

INTRODUCTION

The need of the day is to step up the agricultural production substantially to meet the need of the increasing population of the country. As the cultivable land is limited, the fulfilment of this objective can best be achieved by raising the yields per unit area under cultivation and optimizing the available inputs for maximizing crop production. The yield is the function of various intricate factors like crop variety, levels of irrigation and fertilization, crop growing season, planting time, location and available water which are directly or indirectly related with each other and the increase in the yield result from efficient management and careful handling of these factors of production.

Rice being semi-aquatic in nature, is grown in all types of land situations namely upland, medium land and low land, agro-climatic conditions and in tropical regions having more than 1000 mm rainfall. Although under normal condition, the genetic make up of a variety is the most important factor determining the yield, but the inputs like fertilizer and irrigation water also play significant role in influencing the yield potentiality of a given variety. With the development of dwarf and semi-dwarf (short and medium

duration rice which are photo-insensitive in nature) high yielding varieties, the prospects of growing two to three crops in a year become very bright. Cultivation of short and medium duration rice helps in increasing yields by escaping natural climatological hazards during the months of November and December in wet season. It also helps in releasing fields earlier for timely planting of successive crops. Along with these benefits, the short and medium duration varieties had longer range of planting for higher yields which facilitate to meet the labour requirement for planting as well as for harvesting the crop. On the other hand, the introduction of photo-insensitive high yielding varieties growing rice in dry season is found to be a boon for the areas where very short spell (two to three weeks) of cold temperature (less than 20°C average temperature) existed during winter season. Growing rice crop under assured irrigation is found to be more profitable during dry season as compared to any other cereal crop of winter season.

Fertilization to rice crop is one of the most important factor controlling yield potentialities which generally differ from one to another variety within a particular growing season and between two different seasons depending upon the variation in agro-climatic condition and soil physico-chemical properties under which crop is grown. Under such circumstances, it was felt necessary to find out the optimum levels of fertilization for short, medium and long duration high yielding varieties which are generally grown in

wet season and photo-insensitive variety in dry season at two different locations having two different soil types and sources of irrigation.

The productive potentialities of rice varieties mainly depends upon the climatic condition under which the crop is to be grown. In general, rainfall ranging from 1000 to 1500 mm distributed uniformly in wet season (July to October), temperature range of 15° to 37°C, light intensity of 450 cal/cm², 5 to 7 hours of daily sunshine, 70 to 90 per cent relative humidity and less than 5 km per hour wind velocity have been reported to be optimum for growth and yield of rice crop. Below 5°C temperature, growth is retarded in initial stage, 15° to 20°C temperature favours better tillering at active tillering stage, 30° to 35°C temperature along with more than 7 hours of bright sunshine favours better grain filling. Temperatures beyond 35°C and below 25°C hinder grain filling either due to high or low temperature hazards affecting internal physiological disorder. Similarly, cloudy weather and high wind velocity at grain filling stage hamper the yield. However, the planting of short, medium and long duration varieties are to be done in such a way that each variety can utilize better climatological factors during its growth period for higher productivity. Therefore, to find out the suitable planting range for each rice variety the present investigation was planned.

Irrigation, on the whole, has been considered to be a predominant factor controlling the yield potential of rice not only during dry season but equally important for long duration rice in wet season in the absence of rain during the months of November and December. The uncertainty of rain and its distribution in wet season creates difficult situation to maintain desired quantity of water in the field condition at various stages of crop growth either due to heavy rain or flood. At the same time, the rice cultivation in dry season is only possible where assured irrigation facilities existed. It is also known that the irrigation facilities in our country is not sufficient for larger areas to meet the crop need during dry season. Under such circumstances, the farmers of our country are not sure that the desired quantity of water will be available when they desire. However, the average yield of the high yielding varieties is severely reduced with slight variation in irrigation. The performance of rice crop with reference to its growth and yield under phasic submergence is considered to be better than under continuous submergence which increases the water requirement. In soils with high hydraulic conductivity (more than 0.5 cm per hour), percolation loss of water is alarmingly high under continuous flooding/submergence/standing water and is reported to be as much as 60 per cent of the total water requirement (Pande and Mittra, 1970). Moreover, percolation also results in heavy leaching of nutrients particularly nitrogen. Thus, in such soils, any measure to minimize water

requirement as well as saving of irrigation water to such an extent that without losing much yield more area may be brought under cultivation in dry season. It is, therefore, essential to identify the most ideal level of irrigation for maximizing yield potential of rice during dry season at two different sites differing in soil type, ground-water table and sources of irrigation water.

The aim for richer crop harvest by scientific methods of production need to include two major aspects i.e. maximum yield and its economical viability. In India very little effort has been made so far regarding the optimization of agronomic inputs like fertilizer and irrigation for the cultivation of rice varieties in both wet and dry seasons. Any production practice which can give an additional output more than the additional input are desirable. Water and fertilizer are two main as well as costlier inputs which are highly responsible for maximizing crop production but due to lack of information more emphasis has been given to optimize these inputs for maximum economical yield. Therefore, studies on these aspects have been considered essential in the present investigation.

In view of the above, investigation was planned for both wet and dry seasons at two different sites with the following objectives.

- i) To find out precisely the influence of different levels of fertilization and dates of planting on rice varieties of varying durations.

- ii) To find out seasonal and locational influences on the response of photo-insensitive, high yielding semi-dwarf rice at varying levels of fertilization and moisture regime.
- iii) To develop mathematical models for determining optimum level of inputs for maximizing the yield.