

## STUDY ON BIO-EFFICACY OF NEW POST EMERGENCE HERBICIDES FOR ENERGETICS AND GRAIN YIELD IN TRANSPLANTED RICE (*ORYZA SATIVA* L.)

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**Abstract :** The present investigation was carried out during *kharif*, of 2011 at the research-cum-instructional farm, indira gandhi krishi vishwavidyalaya, raipur (c.g.). Results revealed that higher plant height, total tillers, dry matter accumulation, yield attributes, grain yield and straw yield, crop growth rate, leaf area index were obtained under two hand weedings (20 and 40 dat) ( $t_{11}$ ), followed by ae 1887196+aeF 095404 @ 45 + 22.5 g ha<sup>-1</sup> ( $t_3$ ) and minimum was obtained under unweeded check ( $t_{12}$ ). The maximum energy input and output were obtained under two hand weedings (20 and 40 dat) whereas energy use efficiency and energy output-input ratio were noted under ae 1887196+aeF 095404 @ 45 + 22.5 g ha<sup>-1</sup> ( $t_3$ ) followed by bispyribac sodium @ 20 g ha<sup>-1</sup> ( $t_{10}$ ). The lowest energy parameters were obtained with unweeded check ( $t_{12}$ ).

**Keywords:** Bio-efficacy, post emergence herbicides, energetics

### INTRODUCTION

Chhattisgarh state is popularly known as “Rice bowl” because of maximum area covered during *kharif* under rice contributing major share in national rice production. However, the production and productivity of rice per unit area is very low due to limited irrigation, lack of improved varieties suitable to different ecosystems, low and imbalance use of fertilizer and improper weed management. The area, production and productivity of rice in Chhattisgarh is 3.57 million ha, 5.85 million tonne and 1.52 t ha<sup>-1</sup>, respectively (Anonymous 2010).

Rice growing ecologies are divided into rainfed uplands, rainfed low land and irrigated land. The various crop stand establishment methods followed for rice include; direct-seeded-dry, direct-seeded-wet and transplanting. These stand establishment practices and ecologies influence the intensity and nature of weed problem.

### MATERIAL AND METHOD

#### Grain yield (t ha<sup>-1</sup>)

The crop from each net plot was harvested separately. The grains were separated from straw by threshing. After threshing winnowing was done. The weight of grains was recorded and expressed in t ha<sup>-1</sup> by multiplying the factor (0.595). The no. of hills uprooted for dry matter accumulation were also included in the calculation of yield.

#### Straw yield (t ha<sup>-1</sup>)

The straw yield was worked out by subtracting the weight of grains from the bundle weight of the produce it was expressed in t ha<sup>-1</sup> by multiplying the factor (0.595).

#### Harvest Index (HI)

Harvest index was computed as the ratio of economic yield *i.e.* grain yield to the total biomass *i.e.*

biological yield (grain and straw) from same area and expressed in percent. (Donald, 1962)

$$\text{Harvest Index} = \frac{\text{Economic yield}}{\text{Biological yield}} \times 100$$

Where, Economical yield = Grain yield and  
Biological yield = Grain yield + Straw yield

#### Weed Index (WI)

Weed index was calculated by the formula mentioned under; it is expressed in per cent.

WI =

$$\frac{\text{Maximum grain yield in treated plot} - \text{Grain yield in other treatments}}{\text{Maximum grain yield in treated plot}} \times 100$$

#### Energetics

Energy input and output was calculated from sowing to harvest of all the treatments. it was estimated in Mega Joules (MJ) ha<sup>-1</sup> with reference to the standard values. Energy use efficiency and output/ input ratio were calculated by using the following formulae: (Mittal *et al.*, 1985).

Energy use efficiency (kg MJx10<sup>3</sup> ha<sup>-1</sup>)

$$= \frac{\text{Total produce (q)}}{\text{Energy input (MJx10}^{-3}\text{)}}$$

Energy output-input ratio =  $\frac{\text{Energy output}}{\text{Energy input}}$

### RESULT AND DISCUSSION

#### Grain yield (t ha<sup>-1</sup>)

Data related to grain yield (Table 4.5) revealed that two hand weedings (20 and 40 DAT) ( $T_{11}$ ) registered significantly highest grain yield (4.63 t ha<sup>-1</sup>) over rest of the treatments except, treatments AE 1887196 + AEF 095404 @ 35+17.5 g ha<sup>-1</sup> ( $T_1$ ), AE 1887196 + AEF 095404 @ 40 +20 g ha<sup>-1</sup> ( $T_2$ ), AE 1887196+AE F 095404 @ 45 + 22.5 g ha<sup>-1</sup> ( $T_3$ ), fenoxaprop p-ethyl + (chlorimuron-ethyl+)

metsulfuron-methyl) @ 60+4 g ha<sup>-1</sup> (T<sub>9</sub>) and bispyribac sodium @ 20 g ha<sup>-1</sup> (T<sub>10</sub>) which were at par with two hand weeding (20 and 40 DAT) (T<sub>11</sub>). The lowest grain yield was recorded under unweeded check (T<sub>12</sub>). Similar results were also reported by Ghosh and Mitra (1992), Nandlal *et al.* (1994), Bhattacharya *et al.* (2001), Choubey *et al.* (1998), Tiwari (2002), Halder and Patra (2007) and Yadav *et al.* (2009).

Grain production, which is the final product of growth and development, is controlled by growth and yield attributing characters such as effective tillers, dry matter accumulation and test weight etc. Growth and all yield attributing characters are more in two hand weeding (20 and 40 DAT) (T<sub>11</sub>) because of less crop-weed competition, Similarly environmental conditions were favorable for better crop growth resulted in higher photosynthesis and ultimately higher grain yield in this treatment. The lower grain yield under unweeded check (T<sub>12</sub>) may be due to the high weed interference and less yield attributing characters (Behera and Jha, 1992).

#### Straw yield (t ha<sup>-1</sup>)

The straw yield was significantly influenced by different treatments (Table 4.5). The highest straw yield was produced under two hand weeding (20 and 40 DAT) (T<sub>11</sub>), it was at par with all the treatments except butachlor @ 1250 g ha<sup>-1</sup> (T<sub>6</sub>) and pretilachlor @ 625 g ha<sup>-1</sup> (T<sub>8</sub>). Higher straw yield in these treatments is because of higher plant height, dry matter accumulation. The lowest straw yield was noted under unweeded check (T<sub>12</sub>). Similar results

have been also reported by Choubey *et al.* (1998), Tiwari (2002), Kathirvelan and Vijayapuri (2003), Sori (2008) and Devi (2011).

#### Harvest index (%)

The data on harvest index for different treatments failed to show their significant impact (Table 4.5)

#### Weed index (%)

Data on weed index are presented in table 4.5. It was remarkably influenced by post emergence application of herbicides. The lowest WI was obtained with AE 1887196+AEF 095404 @ 45 +22.5 g ha<sup>-1</sup> (T<sub>3</sub>) followed by bispyribac sodium @ 20 g ha<sup>-1</sup> (T<sub>10</sub>). It might be due to less density and dry matter production of weeds, the yield reduction was minimum in these treatments. Whereas, maximum was found in unweeded check (T<sub>12</sub>).

#### Energetic

The data pertaining to energetic of rice are presented in Table 4.11. Maximum energy input and output was noted under two hand weeding (20 and 40 DAT), though the highest energy output-input ratio and energy use efficiency was observed under AE 1887196+AEF 095404 @ 45 +22.5 g ha<sup>-1</sup> (T<sub>3</sub>) followed by bispyribac sodium @ 20 g ha<sup>-1</sup> (T<sub>10</sub>). The above energy parameters were found lowest in unweeded check (T<sub>12</sub>). This was due to higher biological yield coupled with low energy input. Similar results were also reported by Jain *et al.* (1998) and Billore *et al.* (1999).

**Table 1.** Grain yield, straw yield, harvest and weed index of transplanted rice as affected by weed management practices

	Weed management Practices	Dose (g ha <sup>-1</sup> )	Grain yield (t ha <sup>-1</sup> )	Straw yield (t ha <sup>-1</sup> )	HI (%)	WI (%)
T <sub>1</sub>	AE 1887196-20% +AE F 095404-10%-30% WG	35+17.5	3.90	5.08	43.17	15.77
T <sub>2</sub>	AE 1887196-20% +AE F 095404-10%-30% WG	40+20	4.13	5.16	44.38	10.80
T <sub>3</sub>	AE 1887196-20% +AE F 095404-10%-30% WG	45+22.5	4.59	5.74	44.67	0.86
T <sub>4</sub>	AE 1887196-20% SC	45	3.76	4.95	43.13	18.79
T <sub>5</sub>	AE F 095404-15% WG	22.5	3.70	4.88	43.07	20.09
T <sub>6</sub>	Butachlor 50% EC	1250	3.61	4.50	42.02	22.03
T <sub>7</sub>	Pyrazosulfuran ethyl 10 % WP	15	3.70	4.87	43.07	20.09
T <sub>8</sub>	Pretilachlor 50 % EC	625	3.65	4.82	42.87	21.17
T <sub>9</sub>	Fenoxaprop p-ethyl 9.3% EC + (chlorimuron-ethyl + metsulfuron-methyl 20% WP	60+4	4.06	5.15	44.38	12.31
T <sub>10</sub>	Bispyribac sodium 10 % SL	20	4.46	5.58	44.39	3.67

T <sub>11</sub>	Two hand weeding	-	4.63	5.74	44.90	0
T <sub>12</sub>	Unweeded check	-	2.86	3.76	41.71	38.23
<b>SEm±</b>					<b>0.27</b>	<b>0.31</b>
<b>CD (P=0.05)</b>					<b>0.78</b>	<b>0.91</b>
<b>NS</b>						

**Table 2.** Energetic of transplanted rice as affected by weed management practices

Weed management Practices		Dose (g ha <sup>-1</sup> )	Time of application (DAT)	Energy input (MJ × 10 ha <sup>-3</sup> )	Energy output (MJ × 10 ha <sup>-3</sup> )	Energy output-Input ratio	Energy use efficiency (kg × 10 <sup>-3</sup> ha <sup>-1</sup> )
T <sub>1</sub>	AE 1887196-20% +AE F 095404-10%-30% WG	35+17.5	10	9.61	111.12	11.57	9.34
T <sub>2</sub>	AE 1887196-20% +AE F 095404-10%-30% WG	40+20	10	9.62	115.59	12.02	9.66
T <sub>3</sub>	AE 1887196-20% +AE F 095404-10%-30% WG	45+22.5	10	9.62	129.60	13.47	10.74
T <sub>4</sub>	AE 1887196-20% SC	45	10	9.62	107.53	11.18	9.05
T <sub>5</sub>	AE F 095404-15% WG	22.5	10	9.61	105.78	11.01	8.93
T <sub>6</sub>	Butachlor 50% EC	1250	3	9.89	99.43	10.5	8.20
T <sub>7</sub>	Pyrazosulfuran ethyl 10 %WP	15	15	9.61	105.53	10.98	8.91
T <sub>8</sub>	Pretilachlor 50 % EC	625	3	9.74	104.17	10.69	8.70
T <sub>9</sub>	Fenoxaprop p-ethyl 9.3% EC + (chlorimuron-ethyl + metsulfuron-methyl 20% WP	60+4	20	9.67	114.39	11.83	9.52
T <sub>10</sub>	Bispyribac sodium 10 % SL	20	20	9.62	125.69	13.07	10.44
T <sub>11</sub>	Two hand weeding	-	20 ,40	9.99	129.82	13.00	10.38
T <sub>12</sub>	Unweeded check	-	-	9.58	79.46	8.29	6.91

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