Indian J. Weed Sci. **42** (3 & 4) : 226-228 (2010) *Short Communication*

Growth and Yield of Transplanted Rice (*Oryza sativa*) as Influenced by Sequential Application of Herbicides

Y. Deepthi Kiran, D. Subramanyam and V. Sumathi
Department of Agronomy
S. V. Agricultural College, Tirupati-517 502 (A. P.), India

Rice (*Oryza sativa* L.) is an important food crop of India contributing 45% of the total food grain production. Transplanted rice faces diverse type of weed flora, consisting of grasses, broad-leaved weeds and sedges. Competition offered by weeds is most important and it reduces the grain yield upto the extent of 15-45% (Chopra and Chopra, 2003). Hand weeding is the most effective method, however, high labour wages and non-availability of labour during peak periods of agricultural operations, timely weeding is not possible. Most of the pre-emergence herbicides viz., butachlor, pretilachlor and thiobencarb were applied in large quantities for weed management in transplanted rice. These herbicides are very effective for grasses and less effective against sedges and broad-leaved weeds (Singh *et al*., 2009). Further, these herbicides are very effective for controlling weeds upto 20 DAT. Application of herbicide mixtures or sequential application of herbicides may be useful for broad-spectrum control of weeds in rice. Recent trend of herbicide use is to find out an alternative and effective weed management by using low dose high efficiency herbicides, which will not only reduce the total volume of herbicide per unit area, but also application becomes easier and economical to the farmer. Hence, the present investigation was carried out to evaluate the relative efficacy of some of the newly developed pre- and post-emergence herbicides for control of weeds in transplanted rice.

The field experiment was conducted during **rabi** 2009 at wetland farm of S. V. Agricultural College, Acharya N. G. Ranga Agricultural University, Tirupati, Andhra Pradesh in transplanted rice. The soil was sandy clay loam in texture having low organic carbon (0.23%) and available nitrogen (178 kg/ha), medium in available phosphorus (25 kg/ha) and potassium (183 kg/ha), slightly alkaline in reaction (pH 7.8) and EC of 0.22 dS/m. The experiment was laid out in a randomized block design with 12 treatments and replicated thrice. The experiment consisted of pre-emergence application of pretilachlor 1000 g/ha, oxadiargyl 75 g/ha, pyrazosulfuron-ethyl 35 g/ha alone and sequential applications of pre- and post-emergence herbicides viz., pretilachlor 1000 g/ha+penoxsulam 25 g/ha, oxadiargyl 75 g/ha+penoxuslam 25 g/ha, pyrazosulfuron-ethyl 35 g/ha+penoxsulam 25 g/ha, pretilachlor 1000 g/ha+bispyribac-sodium 30 g/ha, oxadiargyl 75 g/ha+bispyribac-sodium 30 g/ha, pyrazosulfuron-ethyl 35 g/ha+bispyribac-sodium 30 g/ha, post-emergence application of cyhalofop-butyl 125 g/ha, hand weeding (HW) twice at 20 and 40 DAT and unweeded check. The required quantities of pre- and post-emergence herbicides were applied uniformly at 4 and 20 DAT, respectively, by using knapsack sprayer fitted with flat fan nozzle using 600 l/ha of water as per the treatments. Seedlings of rice cultivar NLR-34449 were transplanted on 18 December, 2009 and harvested on 8 April, 2010. Weed density and dry weight were recorded randomly at two places with the help of 0.25 m^2 quadrat at harvest. The data on weed density and dry weight were transformed to square root ($\sqrt{x+0.5}$) transformation to normalize their distribution.

The major weed flora of the experimental field consisted of *Echinochloa colona* (L.) Link., *Digitaria sanguinalis* (L.) Scop., *Cyperus rotundus* L., *Cyperus difformis* L., *Cyperus iria* L., *Eclipta alba* (L.) Hassk. and *Ammania baccifera* L. The composition of grasses, sedges and broad-leaved weeds in unweeded check plot was 16.5, 51.5 and 32.0%, respectively. Among the herbicidal treatments, sequential application of oxadiargyl 75 g/ha and bispyribac-sodium 30 g/ha recorded the lowest density and dry weight of weeds with maximum weed control efficiency. This treatment was closely followed by oxadiargyl 75 g/ha and penoxulam 25 g/ha (Table 1). The reduced density and dry weight of weeds may be attributed to broad spectrum and season long weed control by the sequential application of pre- and post- emergence herbicides. Pre-emergence application of oxadiargyl 75 g/ha effectively controls the weeds at early stages of crop growth followed by post-emergence application of bispyribac-sodium 30 g/ha controls the late coming weeds. The findings of the present study are in accordance with those of Jadhav *et al.* (2008) and

Table 1. Effect of sequential application of pre- and post-emergence herbicides on weed density, weed dry weight, weed control efficiency and growth and growth parameters of transplanted rice

Treatments	Dose (g/ha)	Time of application (DAT)	Weed density (No./m^2)	Weed dry weight (g/m^2)	Weed control efficiency (%)	Plant height (cm)	Leaf area index	Dry matter production (kg/ha)	Tillers (No./m^2)
Pretilachlor	1000	4	121.33 (11.04)	78.54 (8.89)	54.23 (47.43)	65.01	3.10	12014	538
Oxadiargyl	75	4	107.00 (10.37)	60.87 (7.83)	64.53 (53.45)	66.95	3.30	12872	601
Pyrazosulfuron-ethyl	35	4	80.66 (9.01)	71.30 (8.47)	58.43 (49.86)	67.53	3.21	12516	583
Pretilachlor fb penoxsulam	1000+25	4+20	59.66 (7.76)	37.20 (6.14)	78.33 (62.26)	68.90	3.40	13501	644
Oxadiargyl fb penoxsulam	75+25	4+20	38.00 (6.20)	23.42 (4.89)	86.37 (63.84)	72.85	3.72	13976	714
Pyrazosulfuron-ethyl fb penoxsulam	35+25	4+20	48.00 (6.96)	51.28 (7.20)	70.1 (56.82)	67.85	3.38	13214	622
Pretilachlor bispyribac-sodium	1000+30	4+20	42.33 (6.54)	27.49 (5.29)	83.97 (66.4)	69.53	3.65	13800	701
Oxadiargyl fb bispyribac-sodium	75+30	4+20	33.00 (5.79)	20.13 (4.54)	88.27 (69.97)	73.60	3.82	14214	722
Pyrazosulfuron-ethyl fb bispyribac-sodium	35+30	4+20	37.00 (6.12)	25.42 (5.09)	85.2 (67.38)	71.33	3.54	13698	664
Cyhalofop-butyl	125	20	150.00 (12.27)	84.48 (9.22)	50.73 (45.42)	64.53	3.01	11826	526
HW twice	-	20+40	27.00 (5.24)	18.75 (4.39)	89.07 (70.7)	75.26	4.05	14512	736
Unweeded check (Control)	-	-	229.66 (15.50)	171.55 (13.12)	0.00 (0.48)	63.25	2.85	11558	503
LSD (P=0.05)			0.41	0.38	4.32	3.54	0.44	545	33

Figures in parentheses indicate square root ($\sqrt{x+0.5}$) transformed values for weed density and weed dry weight and arcsine transformed values for weed control efficiency.
fb : followed by.

Yadav *et al*. (2009). Sequential application of pyrazosulfuron-ethyl 35 g/ha and penoxsulam 25 g/ha recorded higher weed dry weight and lower WCE, among the different sequential applications of herbicides. Pre-emergence application of pretilachlor 1000 g/ha or oxadiargyl 75 g/ha alone and post-emergence application of cyhalofop-butyl 125 g/ha alone were ineffective.

All the weed management practices significantly improved the growth parameters viz., plant height, leaf area index, dry matter production, tillers/m^2 and yield attributes viz., panicle length, number of filled grains/ panicle and 1000-grain weight of transplanted rice over unweeded check. Sequential application of oxadiargyl 75 g/ha and bispyribac-sodium 30 g/ha or penoxsulam 25 g/ha was as effective as HW twice in improving growth, yield attributes and yield of rice (Tables 1 and 2). However, hand weeding twice and sequential application of oxadiargyl 75 g/ha and bispyribac-sodium 30 g/ha were found at par with each other with respect to all the growth and yield attributes. The increase in growth and yield attributes might be attributed to the reduction in weed competitiveness with crop plants for growth resources. The highest grain yield was recorded with HW twice, which was however comparable with sequential application of oxadiargyl 75 g/ha and bispyribac-sodium 30 g/ha. The increased seed yield was obviously the result of better growth and yield attributes of rice. These findings are in accordance with those of Subramanyam *et al.* (2007) and Singh *et al.* (2009). Unchecked weed growth reduced the grain yield by 33.17% over the hand weeding twice. Sequential application of oxadiargyl 75 g/ha and bispyribac-sodium

Table 2. Effect of sequential application of pre- and post-emergence herbicides on yield components, yield and economics of transplanted rice

Treatments	Dose (g/ha)	Time of application (DAT)	Panicles (No./m^2)	Panicle length (cm)	No. of filled grains/ panicle	1000-grain weight (g)	Grain yield (kg/ha)	Net returns (Rs./ha)	B : C ratio
Pretilachlor	1000	4	402	16.50	103.6	13.87	5325	42849	2.64
Oxadiargyl	75	4	426	17.03	109.0	14.08	5553	46206	2.81
Pyrazosulfuron-ethyl	35	4	412	16.87	105.3	14.22	5495	45143	2.74
Pretilachlor fb penoxsulam	1000+25	4+20	444	17.54	114.0	14.33	5822	46572	2.63
Oxadiargyl fb penoxsulam	75+25	4+20	509	18.13	116.6	14.82	6548	56089	3.00
Pyrazosulfuron-ethyl fb penoxsulam	35+25	4+20	432	17.26	112.3	14.47	5698	45196	2.59
Pretilachlor bispyribac-sodium	1000+30	4+20	488	18.00	115.6	14.70	6264	51688	2.71
Oxadiargyl fb bispyribac-sodium	75+30	4+20	525	18.36	118.6	14.96	6758	58407	3.06
Pyrazosulfuron-ethyl fb bispyribac-sodium	35+30	4+20	468	17.86	115.0	14.62	5947	47878	2.67
Cyhalofop-butyl	125	20	396	16.20	101.3	13.70	5126	38849	2.41
HW twice	-	20 +40	528	18.46	120.6	15.05	6812	58658	3.04
Unweeded check (Control)	-	-	391	16.05	99.6	13.42	4552	34647	2.39
LSD (P=0.05)			39.0	1.00	4.22	NS	399	6291	0.24

fb : followed by.

30 g/ha recorded the highest net returns (Rs. 58,407) and benefit : cost ratio (3.06) due to increased grain yield and lesser cost of herbicides. This was closely followed by HW twice at 20 and 40 DAT.

It may be concluded that the highest weed control efficiency, grain yield and benefit : cost ratio were recorded with sequential application of oxadiargyl 75 g/ha and bispyribac-sodium 30 g/ha, which were at par with HW twice at 20 and 40 DAT in transplanted rice.

REFERENCES

Chopra, N. K. and N. Chopra. 2003. Effect of doses and stages of application of pyrazosulfuron-ethyl on weeds in transplanted rice. *Ind. J. Weed Sci.* **35** : 27-29.

Jadhav, A. B., R. Gupta and P. Katiyar, 2008. Effect of weed control on weed growth and grain yield of transplanted rice (*Oryza sativa* L.). *Adv. Plant Sci.* **21** : 289-290.

Singh, V. P., S. P. Singh, N. Tripathi, M. K. Singh and A. Kumar. 2009. Bio-efficacy of penoxsulam on transplanted rice weeds. *Ind. J. Weed Sci.* **41** : 28-32.

Subramanyam, D., C. Raghava Reddy and D. S Reddy. 2007. Influence of puddling intensity and water management practices on weed dynamics and yield of transplanted rice (*Oryza sativa* L.). *Ind. J. Agron.* **52** : 225-230.

Yadav, D. B., A. Yadav and S. S. Punia, 2009. Evaluation of bispyribac-sodium for weed control in transplanted rice. *Ind. J. Weed Sci.* **41** : 23-27.