



## Short Note

# Effect of Weed Management on Growth, Yield Attributes and Yield of Aerobic Rice

K. Ramachandiran\* and R. Balasubramanian

Department of Agronomy, Agricultural College and Research Institute, Madurai

**Field experiment was conducted at Agricultural College and Research Institute, Madurai during *Rabi* 2010-2011 to study the effect weed management on growth and yield attributes and yield of aerobic rice. Growth parameters of rice such as plant height, LAI, number of tillers  $m^{-2}$ , SPAD value (Chlorophyll) of leaves and DMP of rice were enhanced by post-emergence mixture of fenoxaprop + ethoxysulfuron on 30 DAS ( $T_9$ ). This mixture of herbicides ( $T_9$ ) also increased the yield attributes such as number of panicles  $m^{-2}$ , number of filled grains panicle $^{-1}$  and test grain weight which in turn resulted in higher grain yield.**

**Key words:** Aerobic rice, growth, yield attributes, yield.

Aerobic rice is a new concept to decrease water requirements in rice production and is highly suitable for irrigated lowland rice with insufficient rainfall and favorable uplands with access to supplementary irrigation (Amudha *et al.*, 2009). The greatest weed pressure and crop weed competition occur in upland and aerobic rice and the least in transplanted irrigated and rainfed lowland rice. However, aerobic systems are subjected to much higher weed pressure than conventional puddled transplanting systems. Thus, weeds are the most severe constraints to aerobic rice production and timely weed management is crucial to increase the productivity of aerobic rice (Rao *et al.*, 2007).

## Materials and Methods

Field experiment was conducted at Agricultural College and Research Institute, Madurai during *Rabi* 2010-2011 on weed management in rice with twelve treatments in randomized block design (RBD) with three replications. The test variety tried was ADT 47. The weed management treatments imposed were Pre-emergence pyrazosulfuron alone ( $25 g ha^{-1}$ ) on 3 DAS ( $T_1$ ), Pre-emergence pretilachlor – S alone ( $750 ml ha^{-1}$ ) on 3 DAS ( $T_2$ ), Post-emergence cyhalofop butyl alone ( $90 ml ha^{-1}$ ) on 25 DAS ( $T_3$ ), Post-emergence fenoxaprop alone ( $60 ml ha^{-1}$ ) on 30 DAS ( $T_4$ ), Post-emergence mixture of cyhalofop butyl + (chlorimuron + metsulfuron) ( $90 ml + 20 g ha^{-1}$ ) on 30 DAS ( $T_5$ ), Post-emergence mixture of fenoxaprop + (chlorimuron + metsulfuron) ( $60 ml + 20 g ha^{-1}$ ) on 30 DAS ( $T_6$ ), Post-emergence azimsulfuron alone ( $35 g ha^{-1}$ ) on 20 DAS ( $T_7$ ), Post-emergence bispyribac sodium alone ( $25 ml ha^{-1}$ ) on 20 DAS ( $T_8$ ), Post-emergence mixture of fenoxaprop + ethoxysulfuron ( $60 ml + 15 g ha^{-1}$ ) on 30 DAS ( $T_9$ ), Sequence application of pre-

emergence oxyfluorfen and post-emergence 2, 4-D ( $300 ml + 500 g ha^{-1}$ ) on 30 DAS ( $T_{10}$ ), Two hand weedings at 15 and 35 DAS ( $T_{11}$ ) and Unweeded control ( $T_{12}$ ). The growth parameters, yield attributes and yield were recorded and statistically analysed.

## Results and Discussion

### Growth parameters

Effect of herbicidal weed management practices had a favorable effect on the growth attributes viz., plant height, LAI, chlorophyll content of leaves, tiller production and DMP of rice crop compared to farmers practice (Two hand weedings) and unweeded check (Table 1).

Post-emergence mixture of fenoxaprop + ethoxysulfuron on 30 DAS ( $T_9$ ) significantly increased plant height and leaf area index. It might be due to the effective weed control achieved by the mixture of herbicides at early stage of crop weed competition. This ultimately resulted in reduced nutrient removal by weeds which might have enhanced the nutrient uptake by rice thereby enhanced the growth of rice. Similar results with fenoxaprop-p-ethyl recording higher mean plant height was reported by Sreedevi *et al.* (2009). Increase in LAI might be due to the increase in the length and width of the leaves (Sharif Ahmed Dar *et al.*, 2000).

Higher number of tillers was produced along with greater SPAD value in post-emergence mixture of fenoxaprop + ethoxysulfuron on 30 DAS ( $T_9$ ). SPAD value reading is a measure of total chlorophyll content of leaves which indicates the greenness of leaves. It might be due to the higher level of nitrogen uptake resulting from higher weed control efficiency. The findings of Katiyar and Kolhe (2006) also confirmed that fenoxaprop + ethoxysulfuron @  $60 + 10 g a.i. / ha$  applied at 15 DAS achieved maximum

\*Corresponding author email: krchandiran@gmail.com

**Table 1. Effect of weed management on growth, yield attributes and yield of aerobic rice**

Treatment	*Total weed density (No. m <sup>-2</sup> )	*Total weed dry weight (kg ha <sup>-1</sup> )	Weed control efficiency (%)	Plant height (cm) at flowering	Leaf Area Index at flowering	SPAD Value at flowering	No. of tillers m <sup>-2</sup> at flowering	DMP (kg ha <sup>-1</sup> )	No. of panicles m <sup>-2</sup>	No. of filled grains panicle <sup>-1</sup>	Grain yield (kg ha <sup>-1</sup> )	Test grain weight (g)
T <sub>1</sub> - Pre-emergence pyrazosulfuron alone on 3 DAS	9.10 (82.35)	15.24 (232)	70.26	90	4.70	34.19	356	10791	303	102	14.18	3795
T <sub>2</sub> - Pre-emergence pretilachlor – S alone on 3 DAS	9.72 (94.00)	16.49 (271)	66.05	90	4.67	34.22	341	10187	301	101	14.16	3743
T <sub>3</sub> - Post-emergence cyhalofop butyl alone on 25 DAS	8.48 (71.44)	14.48 (209)	74.20	90	4.72	34.24	359	10817	312	103	14.18	3860
T <sub>4</sub> - Post-emergence fenoxaprop alone on 30 DAS	7.92 (62.36)	11.81 (139)	77.48	91	4.91	37.05	368	10900	317	103	14.19	4065
T <sub>5</sub> - Post-emergence mixture of cyhalofop butyl + (chlorimuron+ metsulfuron) on 30 DAS	7.67 (58.33)	11.06 (122)	78.93	91	5.02	37.18	397	11017	343	105	14.20	4118
T <sub>6</sub> - Post-emergence mixture of fenoxaprop + (chlorimuron + metsulfuron) on 30 DAS	4.30 (18.00)	7.30 (53)	93.50	95	5.12	37.20	468	12010	381	112	14.83	4345
T <sub>7</sub> - Post-emergence azimsulfuron alone on 20 DAS	6.28 (39.00)	9.80 (96)	85.92	101	5.93	40.10	490	13526	402	121	15.24	5153
T <sub>8</sub> - Post-emergence bispyribac sodium alone on 20 DAS	5.24 (27.00)	9.40 (88)	90.25	102	6.28	40.12	517	14994	432	135	15.43	5805
T <sub>9</sub> - Post-emergence mixture of fenoxaprop + ethoxysulfuron on 30 DAS	5.24 (27.00)	9.33 (87)	90.25	103	6.67	43.00	520	16084	439	138	16.67	6278
T <sub>10</sub> - Pre-emergence oxyfluorfen and post emergence 2, 4-D on 30 DAS	4.56 (20.34)	8.93 (79)	92.66	95	5.43	37.21	473	11092	372	110	14.20	4262
T <sub>11</sub> - Two hand weeding at 15 and 35 DAS	7.01 (48.66)	10.25 (105)	82.43	95	5.54	40.09	485	12338	386	114	14.25	4508
T <sub>12</sub> - Unweeded control	16.66 (276.91)	32.20 (1036)	-	69	3.67	30.48	194	7799	159	81	13.08	2105
SEd	0.12	0.20	-	3	0.19	1.32	15	452	13	4	0.51	172
CD=(0.05)	0.25	0.42	-	6	0.40	2.74	32	938	27	8	1.07	357

\*Data subjected to square root transformation; Values in parentheses are original

chlorophyll content, tiller number, grains per panicle and maximum seed yield.

Post-emergence mixture of fenoxaprop + ethoxysulfuron on 30 DAS (T<sub>9</sub>) recorded significantly taller plants with maximum LAI and more number of tillers, which ultimately resulted in the accumulation of greater DMP over all treatments including farmers practice. It might be due to the formation of efficient sink in rice in terms of unit dry matter production by higher N uptake resulting from higher WCE and lower dry matter of weeds. Effective weed control measures reduced the weed biomass which in turn might have reduced weed competition thereby resulting in the improvement of N uptake by crops. Similar results were also reported by Amarjit *et al.* (2006). In post-emergence mixture of fenoxaprop + ethoxysulfuron on 30 DAS (T<sub>9</sub>) DMP of rice produced at harvest stage was (8285 kg ha<sup>-1</sup>) higher compared to unweeded check (T<sub>12</sub>).

#### Yield attributes

Application of herbicides either as mixture or sequence had a favorable effect on the yield attributes (Table 1). Higher number of panicles m<sup>-2</sup>, filled grains panicle<sup>-1</sup> and 1000 grain weight were registered with post-emergence mixture of

fenoxaprop + ethoxysulfuron on 30 DAS (T<sub>9</sub>). This enhanced yield attributes recorded in this mixture of herbicides could be due to the result of lower weed density, dry weight and higher weed control efficiency and better growth rice. Similar result was stated by Saini and Angiras (2002). This was followed by post-emergence bispyribac sodium alone on 20 DAS (T<sub>8</sub>) and post-emergence azimsulfuron alone on 20 DAS (T<sub>7</sub>).

#### Yield

Grain yield was significantly improved by weed control treatments compared to unweeded control (Table 1). Among different treatments, post emergence mixture of fenoxaprop + ethoxysulfuron on 30 DAS (T<sub>9</sub>) recorded significantly higher grain yield of 6278 kg ha<sup>-1</sup>. Fenoxaprop at 0.06 kg ha<sup>-1</sup> mixed with ethoxysulfuron at 0.015 kg ha<sup>-1</sup> as post emergence showed the lowest weed dry matter, highest weed control efficiency and higher grain yield (Tiwari *et al.*, 2010). This treatment recorded 1770 kg ha<sup>-1</sup> more grain yield than hand weeding twice on 15 and 30 DAS (T<sub>11</sub>). This was followed by post-emergence bispyribac sodium alone on 20 DAS (T<sub>8</sub>), post-emergence azimsulfuron alone on 20 DAS (T<sub>7</sub>) and hand weeding twice (T<sub>11</sub>) which registered

grain yield of 5805, 5153 and 4508 kg ha<sup>-1</sup>, respectively. But, hand weeding twice (T<sub>11</sub>) was comparable with post-emergence mixture of fenoxaprop + (chlorimuron + metsulfuron) on 30 DAS (T<sub>6</sub>) and sequence application of pre-emergence oxyfluorfen and post-emergence 2, 4-D (T<sub>10</sub>). Similarly, the treatments T<sub>6</sub> and T<sub>10</sub> were comparable with T<sub>5</sub> and T<sub>4</sub>. In the same way T<sub>5</sub> was on par with T<sub>4</sub>, T<sub>3</sub> and T<sub>1</sub>. Unweeded control (T<sub>12</sub>) recorded very low grain yield of 2105 kg ha<sup>-1</sup> which was 4173 kg ha<sup>-2</sup> lesser than best treatment of post emergence mixture of fenoxaprop + ethoxysulfuron on 30 DAS (T<sub>9</sub>).

The study revealed that growth parameters of rice such as plant height, LAI, number of tillers m<sup>-2</sup>, SPAD value (Chlorophyll) of leaves and DMP of rice were enhanced by post-emergence mixture of fenoxaprop + ethoxysulfuron on 30 DAS (T<sub>9</sub>). This mixture of herbicides (T<sub>9</sub>) also improved the yield attributes such as number of panicles m<sup>-2</sup>, number of filled grains panicle<sup>-1</sup> and test grain weight which inturn resulted in higher grain yield.

#### References

- Amarjit, S.B., Mahinder Singh, Dileep Kachroo, Sharma, B.C. and Shivram, D.R. 2006. Efficacy of herbicides in transplanted, medium-duration rice under sub-tropical conditions of Jammu. *Indian. J. Agron.*, **51**: 128-130.
- Amudha, K., Thiyagarajan, K. and Sakthivel, N. 2009. Aerobic rice: A Review, *Agric. Rev.*, **30**: 145-149.
- Katiyar, P. and Kolhe, S.S. 2006. Weed control in drilled rice. Indira Gandhi +Agricultural University, Raipur. *J. Maharashtra Agric. Univ.*, **31**: 284-287.
- Rao, A.N., Johnson, D.E., Sivaprasad, B., Ladha, J.K. and Mortimer, A.M. 2007. Weed management in direct-seeded rice. *Adv. Agron.*, **93**: 153-257.
- Saini, J.P. and Angiras, N.N. 2002. Evaluation of Ethoxysulfuron on broad-leaved weeds and sedges in direct seeded puddled rice. *Indian J. Weed Sci.*, **34**: 36-38.
- Sharif Ahmed Dar, Amarjit, Bali, S. and Shah, M.H. 2000. Effect of different levels and time of nitrogen application on wet seeded rice in Kashmir valley. *Oryza*, **37**: 244-246.
- Sreedevi, B., Krishan Murthy, P. and Singh, S.P. 2009. Nitrogen uptake and energy consumption of weeds in wet seeded rice. In: National symposium on weed threat to environment, biodiversity and Agriculture productivity, TNAU, Coimbatore. P-49.
- Tiwari, R.B., Pandey, T.D. and Nandeha, K.L. 2010. Weed management studies in direct-seeded rice. In: Biennial conference of Indian society of weed science on Recent Advances in Weed Science Research-2010, February 25-26, Indira Gandhi Krishi Vishwa vidyalaya, Raipur.P-30.