

## Growth response of paddy (*Oryza sativa*) to radiation interception and agroclimatic indices under different planting methods

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### ABSTRACT

Field experiments were conducted at PAU, Ludhiana, to study growth and radiation interception in paddy. Rice cultivars PR-115 and PR-118 were transplanted under three dates of sowing during two consecutive *Kharif* seasons of 2004 and 2005. The leaf area index (LAI) depicted a positive correlation with the photosynthetically active radiation (PAR) interception and growing degree days (GDD). Significant linear positive relationship was also observed between dry matter accumulation with PAR interception and growing degree days (GDD). Heat use efficiency was more under furrow planting as compared to conventional planting. Agroclimatic indices like GDD can be used as a tool in predicting dry matter accumulation and leaf area index of rice crop.

Dhaliwal, L.K., Sandhu, S.K. and Aneja, A. (2011). Growth response of paddy (*Oryza sativa*) to radiation interception and agroclimatic indices under different planting methods. *Internat. J. agric. Sci.*, 7(2): 392-395.

**Key words :** Leaf area index, Dry matter, PAR interception, Growing degree days

### INTRODUCTION

Rice is grown in all continents of the world due to its wide adaptability to diverse agroclimatic conditions. In India, the rice-wheat production system covers nearly 12 million ha area in the Indo-Gangetic plains in states of Punjab, Haryana, Uttar Pradesh, Bihar and West Bengal. This system contributes about 25 per cent to the total food grain production of the country. The rice crop in India accounts for about 24 per cent of the total cropped area under food grains. In Punjab, rice cultivation has increased considerably with the availability of high yielding varieties, irrigation facilities and support price. It dominates the agricultural scene of the state in *Kharif* season having an area of 26.47 lakh ha with the highest state level average yield of 5914 kg/ha in terms of paddy in comparison to 3943 kg/ha average yield of rice (Anonymous, 2006).

On an average more than 4000 liters of water is used to produce one kilogram of rice (Anonymous, 1992). In Punjab, rice-wheat system owing to its high water demand has caused a severe problem of ground water table, which is declining at an alarming rate of 23 cm per year and has depleted about more than four meters since 1982 (Anonymous, 2002). Transplanting in puddled field is the common method of rice crop establishment, which results in formation of a hard pan and damages the soil structure. The traditional practice of continuous ponding of water results in considerable deep percolation losses

and over irrigation than the crop requirements. As a result nearly 80 per cent area of the Punjab state is experiencing a fall in water table. So other practices for rice growing need to be explored to solve this problem in future. There is need to study alternative rice growing methods such as transplanting in furrows without puddling the soil which require less water. In this method the seedlings are transplanted in between the furrows and the water is applied only in furrows, which leads to 30-35% saving of water. There is also a need to study the changes in crop micro climate environment under various planting methods and their effect on yield. Keeping this in view, field studies were conducted to study the effect of two planting methods on radiation interception, crop growth and yield of rice crop.

### MATERIALS AND METHODS

Field experiments on paddy were conducted during *Kharif* seasons of 2004 and 2005 with paddy at Punjab Agricultural University, Ludhiana. It is situated at 30°54'N latitude and 75°48'E longitude and is 247 m above mean sea level. The area experiences an average annual rainfall of 705 mm of which about 80 per cent is received during June to September. Two varieties of paddy, PR-118 and PR-115 were transplanted under conventional method (with puddling) and in between furrows (without puddling) on three different dates *viz.*, 25 May, 10 June and 25 June in both the crop seasons. Seedlings were

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