

## Effect of weed management practices on growth and yield attributes of aerobic rice

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### ABSTRACT

A field experiment with 11 treatment combination was carried out during 2013 at the Agronomy Farm of Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, Puducherry to examine the effect of different weed management practice on growth and yield attributes of aerobic rice. Among the different weed management practices, the result indicates that weed free or pretilachlor plus @0.75 Kg ha<sup>-1</sup> or pendimethalin 1.00 Kg ha<sup>-1</sup> found to be best option for both growth and yield of rice. The study also advocated for chemical weed control under the labour scarcity situations. The combination of pre and post emergent herbicides application is recommended.

**Keywords :** Aerobic rice, growth and yield attributes, weed management

Rice, the most important staple food crop for more than half of the world's population is cultivated under various ecosystems, viz., transplanted, direct sown and rainfed or aerobic situations. Aerobic rice offers many advantages viz., saves labour, fast and easier, timely sowing, less drudgery, less water requirement, low production cost, offer higher yields, more profit besides less methane emissions and maintenance of soil structure. Despite, several advantages, the major production obstacle of weed infestation encountered in aerobic rice cultivation that compete with rice for all inputs. Weed infestation and competition are severe under aerobic rice as compared to puddled rice because of the simultaneous growth of both rice crop and weeds. Use of pre emergence herbicides has been found effective in early stage, but the second flush of weeds at 25 to 30 DAS becomes a major constraint and requires manual hoeing which increases the cost of production and at many circumstances the scarce in labour availability endangers the successful cultivation of aerobic rice. Hence, the present investigation was carried out to evaluate the pre and post emergence herbicide combinations for weed management in aerobic rice in Karaikal region.

The field experiment was carried out during *Kharif* 2013 at Agronomy Farm of Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal on a sandy loam soil with neutral pH (6.58). The fertility status of the soil was low in organic carbon content (0.34%) and available nitrogen (110.81 Kg ha<sup>-1</sup>), medium in available phosphorus and potassium (26.98

and 194.32 Kg ha<sup>-1</sup>, respectively). The experiment was laid out in completely randomized block design (CRBD), replicated thrice with eleven weed management practices viz., Pretilachlor plus (PE) 0.75 Kg ha<sup>-1</sup> fb. 2,4-D Na salt (PoE) 0.8 Kg ha<sup>-1</sup> at 25 DAS (T<sub>1</sub>), Pretilachlor plus (PE) 0.75 Kg ha<sup>-1</sup> fb. Penoxsulam (PoE) 25 g ha<sup>-1</sup> at 20 DAS (T<sub>2</sub>), Pretilachlor plus (PE) 0.75 Kg ha<sup>-1</sup> fb. Bispyribac sodium (PoE) 35 g ha<sup>-1</sup> at 20 DAS (T<sub>3</sub>), Pretilachlor plus (PE) 0.75 Kg ha<sup>-1</sup> fb. Penoxsulam + Cyhalofop-butyl, [ready mix of Topshot 60 OD] (PoE) 135 g ha<sup>-1</sup> at 20 DAS (T<sub>4</sub>), Pendimethalin (PE) 1.00 Kg ha<sup>-1</sup> fb. 2, 4-D Na salt (PoE) 0.80 Kg ha<sup>-1</sup> at 25 DAS (T<sub>5</sub>), Pendimethalin (PE) 1.00 Kg ha<sup>-1</sup> fb. Penoxsulam (PoE) 25 g ha<sup>-1</sup> at 20 DAS (T<sub>6</sub>), Pendimethalin (PE) 1.00 Kg ha<sup>-1</sup> fb. Bispyribac sodium (PoE) 35 g ha<sup>-1</sup> at 20 DAS (T<sub>7</sub>), Pendimethalin (PE) 1.00 Kg ha<sup>-1</sup> fb. Penoxsulam + Cyhalofop-butyl [ready mix of Topshot 60 OD] (PoE) 135 g ha<sup>-1</sup> at 20 DAS (T<sub>8</sub>), hand hoeing twice at 20 and 40 DAS (T<sub>9</sub>), Weed free (T<sub>10</sub>), Unweeded Check (T<sub>11</sub>). All the herbicides were applied in saturated soil moisture as per protocol of application time (3 DAS for PE herbicides). The short duration rice cultivar PMK (R) 4 [Anna 4] was sown on 14<sup>th</sup> June 2014 at spacing of 20 x 10 cm and applied with 175 : 50 : 50 N, P, K Kg ha<sup>-1</sup> as well as 25 Kg ZnSO<sub>4</sub> ha<sup>-1</sup>. Data on crop toxicity rating and weed control rating were recorded at 10 days after herbicide application (DAHA) and 15 DAHA, respectively. The growth attributes viz., leaf area index (LAI), plant height, number of tillers (No. m<sup>-2</sup>), were recorded at 20, 40, 70 DAS and at harvest and yield attributes viz., number of panicles (No. m<sup>-2</sup>), 1000 grain weight, panicle weight, number of spikelets per panicle, fertility percentage were recorded at harvest.

Short Communication

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**Table 1: Influence of different weed management practices on crop toxicity rating (CTR) and weed control rating (WCR) of pre and post emergence herbicides in aerobic rice during Kharif, 2013.**

Treatments	Pre emergence herbicide			Post emergence herbicide		
	Crop toxicity rating (10 DAHA)	Weed control rating (15 DAHA)	Crop toxicity rating (20 DAHA)	Crop toxicity rating (10 DAHA)	Weed control rating (20 DAHA)	Weed control rating (20 DAHA)
T <sub>1</sub> :Pretlathlor + fb. 2, 4-D Na salt	1	7	1	1	4	4
T <sub>2</sub> :Pretlathlor + fb. Penoxsulam	1	8	1	1	8	8
T <sub>3</sub> :Pretlathlor + fb. Bispyribac sodium	1	8	1	1	9	9
T <sub>4</sub> :Pretlathlor + fb. Penoxsulam + Cyhalofop-butyl	1	7	1	1	6	6
T <sub>5</sub> :Pendimethalin fb. 2, 4-D Na salt	1	8	1	1	5	5
T <sub>6</sub> :Pendimethalin fb. Penoxsulam	1	9	1	1	7	7
T <sub>7</sub> :Pendimethalin fb. Bispyribac sodium	1	9	1	1	9	9
T <sub>8</sub> :Pendimethalin fb. Penoxsulam + Cyhalofop-butyl	1	8	1	1	6	6

Note : Crop toxicity rating (Scale 1-10)Scale 1 : No toxicity to cropScale 10 : Complete kill of riceWeed control rating (Scale 1-10)Scale 1 : No control of weedsScale 10:Complete control of weedsThe CTR was given in comparison with unsprayed plots i.e., 9, 10 and 11.The WCR was given in comparison with weedy check (T<sub>10</sub>).

**Table 2: Influence of different weed management practices on growth and yield attributes in aerobic rice during Kharif, 2013.**

Treatments	Plant height (cm)	LAI	Tillers (No. m <sup>-2</sup> )	No. of panicles (m <sup>-2</sup> )	Panicle length (cm)	Panicle weight (g)	No. of spikelets panicle <sup>-1</sup>	Fertility %	Test weight (g)
T <sub>1</sub> :Pretlathlor + fb. 2, 4-D Na salt	90.48	4.50	120	111	20.57	1.05	89	69.87	23.26
T <sub>2</sub> :Pretlathlor + fb. Penoxsulam	104.71	5.87	193	184	24.20	1.84	127	79.30	24.81
T <sub>3</sub> :Pretlathlor + fb. Bispyribac sodium	110.15	6.48	203	195	25.26	2.01	134	81.89	25.51
T <sub>4</sub> :Pretlathlor + fb. Penoxsulam + Cyhalofop-butyl	94.41	4.91	160	150	22.38	1.55	104	72.27	23.83
T <sub>5</sub> :Pendimethalin fb. 2, 4-D Na salt	91.41	4.79	126	117	21.97	1.23	92	70.43	23.58
T <sub>6</sub> :Pendimethalin fb. Penoxsulam	103.48	5.59	190	181	23.66	1.80	125	77.23	24.60
T <sub>7</sub> :Pendimethalin fb. Bispyribac sodium	107.92	6.23	200	192	24.77	1.93	131	80.27	25.24
T <sub>8</sub> :Pendimethalin fb. Penoxsulam + Cyhalofop-butyl	97.40	5.06	161	152	22.95	1.57	109	73.87	24.15
T <sub>9</sub> :Hand hoeing twice (20 and 40 DAS)	102.03	5.42	188	178	23.25	1.78	124	76.23	24.47
T <sub>10</sub> Weed free	115.33	6.85	210	201	26.76	2.15	136	84.33	25.98
T <sub>11</sub> :Unweeded Check (Control)	86.73	3.74	115	106	18.75	1.02	81	68.83	22.75
<b>SEM(±)</b>	<b>0.53</b>	<b>0.07</b>	<b>0.14</b>	<b>3.61</b>	<b>0.51</b>	<b>0.14</b>	<b>0.75</b>	<b>0.25</b>	<b>0.54</b>
<b>LSD (0.05)</b>	<b>1.09</b>	<b>0.15</b>	<b>0.29</b>	<b>7.49</b>	<b>1.05</b>	<b>0.29</b>	<b>1.55</b>	<b>0.52</b>	<b>1.12</b>

Note: PE Herbicides : Pretlathlor plus [Herbicide with safener, Fenclorim] (0.75 kg ha<sup>-1</sup>) and Pendimethalin (1.00 kg ha<sup>-1</sup>) at 3 DAS; PoE Herbicides : 2, 4-D Na salt (0.80 kg ha<sup>-1</sup>) at 25 DAS and Penoxsulam (25 g ha<sup>-1</sup>), Bispyribac sodium (35 g ha<sup>-1</sup>), Penoxsulam + Cyhalofop-butyl (135 g ha<sup>-1</sup>) at 20 DAS

The predominant weed flora of the experimental site included grasses (89.96% and 98.32% at 30 and 70 DAS, respectively) with a lesser weed emergence of broad leaved weeds (8.75% and 1.26% at 30 and 70 DAS, respectively) and sedges (1.29% and 0.42% at 30 and 70 DAS, respectively). *Echinochloa colona* and *E. crusgalli* were the dominant weed species followed by *Leptochloa chinensis*, *Digitaria sanguinalis*, *Brachiaria deflexa*, *Chloris barbata*, *Dactyloctenium aegyptium*, *Cyperus rotundus*, *Cyperus iria*, *Cleome viscosa*, *Aeschynomene indicia* and *Eclipta alba*. The occurrence of these weed species in aerobic rice fields have been earlier reported by Musthafa and Potty (2001), Moorthy and Sanjoy Saha (2002), Mandhata Singh and Singh (2010). Weed management treatments brought about significant variation in the Crop Toxicity Rating and Weed Control Rating (Table 1). There were no symptoms of phytotoxicity with application of PE and PoE herbicides on rice. The herbicides, pretilachlor plus (PE) 0.75 Kg ha<sup>-1</sup> and bispyribac sodium (PoE) 35 g ha<sup>-1</sup> registered the higher scale of weed control rating. The CTR and WCR were given based on visual observations and the scale of 1 to 10.

The growth and yield attributes of rice were significantly influenced by different weed management practices (Table 2) and the higher values of plant height (115.33 cm), LAI (6.85), number of tillers (210 m<sup>-2</sup>), number of panicles (201 m<sup>-2</sup>), panicle length (26.76 cm), panicle weight (2.15 g), number of spikelets panicle<sup>-1</sup> (136), fertility percentage (84.33), test weight (25.98 g) were registered in rice under weed free conditions followed by the herbicide combinations, Pretilachlor plus (PE) 0.75 Kg ha<sup>-1</sup> and Pendimethalin (PE) 1.00 Kg ha<sup>-1</sup> fb. Bispyribac sodium (PoE) 35 g ha<sup>-1</sup> at 20 DAS.

$$LAI = \frac{\text{Leaf area hill}^{-1} (\text{cm}^2)}{\text{Spacing} (\text{cm}^2)}$$

The aerobic rice crop under weed free conditions and the above said herbicide combinations attained lush growth due to elimination of weeds from inter and intra row spaces besides better aeration due to manipulation of surface soil and thus, more space, water, light and nutrients were made available for the better growth and development which resulted in superior growth and yield attributes. The weed growth throughout the crop season adversely affected the crop growth and resulted poor crop attributes of rice (Mercado and Talatala, 1997,

Singh *et al.*, 2005, Sharma *et al.*, 2007, Ravisankar *et al.*, 2008).

From the experimental study it was concluded that the inclusion of effective weed management practices *viz.*, weed free or herbicide combinations of Pretilachlor plus 0.75 Kg ha<sup>-1</sup> / Pendimethalin 1.00 Kg ha<sup>-1</sup> fb. Bispyribac sodium (PoE) 35 g ha<sup>-1</sup> at 20 DAS in aerobic rice enhances the crop growth and yield attributes when compared to weedy check. In current situation of labour scarcity that evidenced at many rice growing areas, where use of herbicides is warranted shall shift for the adoption of herbicide combinations of both pre and post emergence herbicides for weed management in aerobic rice is found best suitable in aerobic rice cultivation in Karaikal region.

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