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# Uptake of nutrients by rice and weeds of influenced by different weed management practices in drum seeded rice

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## ABSTRACT

**A field experiment was conducted during summer season of 2002-03 at Zonal Agricultural Research Station, Navile, Shimoga to study the effect of weed management practices on uptake of nutrients by drum seeded rice and weeds. Pre-emergence application of sofit @ 0.45 kg a.i ha$^{-1}$ + passing cono weeder at 30 DAS + one hand weeding @ 30 DAS was very effective in controlling weeds throughout the crop growth in drum seeded rice, with a weed control efficiency of 98.0 per cent at 60 DAS. The highest uptake of nutrients by crop and lowest uptake of nutrient by weeds (137.5, 49.7 and 119.1, N $P_2O_5$, $K_2O$ kg ha$^{-1}$, respectively) and (6.62, 1.92 and 14.9 N, $P_2O_5$, $K_2O$ kg ha$^{-1}$, respectively) by pre emergence application of sofit @ 0.45 a.i. ha$^{-1}$ + passing cono weeder at 30 DAS + one hand weeding @ 30 DAS.**

**Key words :** Uptake of nutrients, Drum seeded rice, Weeds, Herbicides and Mechanical weeder

## INTRODUCTION

Rice (*Oryza sativa* L.) is the principle food crop in developing countries and major staple food for 50-60 per cent of the world's population. The demand for rice in India is expected to be 100 million tonnes by 2010, 140 million tonnes by 2025 and 528 million tonnes by the year 2050 (Paroda, 1998; Mishra, 2002). Expansion of irrigated areas, availability of short duration rice cultivars, availability of labour, efficient herbicides, increasing transplantation costs and declining profitability of rice production under transplanted condition have forced many farmers in developing countries to shift from transplanting to drum seeding.

Weeds are the universal pest in rice and causes yield loss of 72.6 per cent in Drum seeded rice (Kolhe and Tripathi, 1998). Damage caused by weeds cannot be identified in early stage as compared to insect damage; so that weeds act as hidden war on crop plants. Yield losses due to weeds are greater in drum seeded rice. Early emergence of weeds along with crop seedlings and their rapid growth result in a severe crop weed competition for light, nutrients, moisture and space in drum seeded rice. Research results from various locations showed that herbicides alone do not solve the problem of weed control satisfactory in direct seeded rice culture unless it is supplemented with manual weeding or cultural methods. Continuous use of same herbicide or herbicides having the same mode of action may lead to the evolution of resistance in weeds (Malik *et al*., 1992). But in this type of rice culture, weed problems are critical (Moody, 1993). Pre emergence herbicides mainly control weeds in the earlier stages and weeds emerging at later stages of rice growth are not controlled effectively. In view of these facts, the present study was undertaken to find out the effect of different herbicides alone and in combination with other methods on nutrients uptake by weeds and rice.

## MATERIALS AND METHODS

A field experiment was conducted during summer season of 2002-03 at Zonal Agricultural Research Station, Navile, Shimoga. The soil of the experimental plot was loamy sand with a pH of 5.4. The soil was low in available nitrogen (180.0 kg ha$^{-1}$), high in available phosphorus (47.0 kg ha$^{-1}$) and medium in available potassium (245.0 kg ha$^{-1}$).The experiment comprising twelve weed control treatments were tested in randomized block design with three replications. The treatments comprised of three, pre emergence herbicides alone, *viz*, Sofit (pretilachlor + safener) @ 0.45 a.i. ha$^{-1}$, butachlor @ 0.5 a.i. ha$^{-1}$ and anilophos @ 0.3kg a.i ha$^{-1}$. Applied 3 DAS in combination with either hand weeding or passing cono weeder or hand weeding + passing cono weeder at 30 DAS. Besides, hand weeding alone, passing cono weeder + hand weeding alone at 30 DAS were compared with weedy check. Weed density, dry weight and yield of rice were recorded. The crop was irrigated as and when required. Crop and weed samples were analyzed to find out the uptake of nitrogen, phosphorus and potash by crop and weeds at harvest by adopting modified Kjedahl,

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colorimetry and flame photometry methods, respectively.

## Results and Discussion

The major weed flora observed in the experimental plot was *Echinochloa crusgalli, Echinochloa colonum, Panicum repens* and *Leptochloa chinensis* among grasses, *Cyperus iria* and *Fimbristylis miliaceae* among sedges and *Eclipta alba, Ammania baccifera Marsilea quadrifoliata, Ludwigia adscendens and Monochoria vaginali*s among broad leaved weeds. The dry weight of weeds differed significantly due to weed control treatments at all the crop growth stages. Among the weed control treatments, sofit @ 0.45kg a.i. $ha^{-1}$ + passing cono weeder at 30 DAS + hand weeding at 30 DAS recorded lower weed dry weight of grasses, sedges, broad leaved and total weed (0.28, 0.16, 0.00 and 0.44 g $0.25m^{-2}$, respectively) followed by sofit @ 0.45 kg a.i. $ha^{-1}$ + hand weeding at 30 DAS (0.37, 0.21, 0.15 and 0.71g $0.25m^{-2}$, respectively). Higher dry weight of weeds was noticed in weedy check (13.06, 7.39, 4.47 and 24.92g $0.25m^{-2}$, respectively). Decreased dry weight of weeds in weed control treatments was due to poor germination of weeds due to higher weed control efficiency (96 to 98 per cent). Presence of safener in sofit protects the crop from phytotoxicity and hence it is applied at 3 DAS. Application of sofit led to considerable inhibition of weeds as compared with the remaining treatments and also the safener applied at the early period of the crop growth persisted upto maturity. Giving safener and by passing cono weeder at 30 DAS and hand weeding at 30 DAS helped the crop to have weed free environment. As a result, crop put forth early vegetative growth and tillering. In the present investigation sofit (Pretilachor + safener) applied at 3 DAS effectively controlled the germinating weeds in the initial stage itself. This was in agreement with the earlier findings of Fajardo and Moody (1990), Nandal and Hari Om (1998) and Raju *et al*. (2002). Weed control efficiency was highest (98 per cent) in sofit @ 0.45 kg a.i.ha + passing cono weeder at 30 DAS + hand weeding at 30 DAS, followed by sofit @ 0.45 kg a.i. $ha^{-1}$ + hand weeding at 30 DAS (97 per cent) as compared to that all other treatments. This might be due to control of weeds at early stage by herbicide and supplemented with hand weeding at 30 DAS helped in the better control of weeds during later part of crop growth resulting in weed free environment. However, relatively lower weed control efficiency of Anilophos @ 0.3 kg a.i. $ha^{-1}$(56%) was due to ingressive weed control as evidenced from higher dry weight of weeds. These results are in agreement with earlier findings of Raju *et al.* (2002) and Moorthy and

**Table 1 : Effect of weed control, treatments on weed density and weed control efficiency at 60 days after sowing in drum seeded rice**

| Treatments | Weed biomass (g $0.25\ m^{-2}$) | | | | Weed control efficiency (%) |
|---|---|---|---|---|---|
| | Grasses | Sedges | Broad leaved | Total weed | |
| $T_1$ - Sofit @ .45 kg a.i.$ha^{-1}$ | 1.10 (0.73) | 0.96 (0.44) | 0.94 (0.39) | 1.43 (1.56) | 94.0 |
| $T_2$ - Sofit @ .45 kg a.i.$ha^{-1}$ + HW at 30 DAS | 0.93 (0.37) | 0.84 (0.21) | 0.80 (0.15) | 1.10 (0.71) | 97.0 |
| $T_3$ - Sofit @ .45 kg a.i.$ha^{-1}$ + CW at 30 DAS + HW at 30 DAS | 0.88 (0.28) | 0.81 (0.16) | 0.70 (0.00) | 0.96 (0.44) | 98.0 |
| $T_4$_Butachlor @ .5 kg a.i.$ha^{-1}$ | 1.97 (3.41) | 0.81 (2.78) | 1.58 (2.01) | 2.94 (8.2) | 67.0 |
| $T_5$ - Butachlor @ .5 kg a.i.$ha^{-1}$ + HW at 30 DAS | 1.18 (0.92) | 1.04 (0.60) | 1.01 (0.53) | 1.59 (2.05) | 92.0 |
| $T_6$ - Butachlor @ .5 kg a.i.$ha^{-1}$ + CW at 30 DAS + HW at 30DAS | 1.00 (0.52) | 0.94 (0.39) | 0.89 (0.31) | 1.31 (1.22) | 95.0 |
| $T_7$ - Anilophos @ .3 kg a.i.$ha^{-1}$ | 2.17 (4.21) | 1.99 (3.48) | 1.93 (3.25) | 3.38 (10.94) | 56.0 |
| $T_8$ - Anilophos @ .3 kg a.i.$ha^{-1}$ + HW at 30 DAS | 1.51 (1.81) | 1.33 (1.29) | 1.25 (1.07) | 2.16 (4.17) | 83.0 |
| $T_9$ - Anilophos @ .3 kg a.i.$ha^{-1}$+ CW at 30 DAS + HW at 30 DAS | 1.22 (.1.01) | 1.04 (0.60) | 1.14 ( 0.80) | 1.70 (2.14) | 90.0 |
| $T_{10}$ - Hand weeding at 30 DAS | 1.49 (1.74) | 1.23 (1.02) | 1.19 (0.93) | 2.04 (3.4) | 86.0 |
| $T_{11}$ - Cono weeder at 30 DAS + Hand weeding at 30 DAS | 1.35 (1.34) | 1.09 (0.69) | 1.06 (0.64) | 1.78 (2.67) | 89.0 |
| $T_{12}$ - Weedy check | 3.65 (13.06) | 2.80 (7.39) | 2.22 (4.47) | 5.04 (24.92) | - |
| S.E ± | 0.11 | 0.09 | 0.06 | 0.10 | - |
| C.D. (P=0.05) | 0.33 | 0.27 | 0.18 | 0.30 | - |

HW = Hand weeding DAS = Days after sowing CW = Cono weeder Values in paranthesis indicates Original Values

**Table 2: Nutrient uptake by rice and weeds as influenced by different weed control treatments in drum seeded rice**

| Treatments | Nutrient uptake by rice (kg ha$^{-1}$) | | | Nutrient uptake by weeds (kg ha$^{-1}$) | | |
|---|---|---|---|---|---|---|
| | Nitrogen | Phosphorus | Potasium | Nitrogen | Phosphorus | Potasium |
| $T_1$ - Sofit @ .45 kg a.i.ha$^{-1}$ | 111.3 | 42.3 | 92.7 | 11.96 | 6.97 | 24.17 |
| $T_2$ - Sofit @ .45 kg a.i.ha$^{-1}$ + HW at 30 DAS | 126.1 | 46.6 | 116.4 | 6.85 | 3.19 | 17.43 |
| $T_3$ - Sofit @ .45 kg a.i.ha$^{-1}$ + CW at 30 DAS + HW at 30DAS | 137.5 | 49.7 | 119.1 | 6.62 | 1.92 | 14.93 |
| $T_4$ - Butachlor @ .5 kg a.i.ha$^{-1}$ | 93.07 | 36.0 | 81.3 | 21.88 | 11.93 | 33.96 |
| $T_5$ - Butachlor @ .5 kg a.i.ha$^{-1}$ + HW at 30 DAS | 118.5 | 41.6 | 101.5 | 12.21 | 4.96 | 20.19 |
| $T_6$ - Butachlor @ .5 kg a.i.ha$^{-1}$ + CW at 30 DAS + HW at 30DAS | 124.7 | 44.0 | 104.8 | 10.80 | 4.19 | 19.97 |
| $T_7$ - Anilophos @ .3 kg a.i.ha$^{-1}$ | 66.4 | 27.9 | 73.5 | 24.56 | 18.94 | 45.26 |
| $T_8$ - Anilophos @ .3 kg a.i.ha$^{-1}$ + HW at 30 DAS | 85.2 | 33.3 | 77.9 | 22.74 | 12.95 | 36.94 |
| $T_9$ - Anilophos @ .3 kg a.i.ha$^{-1}$ + CW at 30 DAS + HW at 30 DAS | 105.5 | 35.8 | 87.0 | 18.26 | 11.31 | 27.31 |
| $T_{10}$ - Hand weeding at 30 DAS | 76.6 | 32.1 | 72.3 | 19.10 | 14.98 | 40.33 |
| $T_{11}$ - Cono weeder at 30 DAS + Hand weeding at 30 DAS | 101.5 | 31.6 | 83.4 | 18.22 | 9.99 | 29.99 |
| $T_{12}$ - Weedy check | 25.2 | 13.1 | 24.2 | 46.37 | 32.46 | 70.17 |
| S.E ± | 3.90 | 1.63 | 3.77 | 0.81 | 0.72 | 1.03 |
| C.D (P=0.05) | 11.45 | 4.89 | 11.31 | 2.43 | 2.16 | 3.39 |

HW = Hand weeding DAS = Days after sowing CW = Cono weeder

Saha (2002). Significantly lower uptake of nitrogen, phosphorus and potassium at harvest was noticed in sofit @ 0.45 kg a.i. ha$^{-1}$ + passing cono weeder at 30 DAS + hand weeding at 30 DAS (6.62, 1.92 and 14.93 kg ha$^{-1}$, respectively) which was at par with sofit 0.45 kg a.i. ha$^{-1}$ + hand weeding at 30 DAS (6.85, 3.19 and 17.43 kg ha$^{-1}$, respectively). However, significantly higher uptake of nitrogen, phosphorus and potassium was noticed in weedy check (46.37, 32.46, 70.17kg ha$^{-1}$, respectively).The lower uptake of nutrients by weed was due to early application of sofit leading to considerable inhibition of weed seed germination and giving one hand weeding at 30 DAS created to help weed free environment till harvest. The results are in conformity with findings of Chinnamuthu (1990), Kolhe and Tripathi (1998) and Jena *et al.* (2002).

Nitrogen, phosphorus and potassium uptake by crop was maximum (137.5, 49.7 and 119.1 kg ha$^{-1}$, respectively) in sofit @ 0.45 kg a.i. ha$^{-1}$ + passing cono weeder at 30 DAS + hand weeding at 30 DAS which was at par with sofit @ 0.45 kg a.i. ha$^{-1}$ + passing cono weeder at 30 DAS (126.1, 46.6 and 116.4 kg ha$^{-1}$, respectively) while, the lowest uptake of nitrogen, phosphorus and potassium was noticed with weedy check (25.2, 13.1 and 24.2 kg ha$^{-1}$, respectively). This increase in uptake of nutrient by crop was due to better control of weeds which helped the crop to utilize the available nutrient to the maximum extent. However, weedy check recorded low uptake by rice due to severe weed infestation. Similar type of results were also reported by Madhu and Nanjappa (1996) Rana *et al.* (2000) and Singh *et al.* (2001).

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