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Impact of Weather on the Yield and Stability of Rice Genotypes Under South West Monsoon Conditions

K Parimala, V R K Murthy, I Swarnalatha Devi and P Venkata Rao
Seed Research and Technology Centre, Rajendranagar, Hyderabad

ABSTRACT

A field experiment to study the response of thirty five rice genotypes to varying environmental conditions was conducted on sandy loam soil of Seed Research and Technology Centre, PJTSAU, Rajendranagar,Hyderabad during south west monsoon season, 2013. Three replications of all the genotypes were consistently transplanted on 1rdJuly, 15thJuly, and 30thJuly, in randomized block design. It was established that all the thirty five genotypes were responsive to favourable environments irrespective of dates of transplanting. However, the genotype NLR 40058 produced significantly more yield in all the three dates of sowing and it was highest 5.04 t ha-1 when transplanted on 15th July. The genotype RNR 6841 yielded lowest (1.90 t/ha)when transplanted on 15thJuly, and trends were same for 1stand 30th July. The study indicated that rice sown on 15thJuly is exposed to favourable macro and micro conditions as compared to 1stand 30thJuly transplanted crops. Also, adequate sunshine and congenial air temperatures during the reproductive stage of NLR 40058 resulted in highest yield.

Key words: *Genotypes, Weather, Yield.*

Agriculture is always vulnerable to unfavorable weather events and climate conditions. Despite technological advances such as improved crop varieties and irrigation systems, weather and climate are important factors, which play a significant role in agricultural productivity. Rice (*Oryza sativa* L.) is one of the important cereals grown across the world. Identification of contributing traits towards stability of yield performance would certainly be of great significance in order to stabilize and sustain the rice productivity. Efforts are being made to enhance the plant tolerance to high temperature environments through identification of cultivars with great stability in physiological, growth and yield attributes. Grain yield depends on genotype, environment and management practices. Under the same management conditions, variation in grain yield is principally explained by the effects of genotype and environment (Dingkuhn et al., 2006). Interaction between these two explanatory variables gives insight for identifying genotype suitable for specific environments.Thus, information on the response of new cultivars to changing weather conditions is inadequate and keeping all these facts in view the present study was conducted to note influence of high temperature on yield and component traits in rice.

MATERIAL AND METHODS

The experiment site was at Rajendranagar located 18.5 degrees N Latitude and 75.53 E Longitude at an altitude of 542.6 m above mean sea level. The macro meteorological observations were recorded at an agrometeorological observatory located near the experimental site. The weekly maximum temperatures ranged from 27.9 degrees to 34.7 degrees centigrade with an average 31.3 degrees centigrade. The weekly minimum temperatures ranged from 15.8 to 23.8 with an average of 19.8 degrees centigrade. The mean relative humidity ranged from 72 to 94 percent at 7.14 hrs and 39 to 84 percent at 14 hrs respectively. The average sunshine was 5.9 hours. The total rainfall received during the crop growth period was 539 mm in 29 rainy days. The micro meteorological observations were recorded between 11 am and 1 pm with standard equipment. The field was fallow before the rice crop was transplanted. The gross plot size was 4.0 m x 4.0 m and net plot size was 3.6 mx 3.6 m, and the spacing adopted was 20 cm x 10 cm for all the 35 genotypes. Grain from each net plot was cleaned and sundried until constant weight and expressed in kg ha^{-1}.

RUE= Amount of dry matter produced (g m^{-2}) / Amount of cumulative solar radiation absorbed (M J m^{-2})
RUE= Radiation Use Efficiency

RESULTS AND DISCUSSION

The mean number of productive tillers were significantly altered by all the genotypes tested by changing dates of sowing. The vegetative growth responses of rice genotypes *viz.,* plant height, intermodal length, number of leaves per plant, leaf length leaf area per plant and dry matter accumulation significantly more and were best exhibited by transplanting the crop on 15th July and these parameters reduced sharply in the 1stJuly and 30th July dates of sowing. These differences were due to the congenial average day time air temperature of 27.83 and average night time air temperature of 19.9 degrees centigrade, experienced by 15th July transplanted crop (Murthy, 2015). The average sunshine hours, air temperature and GDD values were 5.08, 29.3 and 129 respectively for 15th July sown crop during reproductive stage and these values were significantly different from 1st and 30th July sown crops, which were found more uncongenial .

The genotype NLR 40058 accumulated significantly larger quantity of phytomass per hill compared to all other genotypes. It was significantly high as compared to RNR 6378. Similarly, days to 50 per cent flowering, total number of seeds per panicle, filled seeds and 1000 seed weight were significantly more for the genotype NLR 40058 than RNR 6378. Same trends were recorded for straw *viz.,* 9528 kg ha^{-1} for NLR 40058 which was significantly more 6841 kg ha^{-1} than RNR 6378. The results indicated that the genotype NLR 40058 required 5.9 hours of average sunshine hours, 27.9 degrees of air temperature, 121 GDD during its reproductive stage and yielded the highest. The genotype RNR 6378 was exposed to 19 % less sunshine hours and 0.9 degrees more of air temperature and 143 GDD as compared to NLR 40058 and yielded the lowest (Tripathi*et al*., 2012).

The highest yield produced NLR 40058 and lowest yield produced RNR 6378 were responsive to favourable environments. NLR 40058 produced mean seed yield of 5040 kg ha^{-1} and the *bi* value was 0.94. The yield and stability parameters were 1900 kg ha^{-1} and 1.12 respectively for RNR 6378. Congenial microclimatic conditions *viz.,* average canopy temperature of 27.2 degrees centigrade and better radiation use efficiency (1.98) are considered the determining factors (Singh *et al.,* 2014) in case of NLR 40058.

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