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# INTER-SEASONAL STABILITY OF HIGH YIELDING RICE GENOTYPES

Reaction of genotypes to the environmental variables during the crop period exerts considerable influence on the expression of their yield potential. The yield of many of the high yielding rice varieties remains far below their potential yield during the different seasons. A substantial decline in yield during the second crop season as compared to the first crop was noticed in Kerala by Alexander *et at.* (1990). The present study was undertaken to find out the stability of rice genotypes in respect of their yield and yield attributes during the first and second crop seasons in Kerala. Identification of stable genotypes is a basic necessity for successful crop improvement programmes.

The study was undertaken at the Regional Agricultural Research Station, Pattambi during the first and second crop seasons of 1989-90. Sixteen high yielding rice genotypes (eight each from short and medium duration groups) were included in the study. All the varieties received uniform cultural and manurial schedules as per the package of practices recommendations of the Kerala Agricultural University (KAU, 1989). Observations on the number of productive tillers per nr, total number of filled spikelets per panicle and sterility percentage were recorded from 10 randomly selected hills. The 1000 grain weight was recorded from three samples and the value adjusted to 14 percentage moisture.

The data revealed that all the varieties, irrespective of their duration, recorded lesser number of productive tillers per $m^2$ during the second crop season with exceptions in the case of Annapoorna and Sabari. Annapoorna produced 536 and 603 tillers during the first and second crop seasons, respectively. The number of productive tillers during the two seasons was almost the same in the case of Sabari. The mean seasonal variation in the number of productive tillers was more in the case of short duration group (98) than medium duration group (31). Majority of the varieties recorded lesser number of filled grains per panicle during the second crop season following the same trend as that of number of productive tillers per nr. Bharathy, Sabari and Bhadra did not show much seasonal variation in the number of filled spikelets.

Table I. Seasonal influence on the performance of short duration varieties

| Variety | Productive tillers / $m^2$ | | No. of filled grains/panicle | | 1000 grain weight, g | | Sterility, % | | Grain yield, t $ha^{-1}$ | | Days to 50% flowering | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop |
| Annapoorna | 536 | 603 | 107 | 86 | 25.4 | 23.4 | 39 | 16 | 4.22 | 4.60 | 84 | 74 |
| Jyothi | 556 | 489 | 115 | 104 | 30.3 | 27.2 | 28 | 16 | 5.20 | 4.80 | 94 | 84 |
| Triveni | 536 | 402 | 125 | 119 | 27.6 | 23.5 | 20 | 17 | 4.89 | 4.80 | 88 | 77 |
| Bhagya | 541 | 402 | 142 | 95 | 31.4 | 28.5 | 26 | 10 | 4.66 | 3.50 | 82 | 77 |
| Onam | 555 | 421 | 125 | 99 | 29.5 | 26.4 | 21 | 14 | 4.64 | 4.00 | 86 | 77 |
| 1R-36 | 838 | 603 | 103 | 96 | 26.2 | 22.4 | 19 | 12 | 4.86 | 4.33 | 96 | 81 |
| Matta Triveni | 469 | 411 | 149 | 128 | 27.0 | 24.1 | 23 | 9 | 5.22 | 5.13 | 86 | 74 |
| KAU 1727 | 475 | 385 | 161 | 123 | 25.6 | 22.7 | 27 | 9 | 5.31 | 4.27 | 98 | 89 |
| Mean | 563 | 465 | 128 | 106 | 27.9 | 24.8 | 25 | 13 | 4.88 | 4.43 | 89.3 | 79.1 |
| CV % | 20.6 | 19.6 | 16.1 | 14.3 | 8.1 | 9.2 | 25.4 | 25.7 | 7.5 | 11.7 | 6.7 | 6.6 |

Table 2. Seasonal influence on the performance of mediuni duration varieties

| Variety | Productive tillers / $m^2$ | | No. of filled grains/panicle | | 1000 grain weight, g | | Sterility, % | | Grain yield, t $ha^{-1}$ | | Days to 50% flowering | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop |
| Aswathy | 496 | 450 | 142 | 132 | 28.3 | 28.1 | 23 | 12 | 5.21 | 5.00 | 105 | 89 |
| Bharathy | 429 | 400 | 122 | 122 | 28.5 | 26.7 | 16 | 6 | 5.11 | 4.91 | 100 | 91 |
| Sahari | 460 | 470 | 128 | 127 | 27.5 | 28.5 | 16 | 15 | 5.00 | 5.41 | 105 | 92 |
| Pavizham | 462 | 430 | 134 | 138 | 27.4 | 24.6 | 9 | 8 | 5.20 | 5.00 | 106 | 90 |
| Bhadra | 475 | 455 | 93 | 92 | 25.5 | 22.8 | 26 | 14 | 4.22 | 4.17 | 120 | 95 |
| MO-5 | 480 | 440 | 129 | 114 | 30.6 | 28.6 | 23 | 13 | 4.80 | 4.50 | 104 | 89 |
| Jaya | 495 | 446 | 132 | 124 | 25.6 | 22.7 | 21 | 18 | 4.50 | 4.33 | 105 | 89 |
| Neeraja | 520 | 480 | 124 | 134 | 24.7 | 22.7 | 18 | 15 | 5.56 | 5.00 | 114 | 97 |
| Mean | 477 | 446 | 126 | 123 | 27.3 | 25.6 | 19 | 13 | 4.95 | 4.79 | 107 | 92 |
| CV % | 5.8 | 5.5 | 11.6 | 11.9 | 7.1 | 10.5 | 28.4 | 31.1 | 8.7 | 8.7 | 6.0 | 3.3 |

Table 3. Weather conditions at different growth stages

| Growth stages | Short duration | | | | Medium duration | | | |
|---|---|---|---|---|---|---|---|---|
| | Total rainfall, mm | | Mean max. temp., "C | | Total rainfall, mm | | Mean max. temp., "C | |
| | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop | 1st crop | 2nd crop |
| Vegetative phase | 1355 | 62.7 | 30.4 | 29.7 | 1529 | 63 | 30.2 | 30.2 |
| Reproductive phase | 145 | - | 29.1 | 32.4 | 59 | - | 30.2 | 32.6 |
| Maturity phase | 154 | - | 30.2 | 33.0 | 199 | | 29.9 | 33.1 |

Almost all the varieties, except Sahari, recorded higher 1000 seed weight during the first crop season. The 1000 seed weight of Sahari was higher by one gram during second crop season as compared to that in first crop season. During both the seasons, the highest 1000 seed weight was recorded by Bhagya in short duration group and MO-5 in the mediuni duration group. The mean data of varieties showed that 1000 seed weight was higher during first crop season by 3.1 g in the case of short duration varieties and 1.7 g in the case of medium duration varieties, as compared to second crop season. Yoshida (1981) showed that a rise in temperature from 22" to 28 C caused a reduction in 1000 grain weight by three grams. The higher day temperature, ranging from 32 to 34 C, experienced in the central zone of Kerala during the post-flowering phase of second crop season may be detrimental to proper grain filling probably by reducing the duration of the grain filling phase

and increasing the rate of respiration. Similarly, the high wind velocity during the second crop season (8 km $h^{-1}$) also might have adversely affected grain filling due to the increased respiration rate. However, the high wind speed during second crop season did not seem to have much adverse influence on the fertilisation *per se* as indicated by the comparatively low percentage of sterility during second crop season.

On the other hand, sterility percentage was high in all the varieties during the first crop season except Pavizham. The comparatively high percentage of sterility observed especially in short duration varieties during the first crop season was attributed to the adverse effect of heavy rainfall (145 mm) at the time of heading and flowering (Table 3). Since the medium duration varieties reached the (lowering stage only after the heavy rainfall period, the fertilization might not have been much affected in them. This group received only 59 mm rainfall during the flowering phase. The high rainfall through its influence on pathogenic infection also might have increased the sterility during first crop. The low variability of medium duration varieties in the percentage of sterility between first and second crop seasons also contributed to their stable **performance** between seasons. The coefficient of variation with respect to the yield and yield characters further indicates better stability of medium duration varieties in different seasons.

Though both the duration groups recorded lesser yield during second erop, the extent of reduction was much high in short duration group which rightly reflects the varietal response to the influence of season on the yield attributes. However, the yield increase during the first crop season did not commensurate with the high values of yield attributes probably due to the high sterility percentage recorded during the season.

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