| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NPK + 25Kg $ZnSo_4$/ha | 54.1 | 29.9 | 94.0 | 47.9 | 26.1 | 74.0 | 46.5 | 31.0 | 77.5 |
| Control | 34.7 | 26.0 | 60.7 | 19.5 | 17.9 | 37.4 | 23.0 | 19.5 | 42.5 |
| CD | 7.8 | N.S | 14.8 | 12.3 | N.S | 8.3 | 5.4 | N.S | 17.1 |

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# EFFECT OF LOW LIGHT INTENSITY ON GROWTH AND PRODUCTIVITY OF IRRIGATED RICE (*Oryza sativa L.*) GROWN IN CAUVERY DELTA REGION

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## ABSTRACT

Irrespective of varieties, low light intensity significantly increased the plant height, leaf area index (LAI) and total leaf chlorophyll content while significant reduction was evident in respect of total dry matter, panicle number, spikelet number, filled grains and grain yield. It was considered that low light intensity during samba/thaladi season, appearing particularly from panicle initiation to harvest was an important constraint for higher productivity since yields as low as 3.19 to 4.28 t/ha were recorded with varieties which yielded 5.00 to 5.84 t/ha under normal light intensity conditions. Among several varieties, Ponni appeared to be more tolerant with least reduction in grain yield (15.9%) under low light intensities thus more suitable for samba/thaladi season followed by White Ponni, Co 43 and IR 20.


KEY WORDS : Rice, Low light, Productivity.

In Cauvery deltaic region, rice is mostly grown during North East monsoon season (Samba/Thaladi) starting from August-September to December-January. During these seasons, low light intensity coincides with the reproductive and ripening phases resulting in poor yield. The present study was therefore aimed at elucidating information on the effect of low light intensity on growth and productivity in certain genotypes of rice.

## MATERIALS AND METHODS

The experiment was conducted at Tamil Nadu Rice Research Institute, Aduthurai during 1986. Four rice varieties commonly grown during samba/thaladi seasons *Viz.*, IR 20, Co 43, Ponni and White Ponni were studied in a strip plot design with six replications. Thrity day old seedlings were transplanted in 5 X 4 m plots with a spacing of 20 X 10 cm. The plots were artificially shaded by using two

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layers of velon screen 1/16" mesh size to prevent 30-40% of the total solar radiation. The treatments were : 1. Shading during reproductive and ripening phases (panicle initiation to harvest). 2. Unshaded (control). Light energy was measured using a Toshiba Luxmeter. Fertilizers were applied at the rate of 100 kg N; 50 kg P; 50 kg K/ha.

## RESULTS AND DISCUSSION

Irrespective of varieties, shading increased the plant height, LAI and total chlorophyll content and significantly reduced the tiller number and total dry matter production (Table 1). These findings, confirm the previous observations of Tanaka *et al.*, (1964), Venkateswaralu *et al*;, (1977), Venkateswaralu (1977) and Sridharan (1975). Shading generally causes the plant to grow taller with more leaves but retards tillering and diminishes dry matter production (Tanaka *et al.*, 1964). In the present study shading was induced at panicle initiation when the plants have already attained maximum tillering. Shading caused the plants to grow better with more leaves resulting in increased LAI at flowering. On the contrary, the tiller, which is an important yield component progressively got weakened and unproductive. This was particularly true in the case of secondary and tertiary tillers. Tanaka *et al.* (1964) stated that total dry matter content decreased under low light intensity. Since with low light intensity, photosynthesis becomes low, it was clear that carbohydrate reserves of the tillers were becoming low causing mortality of the weak and unproductive tillers during the ripening phase when there was greater demand for photosynthates from the developing grains. the LAI was significantly high in the case of Ponni and White Ponni showing varietal differences. This indicated that though the physical limits of assimilatory system were not affected by low light intensity, the rate of dry matter accumulation has been significantly altered. Possibly the function of source (leaf) would be a limitation under reduced light. Similarly, the leaves from the continuously shaded plants have also shown more chlorophyll content especially in the varieties Ponni and White Ponni sugesting that there was a tendency to enrich the assimilatory system under low light intensity probably to provide for accumulation of more photosynthate (Venkateswaralu *et al.*, 1977). Presumably, the loss in dry matter was being compensated through the enrichment of jchlorophyll such that when light intensity increases, the plant may gear the metabolic systems for efficient functioning or enriched chlorophyll would fix more $Co_2$ to the extent possible.

Low light intensity from panicle initiation to harvest significantly reduced the number of panicles, number of spikelets per panicle, number of grain per panicle, 1000 grain weight and grain yield (Table 2). Panicle number which is a function of number of tillers was significantly reduced by reducing light intensity. Here again the variety Ponni appeared to be superior. A similar trend in the case of number of spikelets per panicle, number of grains per panicle, filled grain, 1000 grain weight and grain yield was observed (Yoshida and Parao, 1976). The reduction in grain yield ranged from 15.9% to 45.4% over control. Among the varieties, Ponni appeared to be more tolerant and suited to low light with least reduction in grain yield (15.9%) followed by White Ponni (23.4%), Co 43 (25.7%) and IR 20 (45.4%). As regards grain yield, the treat-

Table 1. Effect of low light intensity on plant height, tiller number, LAI, leaf chlorophyll content and total dry matter in four samba rice varieties.

| Variety | Plant height (cm) | | Productive tillers per hill (number) | | LAI at flowering | | Total leaf chlorophyll content (mg/g fresh wt.) | | Total dry matter (g/hill) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | Shade | Control | Shade | Control | Shade | Control | Shade | Control | Shade |
| IR 20 | 110.8 | 120.0 | 7.3 | 5.7 | 6.59 | 6.70 | 3.115 | 3.577 | 41.7 | 29.1 |
| Co 43 | 109.8 | 119.8 | 7.5 | 6.2 | 6.61 | 6.96 | 3.074 | 3.756 | 42.4 | 28.0 |
| Ponni | 158.2 | 166.0 | 7.0 | 6.8 | 7.23 | 9.88 | 3.093 | 4.583 | 49.4 | 38.8 |
| White Ponni | 156.3 | 164.7 | 7.3 | 6.0 | 7.71 | 9.43 | 3.081 | 4.025 | 50.8 | 35.2 |
| T | | 2.8 | | 0.52 | | 1.19 | | 0.415 | | 5.5 |
| V | | 4.9 | | 0.89 | | N.S | | N.S | | 4.8 |
| T X V | | N.S | | N.S | | N.S | | 0.283 | | N.S |

Table 2. Effect of low light intensity on yield and yield components of four samba rice varieties.

| Varieties | No. of Panicles per m | | No. of spikelets per panicle | | No. of grains per panicle | | Filled grains (%) | | 1000 grain weight(g) | | Grain yield (t/ha) | | Percent decrease over control |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Control | Shade | Control | Shade | Control | Shade | Control | Shade | Control | Shade | Control | Shade | |
| IR 20 | 371.0 | 308.0 | 122.0 | 104.0 | 89.7 | 61.8 | 73.0 | 60.0 | 20.2 | 17.1 | 5.84 | 3.19 | 45.4 |
| Co 43 | 396.0 | 310.0 | 127.0 | 105.0 | 99.2 | 66.7 | 77.0 | 64.0 | 19.7 | 17.9 | 5.40 | 4.01 | 25.7 |
| Ponni | 337.0 | 317.0 | 131.0 | 118.0 | 108.2 | 78.5 | 83.0 | 67.0 | 18.6 | 17.0 | 5.09 | 4.28 | 15.9 |
| White Ponni | 334.0 | 311.0 | 130.0 | 110.0 | 107.3 | 71.8 | 83.0 | 65.0 | 18.3 | 17.1 | 5.22 | 4.00 | 23.4 |
| T | 20.2 | | 5.5 | | 6.4 | | 2.3 | | 0.38 | | 0.23 | | |
| V | 18.0 | | 5.0 | | 3.7 | | 1.9 | | 0.27 | | N.S | | |
| T X V | N.S | | N.S | | N.S | | N.S | | 0.43 | | 0.69 | | |

ment has significantly affected the varieties. The higher yield of Ponni under low light intensity was probably due to higher panicle number per square meter, number of spikelets and grain per panicle besides its ability to accumulate high dry matter.

Thus low light intensity in samba/thaladi season (monsoon season) was proved to be an important constraint for grain yield in rice since varieties with high yield potential of 5.00 to 5.84 t/ha could produce yield ranging from 3.19 to 4.28 t/ha only. The data suggest that high tillering with high panicle number per unit area, optimum LAI and spikelets per panicle besides high photosynthetic efficiency and dry matter accumulation under low light are the desirable traits for choosing rice genotypes suited for samba/thaladi season of Cauvery delta region.

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# PREDIGESTION TECHNOLOGY FOR IMPROVING BIOGAS YIELD OF ANIMAL ORGANIC WASTES

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ABSTRACT

Study on the effect of pre-digesting of wastes in improving microbiological activity and biogas production was conducted. Destruction of TS and VS was high in Saranai incorporated treatments and that of cellulose in saranai mixed with cowdung. Gas production was high in the pre-digested saranai and nutgrass treatments. Pre-digesting for 15 to 20 days favoured maximum gas production.

KEY WORDS : Biogas yield, Organic waste, Predigestion

In order to improve the cleavage of the most resistant waste substrates, suitable technology which is economical, efficient and less time consuming may have to be evolved. This will help in the biogas technology extension programmes, since