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**Short communication**

# Seeding method and weed competition effect on growth and yield of direct-seeded rice under puddled condition

**P. Saravanane and V. Chellamuthu**
*Department of Agronomy, Pandit Jawaharlal Nehru College of Agriculture & Research Institute, Karaikal, Puducherry 609 603*

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Rice is the most important staple food crop of India. It is grown as transplanted crop in most of the command areas. But, labour shortage at the peak of planting activities has encouraged many rice farmers to shift from transplanting to direct-seeding in irrigated areas. Direct-seeded rice are subjected to greater weed pressure than conventional transplanting systems since there is no standing water to suppress weeds at the time of crop emergence (Mahajan and Chauhan 2013). The crop is likely to experience yield reduction, unless weeds are kept free during a part of its growing period (Azmi *et al*. 2007). However, use of suitable seeding methods for rapid establishment of rice seedlings (Tilahun *et al*. 2013) may counter weed competition under direct-seeded condition. Hitherto, such studies are meager which evaluate the effect of critical period of weed interference in direct-seeded rice with different seeding methods under puddled condition. Hence, this study was carried out to assess the effect of seeding methods and critical period of weed competition in direct-seeded rice under puddled irrigated condition in coastal ecosystem of Karaikal, Puducherry, Union Territory (UT), India.

A field experiment was conducted under puddled irrigated condition from September, 2014 to January, 2015 at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, (11° 56' N latitude,79° 53' E longitude, 8 m above mean level), Puducherry U.T. The soil of the experimental field was sandy clay loam in texture, near neutral in reaction (pH: 6.94), low in available nitrogen (119 kg/ ha) and high in available phosphorus (24 kg/ha) and potassium (366 kg/ha). The experiment was laid out in split plot design with two direct seeding methods and four weed competition periods in five replications. The main plot was allotted with two method of direct-seeding in anaerobic condition *viz*., wet (using pre-germinated seeds) and dry (using non pre-germinated seeds). The sub-plots were assigned with maintaining weedy conditions for early 15, 30, 45 and 60 days after sowing (DAS) of crop growth. The rice cultivar '*ADT 46'* of 135 days duration was sown during September 2014 and harvested during January 2015 with 20 cm spacing between rows. An uniform dose of 150 kg N, 50 kg $P_2O_5$, 50 kg $K_2O$ and 50 kg Zn was applied in the form of urea, super phosphate, muriate of potash and zinc sulphate, respectively. Half of the N, and full dose of the $P_2O_5$, $K_2O$ and $ZnSo_4$ was applied as basal and remaining half dose of the nitrogen was applied in two splits: at active tillering and at panicle initiation stage. Weed density (grasses, broad-leaved weeds and sedges) were recorded at 60 days after sowing (DAS) with the help of 50 x 50 cm quadrates at two random places in each plot. The data on weed density and dry weight was transformed using $\sqrt{x+0.5}$ to normalize their distribution before analysis. The experimental data were subjected to standard statistical analysis.

Major weeds observed in experimental field were: *Echinochloa crusgalli* L, *Echinochloa colona* L. among grasses, *Cyperus iria* L., *Cyperus difformis* L. among sedges, *Eclipta alba* L., *Marselia quadrifolia* L., and *Bergia capensis* L among broad-leaved weeds.

The weed density and dry weight of grasses, broad-leaved weeds, sedges and total weeds was not significantly influenced by method of direct-seeding under puddled condition but was found to be affected with weed competition periods (Table 1). Weedy condition for initial 15 days of crop growth followed by weed free condition throughout crop growth resulted in lower density of grasses, broad-leaved, sedges and total density of weeds (1.0, 8.3, 2.0 and 11.3 no/$m^2$, respectively) compared to other periods of weedy condition at 60 DAS. The maximum density of weeds and dry weight was recorded when the weedy condition was maintained upto 60 DAS of crop growth. Further, it was observed that weed floristic composition irrespective of the duration of weedy condition is in the order of broad-leaved weeds > grasses > sedges.

Sowing of either pre-germinated or dry seeds did not influence the growth and yield of rice in puddle condition. Dry seed sowing resulted in less vegetative growth and LAI compared to the pre-germinated seeds. Higher number of productive tillers and filled grains was observed in the sowing of pre-

***Corresponding author:** psaravanane@rediffmail.com

**Table 1. Influence of direct seeding methods and varied weedy condition on weed density and dry weight of rice at 60 DAS**

| Treatment | Weed density (no./ $m^2$) | | | | Weed dry weight (g/ $m^2$) | | | |
|---|---|---|---|---|---|---|---|---|
| | Grasses | Broad-leaved | Sedges | Total | Grasses | Broad-leaved | Sedges | Total |
| *Direct seeding methods* | | | | | | | | |
| Wet | 2.5(5.8) | 5.7(42.3) | 1.1(1.3) | 6.4(49.5) | 2.7(8.9) | 3.3(10.4) | 0.6(0.1) | 4.3(18.6) |
| Dry | 2.8(8.7) | 7.2(55.2) | 2.8(8.0) | 8.3(71.8) | 3.4(10.6) | 3.8(14.4) | 0.9(0.2) | 5.1(25.2) |
| LSD (P= 0.05) | NS | NS | NS | NS | NS | NS | NS | NS |
| *Weedy condition* | | | | | | | | |
| Weedy condition up to 15 DAS and then weed free | 1.2(1.0) | 2.8(8.3) | 1.3(2.0) | 3.4(11.3) | 1.4(1.7) | 1.9(2.9) | 0.7(0.1) | 2.4(4.7) |
| Weedy condition up to 30 DAS and then weed free | 2.3(4.7) | 5.7(38.7) | 1.8(2.7) | 6.5(46.0) | 2.5(5.9) | 3.1(7.8) | 0.8(0.1) | 4.0(13.8) |
| Weedy condition up to 45 DAS and then weed free | 2.8(5.7) | 8.1(68.0) | 1.9(3.0) | 8.7(76.7) | 3.6(9.8) | 3.6(11.0) | 0.8(0.1) | 4.9(21.0) |
| Weedy condition up to 60 DAS and then weed free | 4.3(17.7) | 9.2(80.0) | 2.8(11.0) | 10.7(109) | 4.9(20.0) | 5.7(28.0) | 0.9(0.2) | 7.4(48.2) |
| LSD (P= 0.05) | 1.72 | 4.15 | NS | 3.67 | 1.55 | 1.47 | NS | 1.51 |

Data subjected to $\sqrt{x+0.5}$ transformation. Figures in parentheses are original values. *DAS- Days after sowing

**Table 2. Influence of direct seeding methods and varied weedy condition on growth, yield components and yield of rice**

| Treatment | No. of leaves | Productive tillers per $m^2$ | Panicle weight (g) | Filled grains/ panicle | Grain yield (t/ha) |
|---|---|---|---|---|---|
| *Direct seeding methods* | | | | | |
| Wet | 43.7 | 374.8 | 4.2 | 1284 | 4.44 |
| Dry | 41.7 | 359.8 | 3.7 | 1238 | 4.01 |
| LSD (P= 0.05) | NS | NS | NS | NS | NS |
| *Weedy condition* | | | | | |
| Weedy condition up to 15 DAS and then weed free | 46.1 | 399.0 | 4.4 | 1436 | 4.98 |
| Weedy condition up to 30 DAS and then weed free | 44.1 | 384.2 | 4.4 | 1300 | 4.61 |
| Weedy condition up to 45 DAS and then weed free | 43.1 | 362.0 | 3.8 | 1204 | 4.23 |
| Weedy condition up to 60 DAS and then weed free | 37.2 | 324.0 | 3.21 | 1104 | 3.08 |
| LSD (P= 0.05) | 4.54 | 51.0 | 0.42 | 160 | 0.36 |

DAS- Days after sowing, NA- Statistically not analyzed

germination sprouted seeds. The result was in conformity with the findings of Tilahun *et al.* (2013). However, weed free condition maintained throughout the crop period except the initial 15 DAS resulted in highest rice grain yield of 4.98 t/ha. It was followed by the weedy condition maintained for early 30 and 45 days of crop growth (4.61 and 4.23 t/ ha, respectively). Similar result was also obtained by Mukherjee *et al*. (2008) in wet-seeded rice under *Terai* (lowland region in southern Nepal and north-western India) conditions. Productivity of rice depends on interaction of various physiological and biological functions in plants. Increased weed competition period reduced the number of leaves productive tillers, panicle weight and filled grains per panicle as that of grain yield (Hakim *et al.* 2013). Significantly lower grain yield (3.08 t/ha) was recorded in the experimental plots maintained weedy for initial 60 days of crop growth (Table 2).

## SUMMARY

A field experiment was conducted for direct-seeded rice under puddled irrigated condition in *samba* season (September, 2014 to January, 2015) at Karaikal, Puducherry Union Territory to study the influence of two direct seeding methods (wet and dry sowing) and four periods of weed competition (weedy condition for early 15, 30, 45 and 60 days of crop growth) in split plot design. Weed density and dry weight was not significantly influenced either by sowing with wet or dry seeds but significantly influenced by weed competition. Maximum grain yield, lower weed density and dry weight were recorded with the plots maintained weed free throughout the crop period except the initial 15 days after sowing (DAS).

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