633.18 : 551.586

INFLUENCE OF AGRO-CLIMATIC ELEMENTS ON THE YIELD OF RICE (*ORYZA SATIVA L.*) AT RAIPUR

1. Following Fisher's (1924) modified technique various researchers have studied the influence of meteorological parameters on the yield of a crop. They are among others Huda *et al.* (1975), Pandey and Gupta (1989), Chowdhury and Dandekar (1991). The present work aims at a similar study on the rice yield by including the weather variables, namely, total rainfall, maximum and minimum temperatures, relative humidities (0700 and 1400 hr), number of rainy days and bright sun shine hours.

2. The data on rice yield of Raipur were obtained from the 'Agricultural Statistics' published by the Directorate of Agriculture, Madhya Pradesh from 1951-52 to 1988-89. And the data on weather variables were extracted for the period 1951 to 1988 from the records of Agrimet Division, IMD, Pune. The crop period considered was 19 weeks (26th to 44th standard weeks). This period was divided into the following phenological phases of rice : seedling phase (26-30th standard weeks), vegetative phase (31-35), reproductive phase (36-40) and maturity phase (41-44).

3. From the study of correlation coefficients between different weather elements and the rice yield during different phenological phases, we find that the afternoon relative humidity was significantly and positively correlated with the rice yield in all the phenological phases. The correlation of morning relative humidity was similar, however, the significance was more in vegetative and maturity phases, as compared to other phases. The correlation of rainfall with the yield was also significant and positive from the seedling to reproductive phases. However, the same for the number of rainy days was significant in only seedling and maturity phases. The bright sun shine hours, maximum and minimum temperatures were negatively correlated with the yield in general in all the phases, however, the significance of the first two were generally in the seedling and maturity phases, the third being not significant at all.

4. Fisher's (1924) multiple regression equation, based on third degree polynomial, was fitted for each weather variable. The yield variation explained by afternoon relative humidity (%R^2) was maximum (62. 4%). This was followed by those of rainfall (57.0%), number of rainy days (49.6%), maximum temperature (47.3%), bright sun shine hours (36.2%), minimum temperature (33.2%) and morning relative humidity (33.2%). All the %R^2 were significant at 1% level of probability.

4.1. As for the yield response of rice is concerned, it was found that 10 mm above average of rainfall is favourable for the rice yield upto the initial maturity phase (43rd standard week) fetching an extra yield of 0.60 to 0.65 kg/ha above average if this extra rainfall occurs during 33rd to 37th standard weeks. The effect of 1 degree Celsius increase above average in the maximum temperature is always detrimental to the rice yield with a maximum loss of 16 kg/ha below average if this happens in the initial vegetative phase. The positive response upto 13 kg/ha above average could only be expected if there is 1°C increase in the minimum temperature during the vegetative to early maturity phase.

4.2. An increase of 5% above average of afternoon relative humidity is found to be always beneficial to the rice yield, *i.e.*, in the whole crop period. However, a maximum benefit of 3 kg/ha above average may be expected if this increase occurs in the reproductive phase. The morning relative humidity is also beneficial to a lesser degree except in the maturity phase.

4.3. The effect of one day increase above average in the number of rainy days per week is similarly beneficial to the rice yield, except in the maturity phase. Except for a little favourable response in the yield due to an increase of 1 hour in the bright sun shine hours during 29-32nd standard weeks and the last week of maturity phase, there is always a loss in yield due to such an increase.

5. Thus, it may be concluded that the yield response results are in general agreement with the phasewise correlation study. The most important parameter for assessing a good yield response was found to be the afternoon relative humidity which gave the best estimate of rice yield (R^2 = 0.62). Rainfall and number of rainy days in that order are the next important variables to be monitored for the rice yield.

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