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# INFLUENCE OF WATER REGIMES AND FERTILIZERS ON THE GROWTH AND YIELD OF DIRECT SEEDED RICE

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**ABSTRACT**

Field experiments conducted at Annamalainagar during 1992-'93 revealed that continuous submergence at 5 cm along with a fertilizer dose of 15:75:75 kg N, $P_2O_5$ and $K_2O$/ha resulted in the enhancement of the growth characters such as plant height, leaf area index, number of tillers/$m^2$, dry matter production and grain and straw yields of direct seeded puddled rice.

KEY WORDS : Direct Seeded Rice, Water, Fertilizers, Growth, Yield.

In India, rice is grown in an area of 41 million ha with a production of about 74 million t. In Tamil Nadu, it is cultivated over an area of 2.7 million ha with a production of 5.6 million t. Direct seeding of rice is practiced in Tamil Nadu under conditions of paucity of water and labour. Adequate attention is required for efficient use of water and fertilizers in rice grown under direct seeded condition. Hence, the present study was undertaken to develop an ideal water and fertilizer management practice for direct seeded puddled rice.

## MATERIALS AND METHODS

The study was carried out in the experiment farm of Annamalai University, Annamalainagar, during late *Samba* (September 92- January 93) and *Navarai* seasons (February-May 93) in split plo design with three replications. Five treatmen involving different water regimes *viz*., continuo submergence 3 cm, 5 cm and 7 cm, irrigation to cm depth submergence immediately after t disappearance of ponded water and irrigation to cm depth submergence 2 days after t disappearance of ponded water in the main plot and three graded levels of fertilizer *viz*., 100:50:50 125:62.5:62.5 and 150:75:75 kg N, $P_2O_5$ an $K_2O$/ha were assigned to the sub plots. Ric varieties ADT-37 (*Navarai*) and ADT-38 (*Samba* were used for the study.

The soil of the experiment field was moderately drained clayey loam with a pH of 8.04. The soil was low in available N, (230 kg/ha)

**Table 1. Growth characters as influenced by water regimes and fertilizers in rice**

| | Plant height (cm) at harvest | | LAI at harvest | | No. of tillers/$m^2$ at harvest | | Drymatter Production at harvest (t/ha) | |
|---|---|---|---|---|---|---|---|---|
| | *Samba* | *Navarai* | *Samba* | *Navarai* | *Samba* | *Navarai* | *Samba* | *Navarai* |
| Mainplots | | | | | | | | |
| Continuous submergence (3 cm) | 83.00 | 76.03 | 5.26 | 4.68 | 483.3 | 444.4 | 10.80 | 9.77 |
| Continuous submergence (5 cm) | 85.11 | 79.56 | 5.73 | 5.00 | 505.6 | 470.3 | 11.64 | 10.29 |
| Continuous submergence (7 cm) | 81.70 | 74.23 | 5.10 | 4.55 | 455.6 | 418.9 | 10.70 | 9.72 |
| Irrigation to 5 cm depth immediately after the disappearance of ponded water | 80.30 | 73.30 | 5.04 | 4.43 | 422.1 | 400.0 | 10.56 | 9.53 |
| Irrigation to 5 cm depth 2 days after the disappearance of ponded water | 79.70 | 73.00 | 5.00 | 4.19 | 394.4 | 387.5 | 10.37 | 9.46 |
| CD at 5% | 0.23 | 0.22 | 0.04 | 0.04 | 7.1 | 6.5 | 0.01 | 0.01 |
| Subplots N $P_2$ $O_5$ $K_2$ O (kg/ha) | | | | | | | | |
| 100:50:50 | 80.72 | 74.54 | 5.18 | 4.45 | 433.7 | 404.5 | 10.69 | 9.56 |
| 125:62.5:62.5 | 81.73 | 75.74 | 5.25 | 4.53 | 456.6 | 425.3 | 10.88 | 9.84 |
| 150:75:75 | 82.73 | 76.49 | 5.29 | 4.62 | 466.5 | 446.5 | 10.97 | 9.89 |
| CD at 5% | 0.32 | 0.33 | 0.02 | 0.02 | 5.7 | 5.2 | 0.001 | 0.001 |

**Table 2. Rice yield (t/ha) as influenced by water regimes and fertilizers**

| | Grain yield | | Straw yield | |
|---|---|---|---|---|
| | *Samba* | *Navarai* | *Samba* | *Navarai* |
| Mainplots | | | | |
| Continuous submergence (3 cm) | 4.52 | 4.49 | 7.06 | 5.59 |
| Continuous submergence (5 cm) | 5.28 | 4.76 | 7.20 | 6.20 |
| Continuous submergence (7 cm) | 4.37 | 4.28 | 7.00 | 5.23 |
| Irrigation to 5 cm depth immediately after the disappearance of ponded water | 4.18 | 4.11 | 6.88 | 5.06 |
| Irrigation to 5 cm depth 2 days after the disappearance of ponded water | 4.07 | 3.73 | 6.82 | 4.85 |
| CD at 5% | 0.01 | 0.04 | 0.02 | 0.04 |
| Subplots N $P_2$ $O_5$ $K_2$ O (kg/ha) | | | | |
| 100:50:50 | 3.95 | 3.68 | 6.67 | 4.75 |
| 125:62.5:62.5 | 4.41 | 4.25 | 7.16 | 5.55 |
| 150:75:75 | 5.09 | 4.88 | 7.36 | 5.86 |
| CD at 5% | 0.02 | 0.03 | 0.02 | 0.02 |

medium in available phosphorus (11 kg/ha) and high in available potassium (305 kg/ha). Basally half dose of N as urea, full dose of $P_2O_5$ as super phosphate and half dose of $K_2O$ as muriate of potash were given. The remaining N and $K_2O$ were top dressed in two equal splits at maximum tillering and panicle initiation stages. The observations were recorded at harvest on plant height, leaf area index (LAI), dry matter production (DMP), number of tillers/$m^2$, grain and straw yields.

## RESULTS AND DISCUSSION

### Growth Characters

Among the main plot treatments, continuous submergence at 5 cm recorded the highest values in growth characters *viz*., plant height, LAI, number of tillers/m2 and DMP in both the seasons. Irrigation at 5 cm submergence two days after the disappearance of ponded water recorded the least values in growth characters. Application of 150:75:75 kg N, $P_2O_5$ and $K_2O$/ha recorded the highest values in growth characters in both the seasons (Table 1). Higher dose of fertilizer might have favourably influenced the growth vigour, assimilatory potential and vegetative growth of crop which helped in increasing the growth characters of rice.

### Yield

Water regime at 5 cm continuous submergence registered higher grain yield of 5.28 and 4.76 t/ha and straw yield of 7.20 and 6.20 t/ha in *Samba* and *Navarai* seasons respectively. Application of 150:75:75 Kg N, $P_2O_5$ and $K_2O$/ha recorded the highest grain yield of 5.09 and 4.88 t/ha and straw yield of 7.36 and 5.86 t/ha in *Samba* and *Navarai* seasons respectively as compared to other treatments (Table 2). This might be due to more availability of nutrients under optimum availability of moisture and fertilizers and its favourable effect in accelerating the growth characters and yield of rice. The high amount of fertilizer (150:75:75 Kg N, $P_2O_5$ and $K_2$/ha) and continuous submergence at 5 cm depth might have increased the carbohydrate and protein metabolism in the plant. This might have been efficiently translocated to the sink. The recommended fertilizer dose could support better assimilation towards grain formation. All these factors collectively resulted in increasing the growth characters thereby excelled in recording higher grain and straw yields of rice under continuous submergence as well as high amount of fertilizer application. These findings are in line with the earlier reports of Agarwal *et al*., (1985), Singh and Singh (1988) and Alagappan (1991).

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