1.70
Butachlor +2,4-D EE	1.0+0.50	O	12	18	52	9	9	37
		T	1.09	1.30	1.73	0.97	1.00	1.59
Fluchloralin+2,4-D EE	0.5+0.5	O	13	17	48	8	7	35
		T	1.11	1.26	1.70	0.90	0.95	1.56
Thiobencarb +2,4-D EE	1.0+0.5	O	13	15	46	8	8	32
		T	1.10	1.21	1.68	0.89	0.99	1.52
Butachlor +2,4 D EE fb HW	1.0+0.5	O	14	16	48	8	11	38
		T	1.15	1.22	1.69	0.90	1.11	1.60
Fluchloralin +2,4D EE fb HW	0.5+0.5	O	12	16	48	7	10	31
		T	1.09	1.25	1.70	0.86	1.08	1.52
Oxadiazon+2,4 D EE pp HW	0.5+0.5	O	17	18	53	11	8	38
		T	1.23	1.28	1.74	1.04	0.99	1.60
Thiobencarb +2,-D EE fb HW	1.0+0.5	O	12	13	42	10	8	34
		T	1.07	1.18	1.64	1.01	0.98	1.56
2,4-D EE alone	0 8	O	57	16	126	42	14	94
		T	1.76	1.25	2.11	1.62	1.20	1.98
2,4-D EE fb HW	0.8	O	56	17	130	45	14	93
		T	1.75	1.28	2.12	1.65	1.17	1.98
Hand weeding twice		O	64	47	182	47	49	143
		T	1.80	1.69	2.26	1.68	1.70	2.16
Unweeded control		O	104	87	311	86	80	244
		T	2.02	1.95	2.50	1.93	1.91	2.39
C.D. (P=0.05)			0.162	0.202	0.075	0.148	0.275	1.106

fb—followed by EE—Ethyl Ester. T—Transformed log values.
HW—Hand weeding O—Original values

growth of *E. crusgalli* which amply contributed to the dry matter production. The increased dry weight of weeds in oxadiazon is attributed to its toxicity on the crop. Thus, the competition exerted by the crop was weakened giving weeds a chance. Richard *et al*, (1983) also reported that oxadiazon was temporarily toxic to rice at 0.75 kg a.i/ha. The distinct reduction in weed dry matter in thiobencarb mixture is due to effective control of weeds and prolonged persistence in soil. Even under intermittent irrigation, the pre-emergence action of thiobencarb was not interrupted.

The yield components like productive tillers and number of filled grains were more in herbicide mixtures followed by hand weeding treatment. The highest was in thiobencarb mixture followed by hand weeding. Thiobencarb mixture followed by hand weeding gave higher grain yield of 5488 kg/ha in *kharif* and 4828 kg/ha in winter. It was on par with other mixtures followed by hand weeding except oxadiazon mixture. Individual application of thiobencarb followed by hand weeding recorded comparable grain yield with the mixtures followed by hand weeding. 2,4-D EE whether individually or followed by hand weeding gave the lowest grain yields among the herbicide treatments. The highest yields under thiobencarb mixture followed by hand weeding (122 per cent increased yield over weedy check) was due to better selectivity and effective prolonged control of weeds providing the plant the most favourable environment for growth, yield components and yield.

Mixtures followed by hand weeding, in general, were better than the rest of the weed control treatments due to wider spectrum of weed control. This findings also agrees with that of Rao and Ponnusamy (1983) for butachlor mixture, Kondap *et al*., (1983) for fluchloralin mixture, Patel *et al*, (1980) for oxadiazon mixture and Pillai and Ghosh (1980) for thiobencarb mixture. On the application of herbicide mixtures there is a possibility to reduce the doses of the individual herbicides of the mixture with synergism in controlling weeds and antagonism in reducing the toxicity to the crop. Wider spectrum and prolonged weed control and cost effectiveness of the herbicide mixtures give them an advantage over the use of individual herbicides.

Summarising these results it can be stated that in transplanted rice under intermittent irrigation, the most efficient and economic weed control can be achieved by preemergence application of thiobencarb mixture followed by hand weeding.

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Table: Effect of treatments on weed dry matter, yield components and yield of rice

Treatments		Dose kg a.i. or a.e/ha	*Kharif*				Winter			
			Weed dry matter at 35 day (kg/ha)	Productive tiller/m²	No. of filled grain/panicle	Yield kg/ha	Weed dry matter at 35 day (kg/ha)	Productive tillers/m²	No. of filled grains/panicle	Yield kg/ha
Butchlorts	fb HW	1.50	116.3	582	57.8	4322	21.3	489	54 9	4235
Fluchloralin	fb HW	0.80	92.7	644	59.8	4857	19.7	480	53.4	4157
Oxadiazon	fb HW	0,75	134.4	524	54 8	3164	15.6	480	52.9	3826
Thiobencarb	fb HW	1.50	101.3	604	58.4	4553	17.2	497	53.1	4400
Butachlor	+2,4-D EE	1.00+0.50	99.0	551	56.8	3955	11.5	449	47.3	3547
Fluchoralin	+2,4-D EE	0.50+0.50	101.0	547	56.3	3923	16.6	484	49.5	3540
Oxadiazon	+2,4-D EE	0.50+0.50	84.6	564	57.2	4242	12.1	449	50.5	3695
Thiobencarb	+2,4-D EE	1.00+0.50	84.5	564	57.4	4242	7.1	467	53.4	3887
Butachlor	+2,4-D EE fb HW	1.00+0.50	83.1	644	60.3	4865	10.2	537	58.6	4742
Fluchloralin	+2,4-D EE fb HW	0.50+0.50	81.6	644	61.0	5145	15.9	573	59.2	4610
Oxadiazon	+2.4-D EE fb HW	0.50+0.50	107.2	600	58.0	4553	13 9	489	57.3	4488
Thiobencarb	+2,4-D EE fb HW	1.00+0.50	71.1	649	67.6	5483	8.1	577	63.4	4828
2,4-D EE alone		0.80	139.1	511	53.7	3044	48.3	404	45.4	3137
2,4-D EE fb HW		0.80	123 4	542	55.0	3467	45.6	449	48.2	3486
Hand weeding twice		—	96.9	622	59.2	4705	25.5	542	58.0	4584
Unweeded control		—	204.3	409	52.8	2365	67.6	395	39.4	2292
C.D. (P=0.05)			18.4	74	4.6	623	5.1	103	12.7	530

DT—Days after transplanting HW—Hand weeding fb—followed by EE—Ethyl ester

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