

SUMMARY

The objective of the present study was to determine the factors associated with tillering and yield per tiller in rice with special reference to upland dry-sown conditions. The results are summarised as follows:

I. Factors affecting tillering in rice

Among the major nutrient elements, the deficiency of nitrogen and phosphorus reduced grain yields due to reduction in ear bearing tillers and grain number per panicle. Tillering was affected by nitrogen stress even for short periods of 10 days during the early growth stages i.e. upto 50 days stage of the crop. Relative tillering rate decreased with an increase in tiller number. Varietal differences in tillering were attributed to differences in nitrogen uptake since at the same nitrogen per cent of the plant high tillering varieties produced more tillers than shy tillering types. Tillering ceased when the plant nitrogen content was reduced below 1.5 per cent. In local indica varieties the tiller number decreased after 40 days of transplanting while in newly introduced high yielding varieties the tillering continued even upto 56 days, which could be attributed to maintenance of nitrogen content above 1.5 per cent and N/P ratio above about 8.0.

Shade treatment (30 per cent of normal sunlight) reduced the nitrogen response on tillering. This inhibition in tillering under shade was due to reduced nitrogen uptake by plant rather than nitrogen per cent per se

because the nitrogen per cent in the plant was quite high compared to that of plants grown under normal light conditions.

II. Tillering and nitrogen uptake pattern under dry-sown and transplanted conditions.

Growth and nutrient uptake pattern of some of the high yielding varieties under dry-sown and transplanted conditions indicated that grain yield was lower under dry-sown than under transplanted conditions - mostly due to lower number of grains per panicle. The maximum tillering was attained at 50 days after sowing under dry-sown conditions and the tiller mortality was heavy afterwards. While under transplanted conditions the maximum tillering was observed at 60 days stage (35 days after transplanting) and the tiller mortality was comparatively less. The dry matter accumulation was more upto maximum tillering stage under dry-sown conditions than transplanted conditions, while at later stages the reverse trend was observed. In the dry-sown crop, the nitrogen per cent was lower than transplanted crop throughout the crop growth. However, a lag period in nitrogen uptake was noticed during 40 - 70 days in dry-sown crop, which coincided with the period of tiller mortality, while in transplanted crop no such lag period in nitrogen uptake was seen. In an early variety Bala, the lag period in nitrogen uptake was not noticed and the leaf nitrogen per cent was maintained high (above 2 per cent) from maximum tillering to booting and the tiller mortality was less. These studies gave an

indication that heavy tiller mortality in rice varieties under dry-sown conditions was due to lag period in nitrogen uptake and consequent reduction in the percentage of leaf nitrogen below 2 per cent from maximum tillering to booting.

III. Tillering and yield as influenced by N application.

Experiments designed to maintain leaf nitrogen above 2 per cent through suitable top dressing at 50 days stage indicated an improvement in the ear bearing tillers per unit area and reduced the tiller mortality. It was observed that the tillers (i) that emerged after 40 days of sowing (ii) with height less than 50 per cent of the main shoot (iii) weight less than 500 mg and (iv) nitrogen uptake less than 10 mg per tiller failed to produce panicle under upland dry-sown conditions. A positive correlation between the age of the tiller, height of the tiller, weight of the tiller and nitrogen uptake per tiller with spikelet number and grain number per panicle was also evident. With increase in nitrogen uptake there was an increase in grain number per panicle and three split application of nitrogen (40-30-30) showed higher grain number than two split application (70-0-30).

IV. Yield per tiller or panicle weight.

Analysis of factors affecting tiller yield or panicle weight indicated that translocation of carbohydrates amongst the effective tillers after flowering stage was less than 5 per cent indicating that each panicle bearing tiller

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 was an independent unit after flowering. The top two leaves assimilated about 90 per cent of the carbon fixed by the tiller with all leaves intact. The efficiency of the top two individual leaves was the same (60 per cent) and there was always a compensation in fixation of carbon by the intact leaves when other leaves were excised or shaded. The efficiency of the lower leaves was less than that of the top leaves. The carbon fixation by the panicle (glumes) at flowering was hardly 6 per cent. The recovery in the panicle of the carbon fixed at or after flowering was in the order of 70 - 85 per cent. Most of the fixed carbon at or after flowering was translocated into the panicle within 7 days. The translocation was quicker and more in early varieties and it was more from boot leaf than from lower leaves. The per cent recovery of C^{14} photosynthates in the panicle was the highest when the plants were fed with C^{14} at milk stage of ripening. Increased nitrogen content of the leaf increased photosynthetic fixation upto leaf nitrogen content of 3.16 but the per cent translocation or the per cent recovery in the panicle decreased beyond leaf nitrogen content of 2.5 per cent.

Since some of the factors affecting photosynthesis and translocation in a tiller were known, attempts were made to hypothesise the relation between the " source " and " sink " . Observations on three varieties of rice indicated an apparent relationship between the product of leaf area, specific leaf weight, sunshine hours during ripening period and ripening duration on one hand and panicle weight on the other as follows:

LA x SLW x SS hrs x duration of ripening = Grain
number per panicle x 1000 grain weight x
70/100 = Panicle weight x 0.7

Such relationship, if further substantiated
may help the breeder for manipulation of characters on sound
physiological basis, in future breeding programme for higher
panicle weight and yield.