The Effect of Application of Different Rate N-P Fertilizers Rate on Yield and Yield Attributes of Bread Wheat in Case of Chancha Woreda Southern Ethiopia

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Abstract
Nitrogen and phosphorous is the most essential elements for the plant growth and to boost the yield of crops but the most tropical soils including the Ethiopian soils are poor in the availability of the nitrogen and the phosphorus elements for these reasons the yields of the crops gradually declining. For these reasons the experiments conducted on farmers FTC AT Cahcha woreada southern Ethiopia by using two (2) levels of nitrogen and the four (4) levels of phosphorus fertilizers levels are laid out completed block design with three replications The ANOVA confirmed that there is a significant difference between the yield and growth parameters of the wheat variety Denda. within the growth parameters the highest mean was spike length recorded from with the application of 50kg/ha of nitrogen and 150 kg/ha phosphorus fertilizers while the lowest was recorded from the negative control treatments and the highest mean of the plant height 87.2cm was recorded from the application of the 50 kg/ha of nitrogen and 100kg of phosphorus. From the yield parameters the highest grain yield 63.96/ha quintals was obtained from the application of the 50 kg/ha of nitrogen and the application of 150kg/ha phosphorus fertilizers likewise the highest mean of the biomass yield 1599 kg/plot was obtained from the application of 50 and 150 kg/ha nitrogen and phosphorus fertilizers respectively treatments. From the above fined the use of 50kg/ha of nitrogen and 150 kg/ha phosphorus fertilizers level application is increase the yield of wheat crops in chancha woreda but the further conducting of the researches in different location is important for sound full recommendation
Keywords: fertilizers, nitrogen, phosphorus, wheat

INTRODUCTION

The cultivation of wheat (*Triticum* spp.) reaches far back into history. It was one of the first domesticated food crops and for 8000 years it has been the basic staple food of the major civilizations of Europe, West Asia and North Africa. It is grown on more land area than any other commercial crop and continues to be the most important food grain source for humans. Its production leads all crops, including rice, maize and potatoes (Curtis, 2000).

During the past two decades wheat production in much warmer areas has become technologically feasible (Saunders and Hettel, 1994). In altitude, the crop is grown from sea level to more than 3 000meters above sea level (masl) and it has been reported at 4570 masl. (Percival, 1921).

The increase in wheat production, more than any other crop, has allowed food supply to keep pace with world population growth. Of all the wheat grain produced, an estimated 65% is used directly as food for humans, 21% as feed for livestock, 8% as seed and 6% for other uses including industrial raw materials; and much of the stem and leaf is exploited either as straw or less commonly as fresh forage (Gooding and Davies, 1997).

Ethiopia is the largest wheat producer in the sub-Saharan Africa producing wheat in about one Million hectares. Wheat is one of the major cereal crops in the Ethiopian highlands that lie between latitude of 6o and 16oN and longitude of 35o and 42o E and is widely grown from 1500to 3000 masl. The most suitable areas for wheat production however fall between 1900 and2700 masl (Hailu, 1991). According to CSA (2005), wheat planted area only during the *Meher* season was 1,398,215 ha

The low yield of wheat in Ethiopia (1.3 t/ha) is primarily due to depleted soil fertility (Tanner *et al*., 1993), low levels of chemical fertilizer usage (Asnakew *et al*., 1991), and the unavailability of other modern crop Management inputs (Asnakew *et al*., 1991). Thus, managing soil fertility is crucial for improving agricultural productivity in this country. For these reason the research was conducted with the following objective

- To determine the optimum rate of fertilizer of N-P for Gamo Gofa zone chancha woreada
- To determine the yield and yield attributes of wheat by application of different rate of N-P

Materials and methods

Description of the Experimental Site

The experiment was conducted on farmers' fields during the main rainy season (June-November) of 2006 in Chancha District of south National Regional State (SNNP). Chancha is located at coordinate of 37ºc 60' E and 6º c13' N and altitude 3005 m. (Wassie e*t al*, 2005). From the experimental site the phyisco chemical characteristic was determined and shown in the table 1 below

Experimental Treatments, Design and Procedures
Experimental Treatments and Design
The treatments considered in the study were a factorial combination of five levels of N (0, 50 kg ha-1) and five levels of P (0 50 100 150 kg ha^{-1}) fertilizers. The treatments were laid down in randomized complete block design with three replications by factorial arrangement arranged at factorial arrangement by using RCBD total 8 experimental unites replicated three times. A bread wheat variety Damph(Denda) was planted in raw with seeding rate of 125kg ha^{-1} with the plot size of 4 meter by 4 meter .two outer most rows (40 cm) from both sides of a plot and 0.5 m row length at both ends of each row of plot were left. Hence, 9.6 m^2 (3.2 m x 3 m) of net plot size was used for the collection of data. Seeding was carried out based on recommendation of the National Seed Industry Agency (**NSIA**, 1999) at the rate of 150 kg-^{ha} which is equivalent to 240 g -^{plot} and seeds were sown by hand. Prior to seeding, systematic weighing of the fertilizer was done for each plot. Weeding was done manually three times during the period of the crop.

Laboratory Analyses
All laboratory analyses were done following the procedures in laboratory manual prepared by Sahlemedhin and Taye (2000). The soil samples were air-dried and ground to pass a 2-mm sieve and 0.5 mm sieve (for total N) before analysis. Soil texture was determined by Bouyoucos hydrometer method. The pH and electrical conductivity of the soils were measured in water (1: 2.5 soils: water ratio). Organic carbon content of the soil was determined following the wet combustion method of Walkley and Black while Total nitrogen by (wet digestion) procedure of Kjeldahl method. The available phosphorus content of the soil was determined by Bray II method. The available potassium was determined by Morgan's extraction solution and potassium in the extract was measured by flame photometer.

Table 1 physico chemical properties of the tested soil

Parameters	Texture	pH	OC (%)	N (%)	Available P(pmm)	Exchangeable K(ppm)
	Clay loam	4.4	2.2	0.32	3.02	11

Statistical Analysis
All data collected were subjected to the analysis of variance (ANOVA) using SAS GLM procedure (SAS Institute, 1998). The significance between mean values was expressed by Least Significant difference Tests (LSD).

Result and decision
Growth Parameters
Number of tillers per meter row at mid – tillering
Number of tillers at mid - tillering was not affected significantly due the application of different rate of nitrogen and phosphorus fertilizers. These might be due to from four years of observations made on farmers' fields; in Gamo gofa zone locally Denda or Dampha verity of wheat was found to be weak in its tillering ability than other wheat (personal observation).

The spike length
Spike length of the wheat plant showed statistically significant differences between with the application of the nitrogen and phosphorous fertilizers sources ($P \leq 0.01$). (Table 2).The spike length of the wheat ranged from 6.0–7.7 cm. The highest spike length 7.7cm plant^{-1}) was recorded from the applications of 50kg/ha nitrogen and 150kg/ha phosphorus while the lowest spike length (6.0cm plant^{-1}) was recorded from the control treatment**.**

The application of 50kg/ha nitrogen and 150kg/ha phosphorus significantly increased the spike length of over the control and this might be due to the release of enough nitrogenous compounds for wheat growth, mostly nitrates and ammonium, which can be readily taken up by vascular plants Absorbed nitrogen in turn increases spike length through stem elongation brought about by cell division and expansion (Havlin *et al*., 2010).

Plant height
The ANOVA conformed that The pant height showed the there is no significant difference between the treatments at the probability level of ($P \leq .0.5$).the highest mean was reordered from the treatment which applied 50kg/ha of the N-fertilizer and 100kg/ha of phosphorus fertilizers the lowest was recorded from the control one but all treatments are at pare to each others.

The highest mean was obtained from the highest level of nitrogen applied treatments might be due to as the nitrogen fertilizer rate increased from 0 to 50 kg/ha, the plant height increased from 70.2 cm to 87.2 cm (Table 2). As the P rate increased from 0to 100 kg/ ha the plant height increased from 70.2 cm to 87.2 cm. Similarly Amsal *et al (*2000) observed a positive and linear response to applied fertilizer to plant height in the central highlands of Ethiopia. Several studies in Ethiopia also exhibited dramatic plant height enhancement in response to each increment of fertilizer N doses (Mekonnen, 1985.) similarly Khan *et al.* (2000) who reported that increasing nitrogen rate increased the plant height. Maximum plant height (88.2 cm) was recorded at N rate of 46 kg ha-1, while minimum plant height (84.5 cm) was recorded in the control (0 kg ha^{-1}).

1000 seed weight

The ANOVA confirmed that the there is no significance difference between the treatments but the highest mean was reordered from control one but while the lowest mean was recorded from0kg/ha nitrogen fertilizer and the 100kg/ha phosphorous fertilizers treatment

N-P rate	Growth and Yield parameters				
	Spike length (cm)	Plant height(cm)	1000 seed weight	Grain yield (quintals)	Biomass weight (kg/ha)
0-0	6.0bc	70.2 a	317.67a	15 f	1400b
0-50	6.06bc	80.06a	312.47a	59.17abcde	1500ab
0-100	5.93c	77.93a	291.53ab	45.8 cde	1580a
0-150	6.2bc	80.86a	299.6ab	40.00de	1592a
50-0	6.6b	80.06a	316.2ab	36.25e	1596a
50-50	6.2b	79.6a	306.07ab	46.46bcde	1598a
50-100	7.06ab	87.2a	310.93ab	36.04e	1590a
50-150	7.7a	81.00a	311.67ab	63.96abcde	1599a
CV (%)	7.62	5.82	4.3	31.4	4.6
LSD (5%)	0.85	8.302	21.41	39.51	110

Grain yield

The ANOVA result revealed that the there is a significant variation between the treatments the highest mean 63.96 quintals was recorded from the treatment 50kg/ha nitrogen and 150kg/ha of phosphorous fertilizers while the lowest mean 15quintals was obtained from negative control one .The significance variation from the treatments obtained from the treatments might be due to due to the increasing of the nitrogen fertilizers level in the soil which increasing the vegetative growth of the wheat. The increase in grain weight/m row might be due to effect of nitrogen which expands the plant to produce taller plants, longer spikes, and more spiklets /spike and therefore more grain yield/m row (Gooding and Davis, 1997).Further, nitrogen and phosphorus application and their interaction were reported to increase grain yields of wheat (Mulatu, 2006)

Biomass weight

There is significance difference between the treatments on biomass weight. The highest biomass weight 1599kg/plot was obtained from the treatment of application of 50kg/ha of nitrogen and 150kg /ha of phosphorous fertilizers but there is no significance difference between the rest treatments. The highest grain yield obtained from the application of 50kg/ha of nitrogen and 150kg/ha phosphorous fertilizers might be due to nitrogen which enhance leaf area development as well as photosynthetic activity of the leaf and therefore increase biomass weight (Roger *et al.,* 1987). In contrast, the lowest bio mass weight obtained from the control can be explained by lower N content, which retarded leaf area development resulting in lesser radiation interception, and consequently lower efficiency in converting solar radiation and thereby reduce the bio mass weight.

Summary and conclusion

The population growth of Ethiopia are going in alarming rate so the production of food for all Ethiopian people's with use the use of modern agricultural system is difficult. Tropical countries like Ethiopia soils are poor in nitrogen phosphorus and the fertility of the soils very poor to produce enough amount of food so to increase the fertility of the soil application of different soil fertility increasing parameters is important for these reason the experiment is conducted with the effect of application of different nitrogen and phosphorus fertilizer rate on wheat crops yield and yield parameters on Chencha woreda southern Ethiopia.

From the field experiments ANOVA confirmed that the highest yield and yelled parameters are obtained from the application of 50kg/ha of nitrogen and 150 kg/ha of phosphorus fertilizers on chanca woreda southern Ethiopia. Before the dissemination of the results conducting these experiments in different location with the same agro ecological areas is important for sound full recommendations.

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