Study the Effect of Nitrogen Division and Plant Density on Yield and Yield Components of Rice ‘Tarom Hasansaraie’ Cultivar

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Abstract- In order to study effect of nitrogen division and plant density on yield and yield components of rice Tarom Hasansaraie cultivar an experiment in split plot randomized complete block design with three replications in Field located in the Miyankooh Village in Tonkabon city functions were performed in 2009. The main factor was the four-level mode of nitrogen division, (T1: 1.3 base + 1.3 beginning tillering + 1.3 primary cluster emergence, T2: 1.3 base + 1.3 beginning tillering + 1.3 full clustering stage, T3: 1.3 base + 1.3 primary cluster emergence + 1.3 full clustering stage T4: 1.3 beginning tillering + 1.3 primary cluster emergence + 1.3 full clustering stage) and four levels of planting density, 100, 44.4, 25 and 16 plants per square meter as the operating subsidiary. Result showed that total number of tillers per plant and total number of spikelet in clusters in four level of nitrogen division were highest. Number of spikes per square meter in the second level of division and density 100 plants per square meter was maximum. Grain yield and biological yield were maximum in plant density 16 plants per square meter therefore the second level of division and sowing density 16 plants per square meter due to the increased number of spikes per square meter and grain yield were best subsidiary.

Keywords: Nitrogen division, Plant density, Rice, Yield components, Grain yield.

I. INTRODUCTION

The primary source of rice were from Asia and India and also of rainfed rice cultivation have been popular for about five thousand years before Christ [1]. About 50% of world rice cultivate in wet grounds [2]. About 7.5 % of total rice production is obtained from irrigated lands [3]. Leoid et al. (1998) stated that rice is one of the crop that will produce an array of tillers at the different time and temporary changes in environmental conditions may cause changes in response reaction of tiller with nutritious, temperature and metabolic stress and thus the survival of each tiller has a negative correlation with maximum tillers number, decrease in survival rates in each tiller with increase in number of tillers due to the reduction of nitrogen concentration [4]. Miller et al. (1991) have reported that the tillering ability of rice is one of the most important traits so that they will affect on next generation of spikelet this traits mean tillering ability has very high correlation with the yield [5].

Faraji et al (2000) found that the mode of nitrogen division has a significant effect on yield and yield components of rice in both of Amol-3 and LD-163 genotype and maximum of yield was obtained in nitrogen use in treatment in 50% in base stage and 50% in tillering stage, respectively [6]. Saha et al. (1998) have stated that the cluster of differentiation and osteoporosis are two important process to identify the final spikelet of cluster. And climatic factors, biological and food are effect for determine spikelet and later yield [7]. Zhang et al. (1997) have shown that applying more nitrogen in middle of growth stage improves in use efficiency and use nitrogen uptake and yield increases [8]. Yoshida (1981) reported that application of nitrogen fertilizer on in slppage 20 days before full appearance of clusters of rice can increase the number of clusters and their size [9]. Miller et al. (1991) have reported that the tillering ability of rice is one of the most important traits so that they can effected tackle the
next generation panicle that may affect the ability of tillering has very high correlation with yield [5]. Ladha et al. (1998) found that the use of nitrogen fertilizer, increased number of tillers [10]. Wang et al. (2001) showed that high tillering capacity in rice hybrids has no significant effect on grain yield [11]. Fu Ying (2000) reported the effects of different planting densities on rice hybrids varieties reported that with reduce in plant density tillers and leaves were added and further growth was far also stated that plant density has significance effect on number of clusters and spikelet and LAI [12]. Mobasser et al. (2007) reported that the effects of planting and transplanting age on yield and yield components in Neda variety with change in plant density number of tiller reduce but the number of spikes per square meter and grain yield And grain yield were significantly increased [13]. Baloche et al. (2002) in an experiment to determine the most appropriate density for the high yield found in rice that with increase in distance between plants, number of clusters, grain yield increases [14]. Reddy and Mitra (1984) showed that increasing in plant density number of spikes per square meter was added [15].

II. MATERIALS AND METHODS

In order to study of the effects of nitrogen and planting density on agronomic traits of rice Tarom Hasansarae cultivar an experiment was performed in personal research farm located in the Miyankoooh Village in 2009 year. The experiment was performed in split plot design in randomized complete block with three replications nitrogen division (number below) as the main factor and four levels of planting density of 100, 44.4, 25, 16 plants per square meter as minor. {T1: 1.3 base + 1.3 beginning tillering + 1.3 primary cluster emergence, T2: 1.3 base + 1.3 beginning tillering + 1.3 full clustering stage, T3: 1.3 base + 1.3 primary cluster emergence + 1.3 full clustering stage T4: 1.3 beginning tillering + 1.3 primary cluster emergence + 1.3 full clustering stage} In classification of the thermal regime, Tonkabon city is considered temperate and humid regions and has clay and loam soil. At first prepare the nursery ground leveling, trowel and fertilizer application were performed. Seeds were disinfected by a solution of 5 thousand vitawx thiram and the environment (in the dark and closed container with wet 60 to 70 percent) was gennated. The seed was then sprayed in the treasury. Land equal to three repeats, each repeat was divided of 16 plots with length and width 2 × 5 meter. Prevent the escape of water, fertilizer and herbicide plots were drawn to a depth of half meter nylon cover. When transplanting to 25 cm in height, was transferred to the main floor and 2 days after transplanting the desired plots were irrigated. In each plot 50 kg/ha urea at each step was used. Fight weeds with herbicides poison tereflan 2.5 liters per hectare was performed 4 days after transplantation and three times with hand 20, 38, 50 days after transplantation.

Number of clusters, in clusters and percentage of spikelet-filled hollow with counts were obtained from 15 clusters in each plot were obtained. The obtained data were analyzed with statistical software MSTATC and drawing diagrams and charts with Excel software and compared by Duncan test at 5% level was performed.

RESULT AND DISCUSSION

III.I. number of fertile tiller

The number of fertile tiller affected by nitrogen division and interaction nitrogen division × plant density was significantly meaningful five percent probability level and affected by plant density was significant at the one percent level. The lowest number of fertile tillers in a hill (10.5 number) was under the third level of nitrogen division and the highest at the second level (11.6 numbers) and fourth (11.7number) was resulted. Fertile tillers were decreased with increasing density. The highest number of fertile tillers in a hill (19.7 number) under the effect of interaction fourth level of division and density 25 × 25 cm. Paul et al. (2002) also found that increasing the density of the number of effective tillering a hill was decreased, which is consistent with survey results [16] (Fig. 1).

Fig. 1: Interaction effect of density and division on the number of fertile tillers

III.II. Number of cluster per square meter

Number of cluster per square meter significantly affected by nitrogen division at the 5% level and interaction between density of planting and division × density was at the one percent level probability. The
maximum number of cluster per square meter (406.7 number) in the second of nitrogen division and the lowest level (396 number) in the third nitrogen division was obtained. The maximum number of spikes per square meter (555.7 number) under interaction affected the second level of division× density 100 plants per square meter was obtained and the lowest (315.9 number) under the interaction effect of third level of division× plant density 16 plants per square meter was obtained. Zheng and Shannon (2000) found the number of cluster per square meter with increase in plant density from 40 to 72 plants per square meter was significantly increased which is consistent with survey results [17] (Fig. 2).

III.III. Total number of spikelet in cluster

The total number of spikelet in cluster significantly affected by nitrogen division alone, density of planting density and interaction effect of nitrogen division × plant density was at 1% level probability. The lowest (952.2 number) and highest (1082 number) the number of spikelet in cluster was obtained in the first and fourth level of nitrogen division. The maximum number of spikelet in cluster (1412 number) under the second level interaction nitrogen division× plant density 16 plants per square meter were obtained (Fig. 3).

III.IV. Filled spikelet in cluster

Percentage of filled spikelet in cluster only affected by nitrogen division, plant density and interaction effect of division × density was significant at the one percent level. Percent of filled spikelet in the first level of nitrogen division was the highest (86.7 percent) amount. The maximum percentage of the filled spikelet (91.48 percent) under the effect of first level of nitrogen division× plant density 25 plants per square meter was obtained. Seed yield statistically is only affected by the density was significant difference in 1% probability level (Fig. 4).

III.V. Seed yield

The highest yield (1.88ton. ha) in planting density 16 plants per square meter, was obtained because the panicle length, number of fertile tillers in hill and the total of spikelet in cluster was obtained in lowest yield in the density and the lowest yield the density 100 plants per square meter.

III.VI. Biological yield

Biological yield statistically affected by nitrogen division and interaction effect of planting density × division at the 5% level probability and the effect of density in 1% level probability. The lowest biological yield (3.77 ton/ha) was obtained in the first level of nitrogen division and in the second and third nitrogen division had the highest value respectively 3.89 and 3.84 tons/ha (Fig. 5).
Population effects on growth and yield of *Oryza sativa*

Analysis of variance, regression, and correlation were assessed traits (* and ** indicate probability is 5% and 1% probability, NS, not significant).

<table>
<thead>
<tr>
<th>Biological yield</th>
<th>Seed yield</th>
<th>Fertil</th>
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<th>Cluster per square meter</th>
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<tr>
<td></td>
<td>d</td>
<td>Fill spikelet</td>
<td>d</td>
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</tr>
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</table>

* and ** significant at 5% and 1% probability. NS, not significant

Table 1: Factorial analysis of variance components (nitrogen division, density and their interaction) for assessed traits

REFERENCES


