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Investigate Panicle Structure in Rice by application nitrogen and phosphorus fertilizer

S. YosefTabar

Young Researchers Club, Iran Islamic Azad University, sari Branch, sari, Iran

Corresponding author Email: sy_1981@rocketmail.com

ABSTRACT: In order to investigate the effect of nitrogen and phosphorus fertilizer on panicle structure in rice cultivar(Oryza Sativa L), an experimental design in north of iran in 2011 cropping season. Nitrogen fertilizer at 50,100 and 150 kg/ha was main plot and phosphorus fertilizer at 4 level 0(control), 30, 60 and 90kg/ha as sub plot. Using randomized complete block desing(RCBD) with 3 replication. The results showed that panicle number, panicle lenght, primary branches, filled grain, 1000-garin weight , straw and grain yield increased significantly with nitrogen fertilizer,but the unfilled grain decrease by application nitrogen fertilizer. Interesting in comparison to 50 and 100 kg/ha level application of higher N-fertilizer 150 kg/ha showed a positive respond to application of high nitrogen for taroom hashemi cultivar. Effect of different application of P-fertilizer were significantly on panicle number, filled grain, unfilled grain,1000-garin weight , straw and grain yield. this parameter increase by application P-fertilizer, but the unfilled grain decrease by application phosphorus fertilizer. study of interaction effect of N and P-fertilizer was significant in panicle number and 1000-grain weight.

***Keywords*:** Rice-Nitrogen- Phosphorus- Panicle Structure

INTRODUCTION

Rice is a major crop of 89 countries in the staple food for half of the world population. world wide, rice is harvested in 150.2 milion hectare. In global rice scenario, there is a total production of 606.3 milion tons of unmilled,rough rice with an average productivity of 4.03 tonnes/ha ,asia contributes 59% of world population and accounts for 92% of global rice production(Nachimuthu *et al*,2007). To insure proper growth, large amount of chemical fertilizers are applied in different crops field(Shakouri *et al*,2012). Proper fertilization is an important management practice which can increase the yield of rice,Judicious and proper use of fertilizers can markedly increase the yield and improve the quality of rice(Alam et al,2009). Fertilizer is very important input for intensive rice production the profitability of rice production systems depends on yield and input quantities. so the appropriate fertilizer input that is not only for getting high grain yield but also for attaining maximum profertility (khuang *et al*,2008). Nitrogen and phosphorus fertilizer is a major essential plant nutrient and key input for in increasing crop yield (Dastan *et al* ,2012- Alinajoati sisie & Mirshekari, 2011-Alam(a) *et al*,2009). Nitrogen is a major essential plant nutrient and a key input for increasing crop yield,yield increase(70-80%)of field rice could be obtained by the application of nitrogen fertilizer(Isalam *et al*,2009). The nitrogen nutrition of rice are mainly focused on the aerial parts,such as leaves,in which the absorption and utilization efficiency of nitrogen nutrition ,the effective state and applications of nitrogen fertilizer and the relationship between its application amount and production,quality and related physiology are investigated(xia *et al*,2011). Application of p fertilizer is one of the most important for higher crop yields(Li *et al*, 2010). Higher P application rates increased uptake of all nutrients- a relationship which held true up to and including the P rate provided under the ASI(Patlanayak et al,2008). Phosphorus deficit is a most important restrictive factor in plant growth and recognition of mechanisms that increase plant phosphorus use efficiency is important(Alinajoati sisie & Mirshekari, 2011). According to nitrogen and phosphorus importance on

growth and yield , This study was conducted to determine the effects of nitrogen and phosphorus fertilizer on panicle structure in rice cultivar(Oryza Sativa L).

MATERIALS AND METHODS

In order to investigate the effect of nitrogen and phosphorus fertilizer on panicle structure in rice cultivar Tarom Hashemi, an experimental design in babolsar region in north of iran in 2011 cropping season. Nitrogen fertilizer at 50,100 and 150 kg/ha was main plot and phosphorus fertilizer at 4 level 0(control),30,60 and 90kg/ha as sub plot. Using randomized complete block desing(RCBD) with 3 replication. The plot size was kept as 2×2 meter. Chemical herbicides were employed against different weeds during the course of study. Plots received identical cultural treatments in terms of ploughing, cultivation seed rate, K fertilizes and disease control. in maturity time, panicle number, panicle lenght, primary branches, filled grain, unfilled grain,1000-garin weight ,straw and grain yield was measured. The data were analysed following analysis by SAS software. The Duncan multiple range tests was used to compare the means at 5% of significant.

RESULTS

Panicle number, panicle lenght, filled grain, unfilled grain,1000-garin weight and yield increased significantly with nitrogen fertilizer. The effect of nitrogen fertilizer on panicle number ,1000-garin weight and grain yield were significant in 1% probability level and panicle lenght, filled grain, unfilled grain and straw yield were significant in 5% probability level. But the nitrogen fertilizer on primary branches no significant effect. The effect of phosphorus fertilizer on yield was significant in 1% probability level. Panicle number, filled grain, unfilled grain,1000-garin weight and straw yield were significant in 5% probability level but the phosphorus fertilizer on panicle length and primary branches no significant effect. The interaction effect of nitrogen and phosphorus fertilizer on 1000-grain weight was significant in 5% probability and no significant effect in other parameter. (Anh & Phung ,2004) reported in long-term experiment,phosphorus played a main role that that affected to rice yield and rice yield components. The main effects of N and P fertilizer levels showed significant differences for all yield and yield components studied ,the effects of N by P interaction were significant only for grain yield,number of panicle per m^2, number of spikelets per panicle and plant height among the different yield and yield component studied (Gebrekidan & Seyoum,2006).

Table 1.

Treatment	df	Panicle number	Panicle length	primary branches	Unfilled grain	Filled grain	1000-gain weight	Straw yield	Grain Yield
N †	2	**	*	n.s	*	*	**	*	**
P ‡	3	*	n.s	n.s	*	*	*	*	**
N×P ±	6	n.s	n.s	n.s	n.s	n.s	*	n.s	n.s
%C.V		5	4.79	2	8.82	14. 31	2.56	10.73	5.26

†:Nitrogen fertilizer
‡: phosphorus fertilizer
±:Interaction effects of nitrogen fertilizer and phosphorus fertilizer
* and ** respectively significant at 5% and 1%

Maximum panicle number under nitrogen fertilizer treatment was (23.01) observed for 150 kg/ha nitrogen and minimum of that was(17.15) obtained for 50 kg/ha nitrogen fertilizer (figure1) and panicle number under phosphorus fertilizer treatment in P1 to P4 was (16.35), (17.82), (19.98) and (22.74) respectively (figure 2). The number of panicle bearing were markedly affected by different nitrogen application stagies(Irshad *et al*,2000).

Maximum panicle number under interaction of nitrogen and phosphorus fertilizer was (22.25) observed for (N3P4)150 kg/ha nitrogen with90 kg/ha phosphorus and minimum of that was (14.88) obtained for (N1P1) 50 kg/ha nitrogen fertilizer with 0(control)phosphorus fertilizer (figure 3). The P level significantly increased panicle number, the highest mean number of panicle per m^2(201.8 m^{-2}) was obtained with the application120 kg and 39.6 kg p ha^{-1} (Gebrekidan & Seyoum,2006).

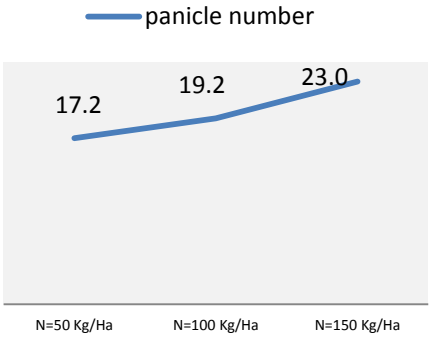


Figure 1. Effect of nitrogen fertilizer on panicle number

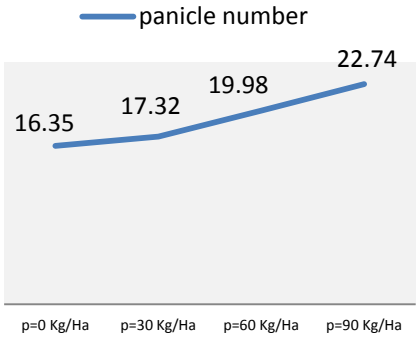


Figure 2. Effect of phosphorus fertilizer on panicle number

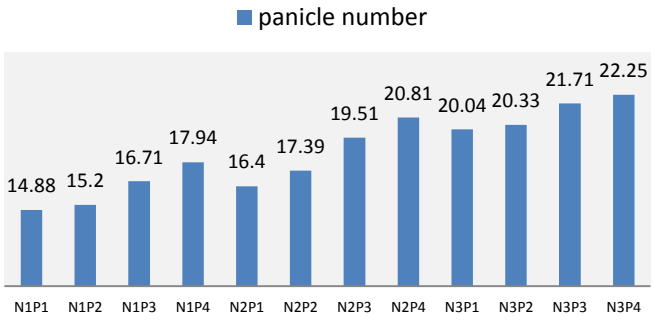
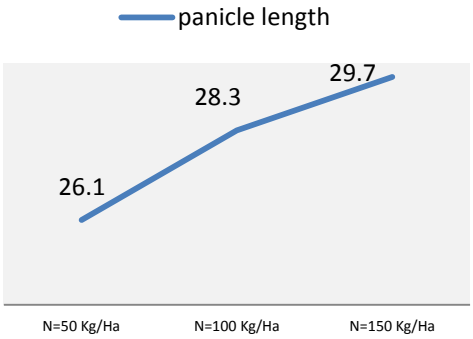


Figure 3. Effect of intraction N and P fertilizer on panicle number

panicle lenght under nitrogen fertilizer treatment in N1 to N3 was (26.11), (28.33) and (29.65) respectively (figure 4). (Tabrizi *et al*,2011) reported that significant difference in panicle length among nitrogen rates at 0.01 probability level,also they showed that the panicle number of N_0 and N_{96} with 21.6 and 24.78cm were lowest and longest respectively. panicle number under phosphorus fertilizer treatment in P1 to P4 was (26.22), (27. 54), (26.78) and (28.14) respectively. Phosphorus application has also improved 1000-grain weight, panicle length and plant height thereby indirectly to increment in grain yield(Gebrekidan & seyoum, 2006). Panicle length of rate of three rice varities increased with the in creasing rate of P fertilizer(Alam *et al*,2009).



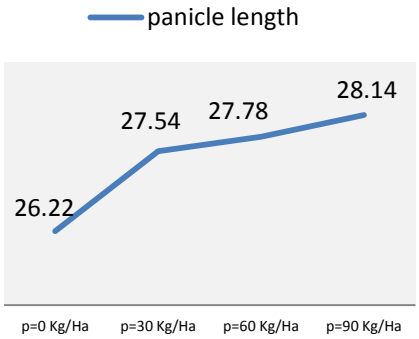


Figure 4. Effect of nitrogen fertilizer on panicle length.

Maximum filled grain was (82.29) observed for 150 kg/ha nitrogen fertilizer and minimum of that was(66.82) obtained for 50 kg/ha nitrogen fertilizer (figure 5). The nitrogen absorbed during the late phase of panicle formation increases the hull size and percentage of filled grains by decreasing the number degenerated spikelet and contributes to grain filling by increasing the number of degenerated spikelet, and contributes to grain filling by increase spikelets, and contributes to grain filling by increase specific leaf wight and N contents at the panicle initiation, formation stage is critical when determining the potential yield(Lee *et al*.,2011).

Maximum filled grain was (79.92) observed for 60 kg/ha phosphorus fertilizer and minimum of that was(68.38) obtained for(control) 0 kg/ha phosphorus fertilizer(figure 6). The interaction effect of nitrogen and phosphorus fertilizer no significant effect on filled grain. Panicles was also significantly affected by different phosphorus phosphorus at 72 kg P_2O_5 (P2) produced the highest number of filled grain panicles^{-1}(Alam(a) *et al*,2009). also (Gebrekidan & Seyoum, 2006) reported similar trends in with higher doses of P fertilization,they suggested that the higher doses of P fertilization, reduction of grain yield was caused mainly by the successive reduction in the number of filled spikelet per panicle and 1000-grain weight of rice.

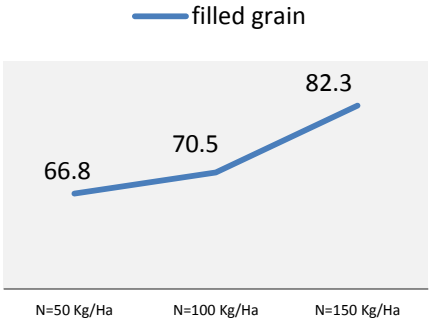


Figure 5. Effect of nitrogen fertilizer on filled grain

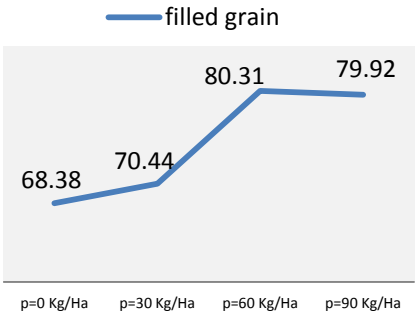


Figure 6. Effect of phosphorus fertilizer on filled grain

Maximum unfilled grain was (22.1) observed for 50 kg/ha nitrogen fertilizer and minimum of that was(14.2) obtained for 150 kg/ha nitrogen fertilizer(figure 7). (Tabrizi *et al*,2011-24-1) showed that caused plants produced as the nitrogen fertilization level increased ,contribution to increase the number of unfilled spikelets and to decrease fertility,lowering productivity. Maximum unfilled grain was (21.25) observed for (control)0kg/ha phosphorus fertilizer and minimum of that was(17.49) obtained for 60 kg/ha phosphorus fertilizer(figure 8). Due to lack of phosphorus unfilled grains panicle was highest with lower doses of phosphorus,also reported that application of 72 and 96 kgp2o5 ha-1 can reduce the unfilled grain (Alam(a) *et al*,2009).

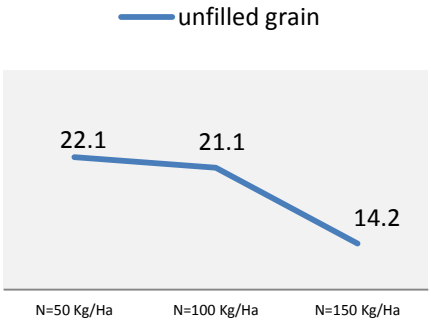


Figure 7. Effect of nitrogen fertilizer on unfilled grain

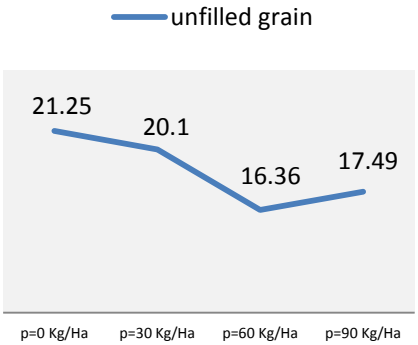


Figure 8. Effect of phosphorus fertilizer on unfilled grain

1000-grain weight under nitrogen fertilizer treatment in N1 to N3 was (23.3),(24.2) and (25.6) respectively (figure 9) and 1000-grain weight under phosphorus fertilizer treatment in P1 to P4 was (22.88), (23.1), (24.47) and (25.03) respectively(figure 10). (Azarpour *et al*,2011) found that the minimum 1000-grain weight with 25.83gr was recorded from(control) 0kg.ha^{-1} nitrogen fertilizer,they reported that 1000-grain weight,number of grain/panicle,panicle weight and grain and straw yields were not significant effect by increasing nitrogen level from 30 to 60 kg .ha^{-1}.Maximum 1000-grain weight under interaction of nitrogen and phosphorus fertilizer were (26.81) and (26.26) observed for (N3P3)150 kg/ha nitrogen with 90 kg/ha and(N3P3)150kg/h with 60 kg/ha phosphorus. Minimum of that was(22.3) obtained for (N1P1) 50 kg/ha nitrogen fertilizer with 0(control)phosphorus fertilizer(figure 11). Maximum 1000-grain weight(66.00 gr)was obtained in plots treated with NP at 128-128 kg,ha -1.it is clear from the results that increasing the ratio of NP also increased in 1000-grain weight(Kaleem *et al* ,2009).

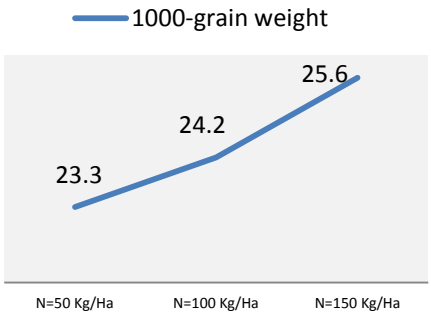


Figure 9. Effect of nitrogen fertilizer on 1000-grain weight.

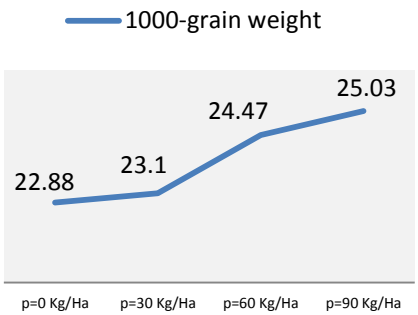


Figure 10. Effect of phosphorus fertilizer on 1000-grain weight.

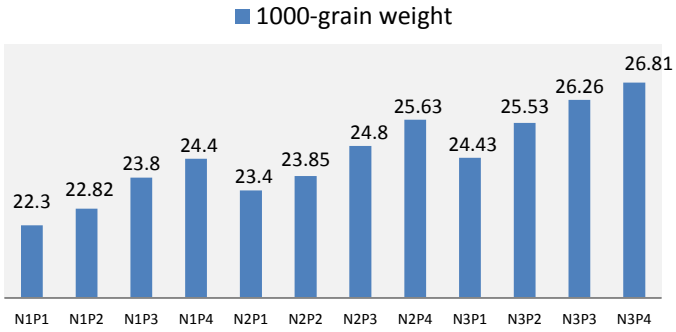


Figure 11. Effect of intraction N and P fertilizer on 1000-grain weight

Maximum straw yield was (4808) observed for 150 kg/ha nitrogen fertilizer and minimum of that was(4100) obtained for 50 kg/ha nitrogen fertilizer(figure12). Nitrogen application increased straw yield over control(Irshad *et al*,2000). Maximum straw yield was (4750) observed for 90 kg/ha phosphorus fertilizer and minimum of that was(3988) obtained for (control) 0 kg/ha phosphorus fertilizer (figure13).

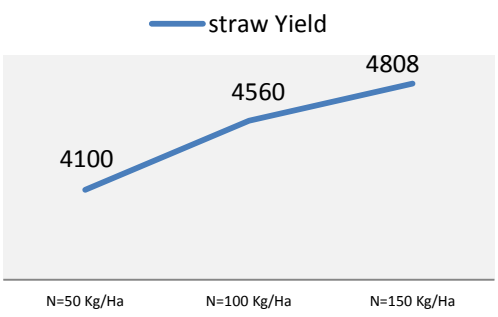


Figure 12. Effect of nitrogen fertilizer on straw yield

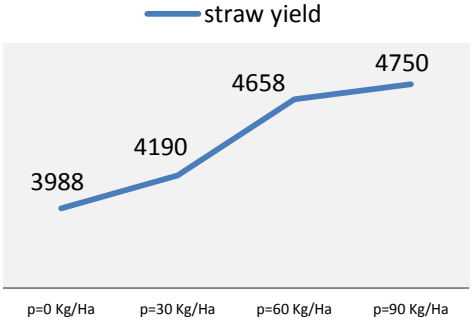


Figure 13. Effect of phosphorus fertilizer on straw yield

Maximum yield was (4540) observed for 150 kg/ha nitrogen fertilizer and minimum of that was(3700) obtained for 50 kg/ha nitrogen fertilizer(figure14). (Tabrizi *et al*,2011)consistently equal or higher grain yield from the standard fertility treatment support current recommendations and suggest that higher N,P and K rates may not result in increased grain yields.The different N rates used showed significant influence on yield and yield components,it was observed that 60 and 40 kg $N.ha^{-1}$ significantly increased the number of grain per panicle of rice while panicle length sho no significant different between 60, 40 and 20 kg $N.ha^{-1}$,though significantly lower than 0 kg $N.ha^{-1}$ (Okonji *et al*,2011).Maximum yield was (4470) observed for 90 kg/ha phosphorus fertilizer and minimum

of that was(3650) obtained for(control) 0 kg/ha phosphorus fertilizer(figure15). Phosphorus plays a very important role to increases rice yield,particularly in wet season(Anh & Phung,2004). application of phosphorus fertilizer had also significantly increased the grain yield of rice up to the applied level of 26.4 kg.ha^{-1}(Gebrekidan & Seyoum,2006). Resulted pf the effects soil P on P nutrition and yield of rice showed that rice yield increased linearly with an increase in soil P content up to 6 mg kg^{-1} (Choudhury *et al*,2007).

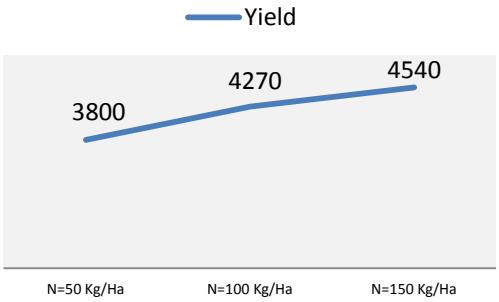


Figure 14. Effect of nitrogen fertilizer on yield

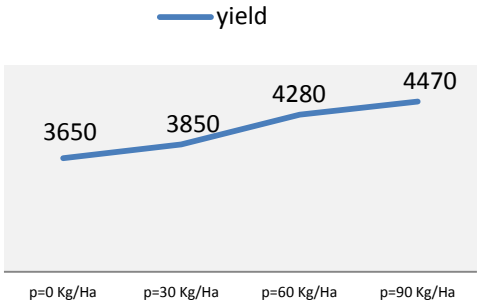


Figure 15. Effect of phosphorus fertilizer on yield

DISCUSSION

Application Nitrogen and phosphorus fertilizer on in rice cultivar Tarom Hashemi resulted that panicle number, panicle lenght, filled grain, ,1000-garin weight and yield increase by application N-fertilizer, Maximum of this parameter were in application 150 kg/ha nitrogen fertilizer. Also panicle number, filled grain, unfilled grain,1000-garin weight and yield increase by application P-fertilizer, Maximum of this parameter were in application 90 kg/ha phosphorus fertilizer. But the unfilled grain decrease by application nitrogen and phosphorus fertilizer and primary branches no response to application nitrogen and phosphorus fertilizer. study of interaction effect of N and P-fertilizer was significant in panicle number and 1000-grain weight. maximum of this parameter were in application 150 kg/ha N-fertilizer at 90 kg/ha P-fertilizer(N3P4).

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