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**Short communication**

# Nitrogen and weed management in direct-seeded aerobic rice

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Aerobic rice is a new way of production system in which input-responsive rice varieties are grown in well-drained - non-puddled, soils without ponded water. The main driving force behind aerobic rice is to economize the water use. Aerobic rice offers easier planting, reduced labour, early crop maturity and higher tolerance of water deficit (Balasubramanian and Hill 2002). In aerobic rice, weeds emerge along with the crop. However, weeds being hardy and having profuse root and shoot growth habit, grow faster than rice there by check the growth of rice by severe weed crop competition. Nitrogen is the most limiting nutrient for rice production because of its higher requirement by the rice crops (Singh and Singh 2002). So, nitrogen and weed management are two important management factors limiting the productivity of upland aerobic rice.

A field experiment was conducted during *Kharif* season 2010 at Birsa Agricultural University, Ranchi, Jharkhand. The soil of experimental plot was sandy clay loam in texture, with slightly acidic reaction (pH 6.2), low in organic carbon (4.6 g/kg) and available nitrogen (228 kg/ha), high in available phosphorus (35.3 kg/ha) and medium in available potassium (157.1 kg/ha). The experiment was laid out in split-plot design with three replications. The treatments comprised three nitrogen levels in main plots and seven weed control methods in sub-plots. Nitrogen was applied in the form of urea as per treatment. A basal dose of $P_2O_5$ and $K_2O$ *i.e.* 40 and 20 kg/ha, respectively were applied through di-ammonium phosphate and muriate of potash. Nitrogen was applied in three equal splits as basal, maximum tillering and panicle initiation stage.

Rice variety '*Naveen*' was grown as the test crop. The herbicides were sprayed uniformly with knapsack sprayer fitted with flat fan nozzle calibrated to deliver 500 l/ha water volume. Species wise weed density (no./$m^2$) and weed dry matter (g/$m^2$) were recorded by putting a quadrat (0.25 $m^2$) at three random spots in each plot at 20, 40, 60, 80 and at maturity. Data on weed density and dry matter of weeds were transformed using square-root transformation $\sqrt{x+0.5}$ before statistical analysis and weed control efficiency was calculated on the basis of weed dry matter.

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**Effect on weeds**

*Echinochloa colona, Eleusine indica, Digitaria sanguinalis, Bracharia milliformis, Paspalum distichum, Ludwigia parviflora, Sphellanthus acmella, Eclipta alba, Commelina benghalensis, Cyperus iria, Fimbristylis milliaceae, Cyperus difformis* and *Kyllinga brevifolia* were dominat weeds. All the weed control treatments significantly reduced the weed density and weed dry matter over weedy check. Among the weed control methods, *Sesbania* (dhaincha) in between rice row + pendimethalin 0.75 kg/ha + 2, 4-D 0.8 kg/ha at 25 DAS recorded significantly lower weed density at all crop growth stages as compared to rest of the weed control methods. Except at 20 and 40 DAS where it remained at par with *Sesbania* in between rice row + pendimethalin PE 0.75 kg/ha and weed free check. However, *Sesbania* in between rice row + pendimethalin PE 0.75 kg/ha + 2, 4-D 0.8 kg/ha at 25 DAS being at par with *Sesbania* in between rice row + pendimethalin PE 0.75 kg/ha registered significantly reduced dry matter accumulation to the tune of 19.2, 48.6, 39.6, 38.7 and 73.5%, respectively compared to mean weed dry matter recorded by rest of the weed control methods at 40, 60, 80 DAS and at crop maturity period. Our finding was in accordance with those of Ray and Mishra (1999).

Application of 75 kg N/ha recorded significantly lower weed density and dry matter at all crop growth stages as compared to 100 and 125 kg N/ha. Except at 60 and 80 days after sowing, dry matter was similar to application of 100 kg N/ha. The reduction in total weed density at 20, 40, 60, 80 DAS and at maturity were 14.31, 18.67, 10.84, 12.53 and 16.91, respectively as compared to mean weed density recorded with 100 and 125 kg N/ha. The result was in close conformity with those of Sharma and Ghosh (2002) and Yadav (2004). All weed control treatments resulted in significantly higher rice grain yield than

**Table 1. Weed dynamics in aerobic rice as influenced by nitrogen levels and weed management practices**

| Treatment | Weed density (no./m²) Days after sowing | | | | | Weed dry matter (g/m²) Days after sowing | | | | | Weed control efficiency | Grain yield (t/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20 | 40 | 60 | 80 | At maturity | 20 | 40 | 60 | 80 | At maturity | | |
| *Nitrogen levels (kg/ha)* | | | | | | | | | | | | |
| $N_1$- 75 | 21.3 (464) | 23.8 (590) | 28.2 (818) | 30.6 (967) | 26.9 (744) | 14.2 (205) | 21.4 (477) | 27.2 (756) | 28.7 (850) | 26.3 (709) | 49.2 | 3.53 |
| $N_2$- 100 | 22.9 (527) | 26.2 (704) | 29.4 (885) | 31.9 (1055) | 29.1 (870) | 15.2 (233) | 23.1 (548) | 27.5 (773) | 29.1 (872) | 27.3 (769) | 44.9 | 3.74 |
| $N_3$- 125 | 23.5 (556) | 27.0 (747) | 30.4 (950) | 33.4 (1156) | 29.9 (921) | 15.6 (246) | 23.6 (568) | 27.8 (790) | 29.4 (883) | 28.9 (851) | 39.1 | 3.90 |
| LSD (P=0.05) | 0.82 | 0.87 | 0.59 | 0.55 | 0.61 | 0.54 | 1.26 | 0.38 | 0.80 | 0.97 | - | 1.11 |
| *Weed management practices* | | | | | | | | | | | | |
| Dhaincha in between rice row + pendimethalin PE 0.75 kg/ha | 20.0 (400) | 21.8 (476) | 25.5 (650) | 26.0 (680) | 25.0 (627) | 13.3 (177) | 18.9 (361) | 23.7 (565) | 25.1 (633) | 24.1 (584) | 58.2 | 4.30 |
| Rice + pendimethalin PE 0.75 kg/ha | 22.8 (526) | 29.2 (856) | 31.2 (970) | 34.1 (1170) | 29.4 (867) | 15.2 (233) | 25.7 (662) | 30.2 (911) | 31.7 (1006) | 28.3 (803) | 42.4 | 3.42 |
| Dhaincha in between rice row + pendimethalin PE 0.75 kg/ha + 2, 4 D 0.8 kg/ha at 25 DAS | 21.1 (446) | 20.9 (442) | 23.3 (543) | 24.6 (607) | 23.8 (567) | 14.0 (197) | 17.6 (313) | 22.8 (522) | 24.4 (594) | 23.2 (539) | 61.4 | 4.37 |
| Urdbean in between rice row + pendimethalin PE 0.75 kg/ha | 22.3 (501) | 28.4 (808) | 30.2 (913) | 33.2 (1107) | 27.8 (777) | 14.9 (222) | 24.3 (589) | 27.5 (758) | 27.7 (770) | 26.8 (721) | 48.3 | 3.73 |
| Urdbean in between rice row + pendimethalin PE 0.75 kg/ha+2, 4 D 0.8 kg/ha at 25 DAS | 21.7 (475) | 25.9 (672) | 27.5 (757) | 30.1 (910) | 26.9 (730) | 14.5 (210) | 23.5 (555) | 26.4 (700) | 27.0 (730) | 26.2 (690) | 50.6 | 3.78 |
| Weed free check | 25.4 (647) | 21.2 (458) | 28.8 (833) | 31.0 (967) | 28.5 (817) | 16.9 (286) | 19.8 (396) | 27.8 (774) | 28.6 (817) | 26.5 (702) | 49.6 | 3.94 |
| Unweeded check | 24.7 (613) | 32.3 (1048) | 38.9 (1517) | 44.4 (1975) | 39.0 (1532) | 16.5 (271) | 29.0 (841) | 34.3 (1180) | 39.0 (1525) | 37.3 (1396) | - | 2.53 |
| LSD (P=0.05) | 1.19 | 0.86 | 0.87 | 1.01 | 1.21 | 0.79 | 1.42 | 1.23 | 1.40 | 1.35 | - | 2.98 |

Figures in parentheses are original values and were transformed to $\sqrt{x} + 0.5$ before statistical analysis

weedy check. Rice crop growth and yield contributing characters were affected adversely due to weedy condition, which resulted in 90% loss of rice grain yield. The rice grain yield produced with *Sesbania* in between rice row + pendimethalin 0.75 kg/ha +2, 4-D 0.8 kg/ha at 25 DAS) followed by *Sesbania* in between rice row + pendimethalin 0.75 kg/ha proved their superiority over rest of the weed management practices. These findings were in conformity with Angadi and Umapathy (1997).

## SUMMARY

Application of 125 kg N/ha and in a planting *Sesbania* in between rice row + pendimethalin PE 0.75 kg/ha + 2, 4-D at 0.8 kg/ha at 25 days after sowing found to be best option for both growth and yield of rice.

## REFERENCES

Angadi VV and Umapathy PN. 1997. Integrated weed management through smother intercrops in rainfed lowland rice. *International Rice Research Newsletter* **22**: 47-48

Balasubramanian V and Hill JE. 2002. Direct-seeding of rice in Asia: Emerging issues and strategic research needs for 21st century, p 38. In: *Direct Seeding: Research Strategies and Opportunities*, (Eds. Pandey S. *et al.*). Proceeding of International Workshop on Direct-Seeding in Asian Rice System, 25-28 January 2000, Bankok, Thailand. International Rice Research Institute Los Banos, Philippines.

Ray DK and Mishra SS. 1999. Effect of weed management in direct seeded upland rice (*Oryza sativa*) at varying nitrogen level. *Indian Journal of Agronomy* **44**(1): 105-108.

Sharma AR and Ghosh A. 2002. Effect of green manuring with *Sesbania aculeata* and nitrogen fertilization on the performance of direct seeded flood-prone lowland rice. *Nutrient Cycling in Agro-ecosystem* **57**(2): 141-153.

Yadav RL. 2004. Enhancing efficiency of fertilizer N use in rice-wheat systems of Indo-Gangetic plains by intercropping *Sesbania aculeata* in direct seeded upland rice for green manuring. *Bioresource Technology* **93**(2): 213-215.

Singh, CS and Singh, UN. 2002. Effect of nitrogen and sulphur nutrition on growth and yield of rice (*Oryza sativa* L.) cultivars. *Research on Crops* **3**(3): 643-646.