Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; SP4: 20-22

Davinder Handa
Department of Agriculture, D.A.V. College, Abohar, Punjab, India

Navdeep Gandhi
Department of Agriculture, D.A.V. College, Abohar, Punjab, India

Karampal Singh
Department of Agriculture, D.A.V. College, Abohar, Punjab, India

Correspondence
Davinder Handa
Department of Agriculture, D.A.V. College, Abohar, Punjab, India

(Special Issue- 4)
National Seminar
"Role of Biological Sciences in Organic Farming"
(March 20, 2019)

Effect of split dose of nitrogen fertilizer on the yield and yield components of wheat (*Triticum aestivum* L.)

Davinder Handa, Navdeep Gandhi and Karampal Singh

Abstract
The research was carried out to evaluate Effect of split dose of nitrogen fertilizer on the yield and yield components of wheat on the yield and yield components of wheat. Variety that used in the experiment was HD 2967. The experiment was to determine which split application of nitrogenous fertilizer (T_1 in single dose; T_2 in two split and T_3 in three split) is more suitable to the particular locality under a commercial point of view. It was found that three split applications of nitrogen fertilizer in wheat was able to show better results. All the biometric parameters such as dry matter accumulation, number of spikelet per plant, 1000 seed weight and grain yield which were observed during the experiment gave better result in T_3 treatment (three split of N fertilizer). It was concluded from the present experiment that three split of N fertilizer in wheat showed more promising results then single and two split of N fertilizer.

Keywords: Nitrogen Dose, Wheat, Yield, Yield Characters.

Introduction
Wheat (*Triticumaestivum*) is one of the most extensively grown crops of the world and is the second most important staple food in India after rice (Kumar *et al.* 2013) [6]. Wheat is the world's leading cereal crop, cultivated over an area of about 215 million hectares with a production of 729 million metric tonnes of grain. India accounts about 12 percent of the total wheat production of the world. The wheat production increased from 12.5 million tonnes in 1964 to around 73 million tonnes in recent years. India has the capacity to become world leader in the production of wheat. The highest production of wheat in the country (76.37 million tonnes) was realized during the 1999-2000 crop season (Yadav *et al.* 2006) [11]. In India, the total area under the wheat crop is about 29.8 million hectares. Wheat production crossed the mark of 95 million tonnes in the year 2013-2014. Uttar Pradesh, Punjab and Haryana are major wheat growing states in the country. Though the maximum acreage and production of wheat is in Uttar Pradesh but Punjab gives highest average yield per hectare (4693 kg ha^{-1}) followed by Haryana (4624 kg ha^{-1}) (Anonymous 2014) [2].
Nitrogen is the most important fertilizer element playing vital role in yield improvement of wheat and the element is frequently reported as deficient in agricultural soils of India. Split nitrogen fertilizer applications can play an important role in a nutrient management strategy that is productive, profitable and environmentally responsible. Dividing total nitrogen application into two or more treatments can help growers enhance nutrient efficiency, promote optimum yields and mitigate the loss of nutrients. Depending on soil type, climate, agronomic, practices and other factors, nitrogen fertilizer can be vulnerable to loss. In wheat, a lot amount of applied nitrogen goes as waste through different process like volatilization, denitrification and leaching (Basit *et al.* 2005) [3]. Denitrification, leaching and volatilization impose costs that include lost productivity and negative environment impact. Split applying nitrogen fertilizer is one way to confront these challenges. Three split application of N as top dress is a common practice for irrigated rice cultivation in India, but in case of wheat, two-thirds of nitrogen fertilizer applied as basal during final land preparation and rest one-third applied as top dressing at crown root initiation (CRI) stage reported as most efficient in improving grain yield (Rahman *et al.* 2011) [7].
Therefore, the present study was undertaken to validate existing nitrogen application methods

and time in order to optimize the dose of N fertilizer and recommend the most effective method of N application in wheat.

Material and Methods

The experiment was carried out at the farm of Mr. Jagdish Kumar, Village Sher Mohamad Mahighir, Teh. Jalalabad (west), P.O Jalalabad (West), Distt. Fazilka during *rabi* season 2015-16. The site lies at 30.62° N latitude and 74.25° E longitude. It is located at elevation of 176m above sea level. The soil of the area is sandy loam. The water holding capacity of soil is good. The field was properly prepared with disc plough followed by two ploughing with cultivator. The field was leveled with the help of a planker. Pure and healthy seeds @ 40 kg acre^{-1} were used to sown. A seed-cum fertilizer drill was used to sow seeds in the field. The spacing of 20cm between the rows and the seeds were placed at the depth of 4-6cm. The first irrigation was applied after 25 days of sowing. Then irrigation was applied at interval of three-four weeks. Nitrogen (50 kg acre^{-1}) in the form of urea was applied in treatments (T_1 full dose of nitrogen at sowing; T_2 ½ nitrogen at sowing; ½ nitrogen at 1st irrigation; T_3 ⅓ nitrogen at sowing; ⅓ nitrogen at 1st irrigation; ⅓ nitrogen at 2nd irrigation). P_2O_5 (23 kg acre^{-1}) in the form of D.A.P was applied at the time of sowing. The weedicides used for controlling broad leaf weeds and grassy weeds after 40 days of sowing.250 ml of 2, 4-D ethyl ester in 200 litres of water has applied in one acre of field for control of bathu (*Chenopodium album*). The dose of Topic (Clodinafop 15 WP) 160 g in 100 litres of water was applied in one acre for control gullidanda (*Phalaris minor*). The crop was harvested on 15-April-2016.The crop was threshed after 2 days of harvesting on 17-April-2016.

Results and Discussion

Dry matter accumulation

Dry matter accumulation is the result of total accumulation of photosynthates formed and total nutrient uptake by the plant up to the stipulated growth period. The periodic dry matter was recorded at 30, 60, 90, 120 days after sowing and at harvest (as shown in table 1).

Table 1: Dry matter weight per plant

Treatment	Dry matter accumulation (g)				
	30 DAS	60 DAS	90 DAS	120 DAS	At harvest
T_1	0.20	1.80	9.60	14.80	15.50
T_2	0.60	2.30	11.20	19.80	20.80
T_3	0.40	4.00	12.80	27.20	28.50

After 30 days of sowing it was observed that the dry matter accumulations of wheat in T_1, T_2 and T_3 treatments were 0.20 g, 0.60 g and 0.40 g respectively. But in next reading has been observed that more weight of wheat in T_3 treatment than of T_1 and T_2 treatments. At harvesting the plant dry matter accumulation of wheat in T_1, T_2 and T_3 treatments were 15.5 g, 20.8 g and 28.5 g respectively. Results confirm from Sohail *et al.* (2013) [10], Deressa and Nigussie-Dechassa (2013) [4] and Ananda and Patil (2005) [1].

Number of spikelet per plant

Spikelet is an important character in wheat crop. The yield of wheat crop is mainly depends upon the number of spikelets per plant. The number of spikelets per plant was counted at time of harvesting. The data pertaining to the effect of different treatments on number of spikelet per plant are presented in table 2.

Table 2: Number of spikelet per plant at harvesting

Treatments	Number of spikelet per plant					Average
	1	2	3	4	5	
T_1	4	4	5	3	4	4.0
T_2	5	4	5	6	4	4.8
T_3	6	7	5	8	7	6.6

The average numbers of spikelet were counted from five plants at the time of harvesting. The number of spikelet per plant of wheat was same as number of tillers per plant. It has been observed that number of spikelet per plant of wheat in T_3 treatment was more than T_1 and T_2 treatments. The average numbers of spikelet per plant of wheat were 4.0, 4.8 and 6.6 found in T_1, T_2 and T_3 treatments respectively. Results confirm from Singh *et al.* (2016) [9], Kumar *et al.* (2013) [6], and Samsujjaman *et al.* (2009) [8].

1000 grains weight

The data on 1000-grain weight have been presented in table 3. The grain weight indicates the nature and extends of grain development. It is the function of various production factors that influence grain development and filling patterns. Different split dose of nitrogen fertilizer had significant effect on 1000-grain weight.

Table 3: 1000 grains weight at harvesting

Treatments	1000-grain weight (g)
T_1	41
T_2	43
T_3	47

It has been observed that 1000 grain weight of wheat was more in T_3 treatment than of T_1 and T_2 treatments. 1000 grains weight of wheat was 41 g in T_1 treatment, 43g in T_2 treatment and 47 g in T_3 treatment (as shown in table 4). Results confirm from Singh *et al.* (2016) [9], Sohail *et al.* (2013) [10] and Jan *et al.* (2011) [5].

Yield per acre

Grain yield of a crop is the net resultant of interaction of various factors and is a valid criterion for comparing the efficiency of different inputs in a given situation. Grain yield in wheat is primarily a function of number of grains per spikelet and 1000-grain weight. The efficiency of different factors can be judged mainly by addition they make to yield which is the ultimate aim of the field research investigations. The data on grain yield is presented in table 4.

Table 4: Average Yield per acre

Treatments	Yield (q acre^{-1})
T_1	14.08
T_2	15.20
T_3	17.76

Spits dose of nitrogen fertilizer had significant effect on wheat grain yield. The wheat grain yield was maximum (17.76 q acre^{-1}) in T_3 treatment where nitrogen fertilizer was applied in three splits minimum in T_1 treatment where all nitrogen fertilizer was applied at sowing. Kumar *et al.* (2013) [6], Sohail *et al.* (2013) [10] and Rahman *et al.* (2011) [7] has also reported

the similar results.

Conclusion

The present experiment concluded that nitrogen fertilizer applied in three splits is the best treatment for the growth and grains yield characters. Nitrogen fertilizer applied in three splits in wheat exhibited high mean value for characters like dry matter weight per plant (28.50 g), number of spikelet per plant (6.6), 1000-grain weight (47 g) and yield per acre (17.76 q acre^{-1}). So the three split application of nitrogen fertilizer in wheat was better split method of fertilizer application for getting higher yield.

References

1. Ananda N, Patil BN. Effect of micronutrients (Zn and Fe) and time of nitrogen application on growth and yield of durum wheat. Karn J Agric Sci. 2005; 18(3):604-08.
2. Anonymous. Area and Production of wheat in India and Punjab, 2014. http://www.listz.in
3. Basit A, Gul MIFA, Jaffar AK, Ahmad N. Studies of nitrogen use efficiency in wheat (*Triticum aestivum* L.) by split application at different growth stages. J App Em Sci. 2005; 1(2):39-42.
4. Deressa H, Nigussie-Dechassa R. Seed and seedling performance of bread wheat (*Triticum aestivum* L.) as influenced by rate and in-season nitrogen application. Amer J Expl Agri. 2013; 3(4):857-70.
5. Jan MT, Khan MJ, Khan A, Arif M, Farhatullah, Jan D *et al*. Improving wheat productivity through source and timing of nitrogen fertilizeration. Pak J Bot. 2011; 43(2):905-14.
6. Kumar M, Yadav A, Mehta AK. Influence of methods of sowing and N management strategies on yield attributes and yield of wheat (*Triticum aestivum* L.). Agricl Sci Digest. 2013; 33(4):279-83.
7. Rahman MA, Sarkar AZ, Amin MF, Jahan AH, Akhter MM. Yield response and nitrogen use efficiency of wheat under different doses and split application of nitrogen fertilizer. Bang J Agril Res. 2011; 36(2):231-40.
8. Samsujjaman M, Ahmed M, Amin MHA, Faruk MO, Azad MOK. Effects of timing of nitrogen fertilizer application and date of harvesting on yield of wheat. Bang Res Pub J. 2009; 2(2):454-69.
9. Singh RK, Kumar P, Prasad B, Das AK, Singh SB. Effect of split application of nitrogen on performance of wheat (*Triticum aestivum* L.). Internat J Agricl Sci. 2016; 12(1):32-37.
10. Sohail M, Hussain I, Riaz-ud-din, Abbas SH, Qamar M, Noman M. Effect of split N fertilizer application on physioagronomic traits of wheat (*Triticum aestivum* L.) under rainfed conditions. Pak J Agricl Res. 2013; 26(2):71-78.
11. Yadav VK, Chand R, Fulzele RM, Sah AK, Kumar A. Knowledge and adoption of scientific wheat cultivation practices in Bihar and Haryana. Ind Res J Ext Edu. 2006; 6(3):1-4.