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ORIGINAL ARTICLE

# Effect of different Herbicide and their Combination on weed Dynamics in Transplanted rice

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**ABSTRACT**
*A field experiment was conducted during Kharif, 2014 and 2015 at the Crop Research Centre, Chirodi, S.V.P.U.A.&T. Meerut, to evolve weed management practice in rice . There were Echinochloa colonum (L.), Echinochloa crusgalli (L.), Dactyloctenium aegyptium (L.), Eleusine indica (L.), Cyondon dactylon (L.), Ischaemum rugosum, Eclipta alba (L.), Caesulia axillaris, Commelina benghalensis (L.), Phyllanthus niruri (L.), Cyperus rotundus (L.), Cyperus iria were the dominant weeds. Among the herbicide application of pretilachlor fb almix ($T_6$)30 DAT found to have significantly lower total weed dry weight (2.35 and 2.27 g $m^{-2}$) except a par with Pretilachlor fb ethoxysulfuron ($T_5$) Pendimethalin fb bispyribac ($T_{10}$),significantly lower total weed density (5.14 and 4.93) except at par with Pretilachlor fb ethoxysulfuron ($T_5$) and significantly lower weed control efficiency(86.07 and 86.15) whereas application of bispyribac+almix ($T_4$) 60 DAT found to have significantly lower total weed dry weight (4.19 and 3.61), total weed density (5.38 and 4.84) and significantly higher weed control efficiency (84.83 and 87.08 %). The significantly higher dry matter accumulation at harvest (1333.90 and 1351.53 g $m^{-2}$) also achieved with application of bispyribac + almix ($T_4$) except at par with pretilachlor fb almix ($T_6$), Bispyribac + ethoxysulfuron ($T_3$), Pretilachlor fb ethoxysulfuron ($T_5$). The grain yield (40.30 and 42.37 q $ha^{-1}$) was significantly higher with the application of Bispyribac + Almix ($T_4$) during both the year.*
***Key words*** *: Rice , Herbicide combination, weed control efficiency, grain yield*

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## INTRODUCTION

Weeds are ubiquitous and insidious tyrant on earth and recognized as major biological constraints that hinder the attainment of optimal rice productivity [1] and quality. The negative values of weeds are depicted during harvesting, marketing storage and dockage of weedy crop. Uncontrolled weeds compete with rice and causes yield losses to the tune of 50-65% under wet seeded rice [2] and up to 76% in transplanted rice [3].

Agriculture is labour intensive activity .At the time of the peak period of the labor crisis and unfavorable weather condition, weeding some time become late. But delay in weeding beyond 15-25 days sharply reduces the yield to the tune of 43 kg/ha/day between 25 to 45 days [4].

The weed flora under transplanted condition is very much diverse and consists of grasses, sedges and broad-leaved weeds. The effective control of weeds at initial stages (0-40 DAT) can help in improving productivity of this crop. Use of pre emergence herbicides such as butachlor, pretilachlor, pendimethalin has been found effective in early stages but the second flush of weeds at later stages has become problematic. In such situations, sequential or mixture application of herbicide is the only alternative, in order to achieve broad spectrum and season long control during the critical period of crop [5].

The recent trend of herbicide use is to find out an effective weed control measure by using low dose with high efficiency herbicides which will not only reduce the total volume of herbicide use but also the application become easier and economical [6].

To repress mixed population of weeds as also to avoid herbicides resistance by continuous use of single herbicide, compatible mixtures or sequential application of herbicides can be employed to widen the spectrum of weed control.

Herbicides with differential selectivity can be applied sequentially, but it results in enhancing the cost. Therefore, mixing two different herbicides and applying them simultaneously widens the spectrum of

weed-control, saves time and application cost. Hence evolving a proper management was felt to reduce such yield loss due to weeds in rice.

## MATERIALS AND METHODS

A field experiment was conducted during two consecutive kharif seasons of 2014 and 2015 at the Crop Research Centre, Chirodi, Meerut, located at latitude of $29^0$ 13' 96'' North and longitude of $77^0$ 68' 43'' East and at an altitude of 237meter above mean sea level. Meerut lies in the heart of Western Uttar Pradesh and has sub-tropical climate. The soil of experimental site was sandy loam in texture and slightly alkaline in reaction. The soil was low in organic carbon, low in available nitrogen and medium in available phosphorus and available potassium.There are overall 12 treatments viz. Bispyribac – sodium (25 g $ha^{-1}$) 25 DAT ($T_1$), Penoxsulam 24% SC (22.5 g $ha^{-1}$) 15 DAT ($T_2$), Bispyribac + ethoxysulfuron (25 + 18.75 g $ha^{-1}$) 25 DAT ($T_3$), Bispyribac + almix (20 + 4 g $ha^{-1}$) 25 DAT ($T_4$), Pretilachlor fb ethoxysulfuron (750/18.75 g $ha^{-1}$) 0-3/&25 DAT ($T_5$), Pretilachlor fb almix 750/4 g $ha^{-1}$ 0-3/&25 DAT ($T_6$), Pyrazosulfuron fb almix 20/4 g $ha^{-1}$ 0-3/&25 DAT ($T_7$), Penoxsulam + cyhalofop 6% (RM) 135 g $ha^{-1}$ 15-20 DAT ($T_8$), Anilofos + 2,4D (RM) 850 g $ha^{-1}$ 5-7 DAT ($T_9$), Pendimethalin fb bispyribac 750/25 g $ha^{-1}$ 0-3/25 DAT ($T_{10}$), Hand weeding 25, 45 DAT ($T_{11}$), Weedy check ($T_{12}$).The treatnents were replicated thrice in randomized complete block design keeping individual net plot size of 4×2.6 m Rice variety Vallabh Basmati-21 was sown on 22-06-2014 and 17-06-2015 in rows 20 cm apart and harvested on 12 November .and 08 November in 2014 and 2015, respectively. A uniform basal dose of 60 kg N , 60 Kg $P_2O_5$, 40 kg $K_2O$ and 25 kg Zn/ha were applied in all plots. Weed data were recoreded at 30 and 60 DAT.

## RESULT AND DISCUSSION

### Weed flora

The experimental field was mainly infested by *Echinochloa colonum* (L.), *Echinochloa crusgalli* (L.), *Dactyloctenium aegyptium* (L.), *Eleusine indica* (L.), *Cyondon dactylon* (L.), *Ischaemum rugosum, Eclipta alba* (L.), *Caesulia axillaris, Commelina benghalensis* (L.), *Phyllanthus niruri* (L.), *Cyperus rotundus* (L.), *Cyperus iria (*L.) (Table 1) Somewhat similar weed flora of rice crop have also been recorded by Sangeeta *et al.* [7].

**Table 1. Weed flora prevalent in experimental field of rice**

| S. No | Scientific name | Common name | Family |
|---|---|---|---|
| **Grassy weeds** | | | |
| 1. | *Echinochloa colonum* (L.) | Swank, jungle rice | Poaceae |
| 2. | *Echinochloa crusgalli* (L.) | Barnyard grass | Poaceae |
| 3. | *Dactyloctenium aegyptium* (L.) | Crowfoot grass | Poaceae |
| 4. | *Eleusine indica* (L.) | Goos grass | Poaceae |
| 5. | *Cyondon dactylon* (L.) | Bermuda grass | Poaceae |
| 6. | *Ischaemum rugosum* | Wrinkle grass | Poaceae |
| **Broad leave weed** | | | |
| 1. | *Eclipta alba* (L.) | False daisy | Asteraceae |
| 2. | *Caesulia axillaris* | Pink node flower | Asteraceae |
| 3. | *Commelina benghalensis* (L.) | Day flower | Commelinaceae |
| 4. | *Phyllanthus niruri* (L.) | Hajardana | Phyllanthaceae |
| **Sedges** | | | |
| 1. | *Cyperus rotundus* (L.) | Purple nut sedges | Cyperaceae |
| 2. | *Cyperus iria (*L.) | Yellow nut sedges | Cyperaceae |

### Effect on weed

The data regarding effect of weed management practices on total weed dry weight (g $m^{-2}$), total weed density (no. $m^{-2}$) in transplanted rice shown in Table 2. The effect of weed management practices on total weed dry weight recorded at 30 and 60 DAT was significant. At 30 DAT, the significantly minimum total weeds dry weight was found under Pretilachlor fb. Almix ($T_6$) over rest of the treatments which was at par with Pretilachlor fb. Ethoxysulfuron ($T_5$) and Pendimethalin fb. Bispyribac ($T_{10}$) during 2014 and 2015. . The mean reduction in total weeds dry weight was recorded 86.10 percent with Pretilachlor fb. Almix ($T_6$) and 72.05 percent with two hand weeding ($T_{11}$) over weedy check. This might be due to that pre-emergence herbicide application of Pretilachlor, Pendimethalin suppress the early emerged weed and two hand weeding done at 25 DAT also reduced the population and dry weight.

At 60 DAT total weeds dry weight was found significantly minimum under two hand weeding ($T_{11}$) over rest of the treatments and at par with Bispyribac + Almix ($T_4$) during 2014 and 2015. The maximum total weed density was recorded with weedy check during both the years. Among the herbicide total weed

 

density was found significantly lower with Bispyribac + Almix ($T_4$) over rest treatment and at par with Pretilachlor fb. Almix ($T_6$) during 2014 and 2015. The mean reduction in total weed dry weight was recorded 85.86 percent with Bispyribac + Almix ($T_4$) and 88.28 percent with two hand weeding ($T_{11}$) over weedy check.

**Table-2 Effect of weed management practices on total weed dry weight (g $m^{-2}$), total weed density (no. $m^{-2}$) in transplanted rice**

| Treatment | Total weed dry weight (g. $m^{-2}$) | | | | Total weed density (no./$m^2$) | | | |
|---|---|---|---|---|---|---|---|---|
| | 30 DAT | | 60 DAT | | 30 DAT | | 60 DAT | |
| | 2014 | 2015 | 2014 | 2015 | 2014 | 2015 | 2014 | 2015 |
| Bispyribac-sodium ($T_1$) | 3.93 (14.50) | 3.78 (13.34) | 5.46 (28.89) | 4.93 (23.40) | 8.36 (69.00) | 8.03 (63.50) | 6.52 (41.63) | 6.04 (35.50) |
| Penoxsulam 24% SC ($T_2$) | 3.48 (11.14) | 3.35 (10.24) | 7.35 (53.08) | 6.96 (47.54) | 7.53 (55.74) | 7.22 (51.22) | 8.91 (78.44) | 8.27 (67.50) |
| Bispyribac+Ethoxysulfuron ($T_3$) | 4.00 (15.07) | 3.85 (13.90) | 4.69 (21.09) | 4.16 (16.38) | 8.33 (68.50) | 8.01 (63.19) | 5.56 (29.99) | 5.23 (26.38) |
| Bispyribac+Almix ($T_4$) | 4.09 (15.73) | 3.90 (14.28) | 4.19 (16.61) | 3.61 (12.07) | 5.51 (71.53) | 8.12 (64.93) | 4.97 (23.78) | 4.46 (18.94) |
| Pretilachlor fb Ethoxysulfuron ($T_5$) | 2.56 (5.56) | 2.46 (5.05) | 4.99 (23.97) | 4.49 (19.23) | 5.41 (28.37) | 5.14 (25.50) | 6.03 (35.41) | 5.56 (30.02) |
| Pretilachlor fb Almix ($T_6$) | 2.35 (4.55) | 2.27 (4.17) | 4.52 (19.48) | 3.93 (14.60) | 5.14 (25.50) | 4.93 (23.37) | 5.38 (27.97) | 4.84 (22.51) |
| Pyrazosulfuron fb Almix ($T_7$) | 3.05 (8.32) | 2.93 (7.64) | 6.28 (38.48) | 5.76 (32.28) | 6.37 (39.60) | 6.11 (36.37) | 7.31 (52.50) | 6.96 (47.63) |
| Penoxsulam+Cyhalfop (RM) ($T_8$) | 3.20 (9.29) | 3.08 (8.50) | 5.85 (33.27) | 5.37 (27.86) | 7.06 (48.86) | 6.76 (44.81) | 7.07 (49.06) | 6.48 (41.07) |
| Anilofos +2,4D (RM) ($T_9$) | 3.52 (11.41) | 3.38 (10.48) | 6.60 (42.61) | 6.04 (35.55) | 7.10 (49.55) | 6.82 (45.58) | 7.85 (60.68) | 7.28 (52.06) |
| Pendimethalin fb Bispyribac ($T_{10}$) | 2.65 (6.04) | 2.56 (5.58) | 5.25 (26.63) | 4.74 (21.56) | 5.67 (31.28) | 5.44 (28.70) | 6.24 (38.06) | 5.79 (32.63) |
| Hand weeding at 25, 45 DAT ($T_{11}$) | 3.16 (9.04) | 3.08 (8.51) | 3.86 (13.99) | 3.28 (9.78) | 6.03 (35.36) | 5.82 (32.88) | 4.66 (20.76) | 4.00 (15.00) |
| Weedy check ($T_{12}$) | 5.80 (32.66) | 5.57 (30.10) | 10.50 (109.47) | 9.71 (93.42) | 11.24 (125.54) | 10.80 (115.72) | 12.54 (156.34) | 11.72 (136.48) |
| SEm± | 0.05 | 0.07 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |
| CD (P = 0.05) | 0.15 | 0.21 | 0.33 | 0.34 | 0.34 | 0.33 | 0.35 | 0.32 |

**Table-3 Effect of weed management practices on weed control efficiency (%), Dry matter accumulation (g $m^{-2}$) and grain yield (q $ha^{-1}$) in transplanted rice**

| Treatment | Weed control efficiency (%) | | | | Dry matter accumulation (g $m^{-2}$) | | Grain yield (q $ha^{-1}$) | |
|---|---|---|---|---|---|---|---|---|
| | 30 DAT | | 60 DAT | | At harvest | | | |
| | 2014 | 2015 | 2014 | 2015 | 2014 | 2015 | 2014 | 2015 |
| Bispyribac-sodium ($T_1$) | 55.60 | 55.68 | 73.61 | 74.95 | 1146.79 | 1169.57 | 35.42 | 38.10 |
| Penoxsulam 24% SC ($T_2$) | 65.89 | 65.98 | 51.51 | 49.11 | 1013.60 | 1033.37 | 31.00 | 34.73 |
| Bispyribac+Ethoxysulfuron ($T_3$) | 53.86 | 53.82 | 80.73 | 82.47 | 1285.12 | 1296.90 | 37.33 | 39.50 |
| Bispyribac+Almix ($T_4$) | 51.84 | 52.56 | 84.83 | 87.08 | 1333.90 | 1351.53 | 40.30 | 42.37 |
| Pretilachlor fb Ethoxysulfuron ($T_5$) | 82.98 | 83.22 | 78.10 | 79.42 | 1272.11 | 1287.80 | 36.42 | 39.10 |
| Pretilachlor fb Almix ($T_6$) | 86.07 | 86.15 | 82.21 | 84.37 | 1309.92 | 1337.70 | 39.10 | 40.73 |
| Pyrazosulfuron fb Almix ($T_7$) | 74.53 | 74.62 | 64.85 | 65.45 | 1119.23 | 1138.50 | 34.12 | 37.27 |
| Penoxsulam+Cyhalfop (RM) ($T_8$) | 71.56 | 71.76 | 69.61 | 70.18 | 1109.55 | 1132.33 | 34.92 | 37.60 |
| Anilofos +2,4D (RM) ($T_9$) | 65.06 | 65.18 | 61.08 | 61.95 | 1093.30 | 1133.00 | 33.92 | 36.60 |
| Pendimethalin fb Bispyribac ($T_{10}$) | 81.51 | 81.46 | 75.67 | 76.92 | 1217.72 | 1240.50 | 35.65 | 38.33 |
| Hand weeding at 25, 45 DAT ($T_{11}$) | 72.32 | 71.73 | 87.22 | 89.53 | 1380.47 | 1410.05 | 42.30 | 44.47 |
| Weedy check ($T_{12}$) | 0.00 | 0.00 | 0.00 | 0.00 | 691.71 | 714.49 | 24.05 | 26.73 |
| SEm± | - | - | - | - | 21.09 | 23.30 | 0.81 | 0.96 |
| CD (P = 0.05) | - | - | - | - | 62.26 | 68.77 | 2.40 | 2.81 |

The effect of weed management practices on total weeds density recorded at 30, and 60 DAT was significant. At 30 DAT, significantly minimum total weed density was found under Pretilachlor fb. Almix

 

($T_6$) over rest of the treatments and except at par Pretilachlor fb. Ethoxysulfuron ($T_5$) during 2014 and 2015. The maximum total weeds density was found with weedy check during both years. The mean reduction in total weed density was recorded 79.74 percent with Pretilachlor fb. Almix ($T_6$) and 89.60 percent with two hand weeding ($T_{11}$) over weedy check.

At 60 DAT total weeds density was found significantly minimum under two hand weeding over rest of the treatment and at par with Bispyribac + Almix ($T_4$) during 2014 and 2015. The maximum total weeds density was found with weedy check during both the years. Among the herbicide total weed density was found significantly lower with Bispyribac + Almix ($T_4$) over rest of the treatments during 2014 and 2015. The mean reduction in total weeds density was recorded 85.41percent with Bispyribac + Almix ($T_4$) and 71.71 percent with two hand weeding ($T_{11}$) over weedy check. The reason behind the control of total weed density by the combination of post-emergence application of Bispyribac + almix ($T_4$) might be due to the efficient broad spectrum control. Post-emergence application of bispyribac-sodium alone and in combination at 20 and 25 g/ha was effective against mixed weed flora in transplanted rice. Similar results were reported by Walia et al. [8] and Yadav et al. [9].

The data pertaining to effect of weed management practices on weed control efficiency (%), dry matter accumulation (g $m^{-2}$) and grain yield (q $ha^{-1}$) in transplanted rice presented in Table 3**.** All the weed management treatments resulted in improved weed control efficiency over the weedy check. At 30 DAT, highest weed control efficiency was recorded 86.07 and 86.15 percent under Pretilachlor fb Almix ($T_6$) followed by Pretilachlor fb. Ethoxysulfuron ($T_5$) during 2014 and 2015.

At 60 DAT, weed control efficiency 87.22 and 89.53 percent was found higher under two hand weeding ($T_{11}$) fallowed by Bispyribac+Almix ($T_4$) during 2014 and 2015. The minimum weed control efficiency was observed 51.51and 49.11 percent with Penoxsulam 24% SC ($T_2$) during both years. This indicates that mixture and follow up application of herbicide has greater effect on complex weed flora than individual application in rice crop. ). Almost similar results were obtained by [10-12]**.**

Dry matter accumulation (g $m^{-2}$) was found significantly higher under two hand weeding ($T_{11}$) over rest of the treatments and at par with Bispyribac + Almix ($T_4$) at harvest during 2014 and 2015. Among herbicide treatment at harvest stage significantly highest dry matter accumulation (g $m^{-2}$) was measured under Bispyribac + Almix ($T_4$) over rest of the treatments which was at par with Pretilachlor fb. almix ($T_6$), Bispyribac + ethoxysulfuron ($T_3$), and Pretilachlor fb. ethoxysulfuron ($T_5$) during 2014 and 2015.

**Effect on grain yield**

All weed control treatments gave significantly higher grain yield over weedy check. Significantly highest grain yield was recorded 42.30 and 44.47 q $ha^{-1}$ under two hand weeding ($T_{11}$) over rest treatment except at par with Bispyribac + Almix ($T_4$) during 2014 and 2015, respectively. Among the herbicide application Bispyribac + Almix ($T_4$) was found significantly higher grain yield 40.30 and 42.37 q $ha^{-1}$ over rest treatments except at par with Pretilachlor fb. Almix ($T_6$) during both years. The minimum grain yield was recorded 24.05 and 26.73 q $ha^{-1}$ under weedy check. The mean increase the grain yield 40.32 and 36.91 percent was recorded with Bispyribac + Almix ($T_4$) and 43.14 and 39.89 per cent with two hand weeding ($T_{11}$) over weedy check.

The significantly higher yield attributed to timely control of weeds in critical period of crop growth and maintained less weed population throughout the crop growth period. These results are in close conformity with those reported by [8, 13, 14, 15, 3, 11].

## CONCLUSION

On the basis of two year study, it might be suggested that post emergence application of Bispyribac + almix @ 20 + 4 g $ha^{-1}$ ($T_4$) may be a good weed management practice for effective control of narrow, broad leaved and sedges weeds very effectively resulted into higher value of weed control efficiency maximizing productivity of rice.

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