

Effect of water deficit and nitrogen levels on yield, n-uptake and nutrient balance in rice (*Oryza sativa* L.)

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ABSTRACT

A field experiment was conducted at Pangabri plot of Pusa Farm, Rajendra Agricultural University Bihar, Pusa during two consecutive Kharif season of year 2000 and 2001 to study the effect of water deficit and nitrogen levels on growth, yield and nutrient balance in rice (*Oryza sativa* L.). Moisture regimes 'So' i.e. 5±2 cm irrigation after 3 days disappearance of ponded water produced maximum grain yield and nitrogen uptake than that obtained with lower moisture regimes i.e., 'S₁', 'S₂' and 'S₃'. 120 kg N/ha (N₃) of nitrogen level registered statistically higher grain yield and N-uptake in comparison to lower nitrogen levels N₀, N₁, and N₂. Higher positive nitrogen balance was recorded with S N treatment combination. All treatment combination showed positive balance of P. However, K-balance with all treatments under investigation were negative.

Key words : Water deficit, N-uptake and Balance sheet.

INTRODUCTION

Rice is a semi-aquatic plant and is cultivated in diverse agro-eco-systems like up, medium and low land and also cultivated well in rainfed condition. In all the agro-eco-system water plays an important role to express the yield potential of rice variety. Thus an adequate quantity of water supply is considered essential for exploiting the potential yield. Hence, appropriate scheduling of irrigation are vital for optimising the grain yield of rice. Gajbhiye *et al.* (1990) suggested that knowledge of optimum level of soil moisture for plant establishment and growth is important for scheduling irrigation under water deficit situation. Nitrogen (N) is also the key nutrient element limiting the yield of rice. Due to natural losses of nitrogen through various channel it become essential to apply adequate level of nitrogen for achieving optimum yield.

Therefore, the present investigation was undertaken to find out the effect of water deficit and nitrogen levels on growth, yield and nutrient balance in rice under North Bihar condition.

MATERIALS AND METHODS

Present field experiment was under taken during Ph.D. Programme at South Pangabri plot of Pusa farm, Rajendra Agricultural University, Bihar, Pusa situated at 25° 59'N and 85° 48'E at an elevation of 52.92 metre above the mean sea level. The physico-chemical analysis of experimental plot revealed that the soil was sandy loam in texture and low in available NPK status i.e. 206.3, 12.3 and 113.8 kg NPK/ha; respectively.

The experiment was conducted during two consecutive Kharif season of year 2000 and 2001. The experiment was laid out in a randomized block design having three replications. The treatment consisted of 4 nitrogen levels No- 0 kg N/ha, N₁- 40 kg N/ha, N₂- 80 kg N/ha and N₃-120 kg N/ha and 4 moisture regimes. 'So'- 5 ± 2 cm irrigation after 3 days disappearance of Ponded water; 'S₁'-Irrigation with held during 10-60 days after transplanting (DAT); 'S₂'-

irrigation with held during 10-60 and 61-75 DAT only and 'S₃'- Rainfed (control). Irrigation of rice crop was provided according to the treatments and had 7, cm irrigation water during each irrigation. Phosphorus and potassium @ 40 and 20 kg/ha, respectively was uniformly applied. The source of nitrogen, phosphorus and potassium were Urea, SSP and MoP, respectively. The crop received one fourth of nitrogen and full dose of phosphorus, potassium and zinc sulphate (25 kg/ha) as a basal and remaining half and one-fourth of nitrogen was applied at the time coinciding tillering and panicle initiation period, respectively. The test variety was "Rajshree" a medium long cultivar. The uptake of NPK was calculated by multiplying NPK contents in grain and straw with their respective grain yield and dry matter. Balance sheet was tabulated by considering the amount of nutrient added and nutrient removed by the crop during period of experimentation.

RESULTS AND DISCUSSION

Grain and straw yield:

Grain and straw yield significantly increased with different moisture regimes and nitrogen levels. The maximum grain (32.09 and 36.68 q/ha) and straw (51.92 and 62.12 q/ha) yield was recorded with 'So' moisture regime and minimum with 'S₃' (rainfed) during the year 2000 and 2001, respectively (Table 1). However, during first year straw yield at 'S₁' moisture regime was statistically at par with 'So' moisture regime. The percentage increase in grain yield of 'So' over 'S₃' (rainfed) was 32.71 and 30.62 during year 2000 and 2001, respectively. This was might be due to favourable moisture condition with 'So' moisture regime which consequently improved the growth and yield attributing characters and ultimately increased the grain yield. Similar results have been reported by Patjoshi and Lenka (1998).

Increasing nitrogen levels significantly increase the grain and straw yield. Maximum grain (34.82 and 39.96 q/ha) and straw (54.61 and 65.81 q/ha) yield was noticed

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