International Journal of Advance Research in Science and Engineering
Volume No.06, Special Issue No.(01), Nov 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

Effect of different seed rate and split application of nitrogen on yield attributing characters and yield of wheat (Triticum aestivum L.)

Harpreet Singh[1], Karampal Singh[2], Navjot Singh[3], Navdeep Gandhi[4]

[1234]*Department of Agriculture, D.A.V College, Abohar (India)*

ABSTRACT

A field experiment was conducted at village Ratta Tibba, Distt. Sri Muktsar sahib, Punjab to determine the effect of different seed rates and split application of nitrogen on yield and yield attributing characters of wheat variety HD 2967 during rabi season 2016-17. The treatments consisted of two seed rates (S_1- 30 kg per acre and S_2- 45 kg per acre) and three N scheduling (N_1- 100 % recommended dose of nitrogen at sowing, N_2- 50 % recommended dose of nitrogen at sowing and 50% recommended dose of nitrogen before first irrigation, N_3- 33.33% recommended dose of nitrogen at sowing, 33.33% recommended dose of nitrogen before first irrigation and 33.33% recommended dose of nitrogen before second irrigation). Results revealed that among the different seed rates, S_2 has higher grain yield (20.38 q acre^{-1}) than S_1 which has grain yield (15.60 q acre^{-1}) and among the split application treatments, N_3 has maximum emergence count, plant height, dry matter accumulation per plant and grain yield.

Keywords: *Nitrogen, Seed rate, Split application, Wheat, Yield*

I. INTRODUCTION

Wheat (*Triticum aestivum*) is a crop of global significance. It is grown in diversified environments. It is a staple food of millions of people. Approximately one-sixth of the total arable land in the world is cultivated with wheat. Whereas paddy is mainly cultivated in Asia, wheat is grown in all the continents of the world. It supplies about 20 per cent of the food calories for the world's growing population. Wheat is grown mainly in two seasons in the world viz., winter and spring. Winter wheat is grown in cold countries like Europe, U.S.A., Australia, Russia Federation etc., while spring wheat is grown in Asia and a part of U.S.A. Spring wheat matures in 120-130 days while winter wheat takes 240-300 days for maturity. Due to this reason productivity of winter wheat is higher in comparison to spring wheat. Application of nitrogen to wheat in two splits, one half basal and second half with first irrigation between 21 and 30 days after sowing is normally advocated. Wheat is a long duration (about 150 days) crop; hence less proportion of nitrogen, out of applied during initial stages, will be available during reproductive phase. Moreover, nitrogen requirement of the crop during initial growth stage is low due to less dry matter accumulation but recommended application rates are high. It means that supply of nitrogen to the crop does not commensurate with the crop requirement pattern (Sharma *et al* [1]). Fertilizer application assumes

greater significance in determining crop productivity and warrants judicious use to maximize its use efficiency. Recovery of added fertilizer nitrogen is only 50 percent or less, although it can be enhanced through modification in timing and placement of added fertilizer. N fertilizer application and frequent N top dressing during wheat-growing season are effective ways of improving wheat yield (Kumar *et al* [2]). 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. The maximum use of N fertilizer as basal may cause less NUE (Nitrogen Use Efficiency) thus three split applications of N *viz.*, one- third as basal, one-third as top dressing during 20-25 days after sowing (DAS) and rest one third as top dressing during 50-55 DAS are recommended for wheat (Singh *et al* [3]). Seed rate also plays a key role in the grain yield and quality of wheat. Seed rate governs the inter and intra plant competition, the numbers of tillers per plant, spikelet number per spike, grain size, grain shape etc. Likewise nitrogen nutrition, seed rate also influences the plant growth, development, grain size and other qualities of wheat (Madan *et al* [4]). Considering all these factors, the main objective of the experiment is to study the effect of split application of nitrogen and different seed rates on the yield attributing characters and yield of wheat.

II. MATERIAL AND METHODS

The experiment was carried out at Village Ratta Tibba, District Sri Muktsar Sahib during *rabi* season 2016-17. Treatments were allocated in six plots with each plot having dimensions of 5 m × 5 m. The treatments consisted of two seed rates (S_1- 30 kg per acre and S_2- 45 kg per acre) and three N scheduling (N_1- 100 % recommended dose of nitrogen at sowing, N_2- 50 % recommended dose of nitrogen at sowing and 50% recommended dose of nitrogen before first irrigation, N_3- 33.33% recommended dose of nitrogen at sowing, 33.33% recommended dose of nitrogen before first irrigation and 33.33% recommended dose of nitrogen before second irrigation). For preparation of field, pre sowing irrigation (*rauni*) was given and then field was ploughed once and twice with disc harrow and cultivator respectively followed by planking. Wheat variety HD 2967 was sown on November 22, 2016 with single hand seed drill. Nitrogen (50 kg/acre) was applied according to the treatments mentioned above and P_2O_5 (25 kg/acre) was applied in the form of D.A.P. during time of sowing in each plot. Crop was raised according to the recommended package of practices under irrigated culture. Crop was harvested on April 18, 2017 and threshed on April 19, 2017. Grain yield obtained from plot was then converted to q/acre. Observations recorded were emergence count m^{-2}, plant height, dry matter per plant and grain yield.

III. RESULTS AND DISCUSSION

3.1 Emergence count m^{-2}

The yield of crop depends upon plant population based on the number of seeds that emerge out after germination. The emergence count is the first index of predicted crop yield. Thus the effect of various treatments on emergence was recorded. Among the different seed rates, S_2 treatment has higher emergence rate (224.66) than S_1 treatment (179.75) and among the split application treatments, emergence per m^2 (218.50) in N_3

was highest among all the treatments (Table 4.1). Iqbal *et al* [5] had also shown that maximum emergence per m^2 (168.33) and minimum emergence per m^2 (132.27) was recorded when wheat was sown at seed rate of 200 kg h^{-1} and 125 kg h^{-1} respectively. Hussain *et al* [6] had also observed that higher emergence per m^2 (169) and lowest emergence per m^2 (121) was recorded where N was applied in two splits and in single split respectively.

3.2 Plant height

Plant height is a useful index of the developmental phases of the plant and can give some idea of the predictable dry matter production and ultimate yield. To assess the effect of different treatments on plant height, the data were recorded at 30, 60, 90, 120 days after sowing and at maturity. It is shown in Fig. 4.1 that at maturity plant height of wheat in N_1, N_2 and N_3 were 103.0 cm, 107.2 cm and 112.8 cm respectively. From Fig.4.2 it is found that at maturity maximum plant height (113.2 cm) and minimum plant height (104.0 cm) were found in N_3 and N_1 respectively. Singh *et al* [3] had also indicated that maximum height (97 cm) was found when Nitrogen was applied in three splits: at planting, crown root initiation (CRI), and panicle initiation (PI) stages. Bhardwaj *et al* [7] had also observed that maximum height (89.01 cm) was found when Nitrogen was applied in three splits.

3.3 Dry matter accumulation per plant

Dry matter accumulation is the total accumulation of photosynthates formed and total nutrient uptake by the plant up to stipulated growth period. Dry matter accumulation per unit area is directly proportional to number of tillers and plant height. In this experiment, dry matter accumulation was recorded at 30, 60, 90, 120 DAS and at maturity. It is shown in Fig. 4.3 that dry matter per plant in N_1, N_2 and N_3 were 17.2 g, 20.2 g and 22.9 g respectively. From Fig. 4.4, it is seen that maximum dry matter per plant (23.7 g) and minimum dry matter per plant (18.5 g) were found in N_3 and N_1 respectively. Sohail *et al* [8] had also recorded that Split N application in three split doses produced 11.8 and 11.5 t ha^{-1} dry matter, respectively at 120 and 90 kg N ha^{-1} which were significantly higher as compared to single basal N doses of these applied N rates.

3.4 Yield per acre

The efficiency of different factors towards crop improvement can be judged mainly by the addition they make to yield which may be the ultimate aim of field research investigations. As mentioned in Table 4.2, among the different seed rates S_2 has higher yield per acre (20.38 q) than S_1 (15.10 q) and among split application treatments, maximum yield (18.95 q) is found in N_3 while minimum in N_1 (16.25 q). Kumar *et al* [2] also reported that grain yield during 2004-05 (5036 kg h^{-1}) was significantly higher with N application as 1/3 before sowing + 1/3 after 1st irrigation+ 1/3 at spike emergence as compared to other N application treatments. Ram *et al* [9] showed that highest productivity (6.54 tonnes ha^{-1}) was recorded in 112.5 kg seed rate/ha with variety PBW 550 at Ludhiana during (2007-08) which was significantly higher than all the other seed rates. Lopez-Bellido *et al* [10] had also reported that splitting nitrogen dose gave more yield than full nitrogen applied at sowing time.

International Journal of Advance Research in Science and Engineering
Volume No.06, Special Issue No.(01), Nov 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

IV. FIGURES AND TABLES

Table 4.1 Effect of different seed rate and split application of nitrogen on emergence count m^{-2} of wheat crop

Treatments	N_1	N_2	N_3	Average
S_1	161.25	182.00	196.00	179.75
S_2	210.00	223.00	241.00	224.66
Average	185.50	202.50	218.50	

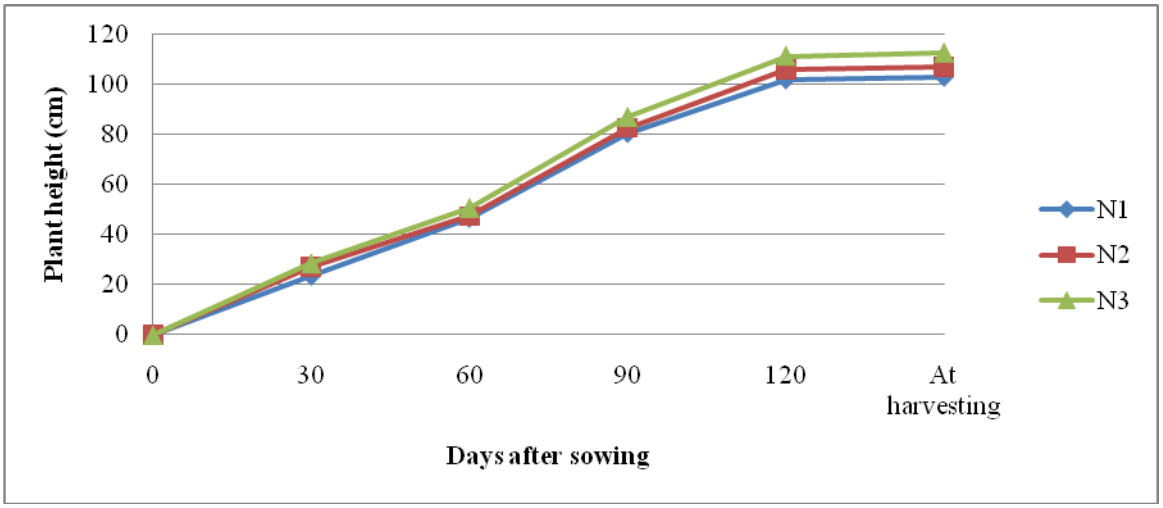

Fig. 4.1 Effect of split application of nitrogen on plant height of wheat crop sown with a seed rate of 30 kg per acre

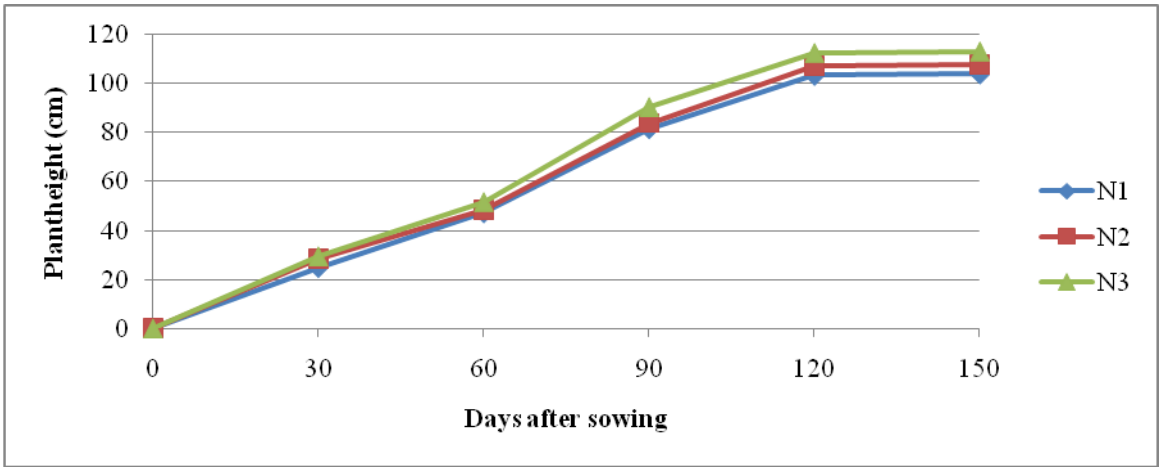

Fig. 4.2 Effect of split application of nitrogen on plant height of wheat crop sown with a seed rate of 45 kg per acre

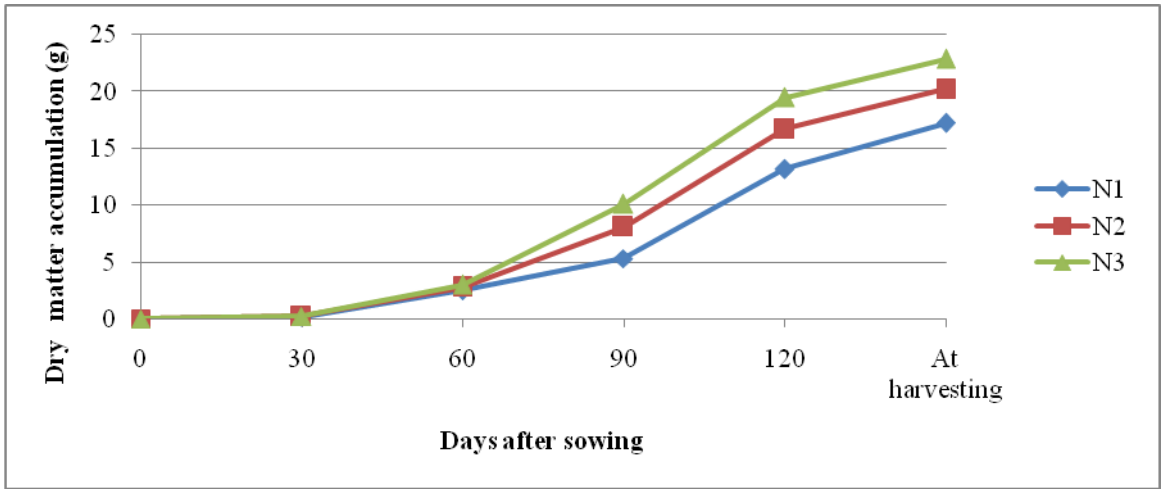

Fig. 4.3 Effect of split application of nitrogen on dry matter accumulation per plant of wheat crop sown with a seed rate of 30 kg per acre

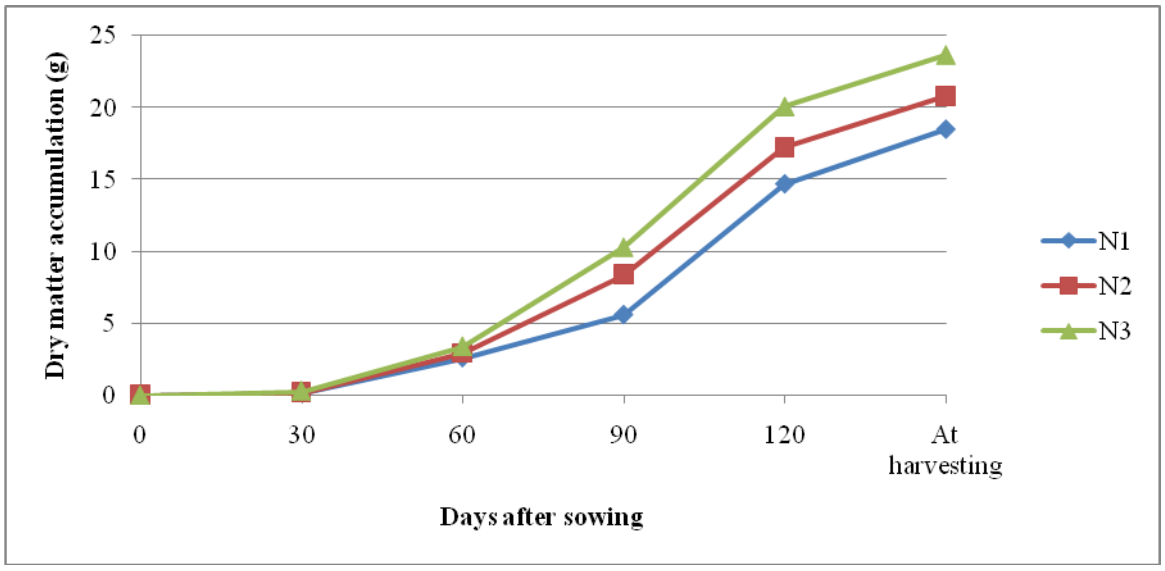

Fig. 4.4 Effect of split application of nitrogen on dry matter accumulation per plant of wheat crop sown with a seed rate of 45 kg per acre

Table 4.2 Effect of split application of nitrogen and seed rate on yield per acre (q)

Treatments	N_1	N_2	N_3	Average
S_1	13.70	15.50	16.10	15.10
S_2	18.80	20.56	21.80	20.38
Average	16.25	18.03	18.95	

V. CONCLUSION

The present experiment was carried out to study the effect of different seed rates and split application of nitrogen on the yield and yield attributing characters of wheat. The experiment concluded that among the different seed rates, S_2 (45 kg per acre) has performed better than S_1 (30 kg per acre) in parameters like emergence per m^2, plant height, dry matter per plant and yield per acre. Among the split application treatments, N_3 (Nitrogen applied in three equal splits) has performed best in parameters like emergence per m^2, plant height, dry matter accumulation per plant and yield per acre and harvest index. So it can be concluded from the experiment performed that higher yield can be obtained by sowing the wheat with a seed rate of 45 kg per acre when nitrogen is applied in three equal splits.

REFERENCES

[1] P. K. Sharma, and T. Kaur, Effect of split application of nitrogen and herbicide levels on zero till wheat in rice-wheat cropping system, *Journal of Research, 50(1, 2),* 2013, 11-13.

[**2]** M. Kumar, A. Yadav, and A. K. Mehta, Influence of methods of sowing and N management strategies on yield attributes and yield of wheat (*Triticum aestivum* L.), *Agricultural Science Digest, 33(4),* 2013, 279-283.

[3] R. K. Singh, P. Kumar, B. Prasad, A. K. Das, and S. B. Singh, Effect of split application of nitrogen on performance of wheat (*Triticum aestivum* L.), *International Journal of Agricultural Sciences*, *12(1),* 2016, 32-37.

[4] H. S. Madan, and R. Munjal, Effect of split doses of nitrogen and seed rate on protein content, protein fractions and yield of wheat, *ARPN Journal of Agricultural and Biological Science, 4(1),* 2009, 26-31.

[5] N. Iqbal, N. Akbar, M. Ali, M. Sattar, and L. Ali, Effect of seed rate and row spacing on yield and yield components of wheat (*Triticum Aestivum* L.). *Journal of Agricultural Research*, *48(2),* 2010, 151-156.

[6] I. Hussain., M. Aslam, S. K. Tanveer, M. Sohail, and N. S. Kissana, First irrigation and nitrogen application in zero-tillage wheat. *Pakistan Journal of Agronomy*, *2(2),* 2003, 109-112.

[7] V. Bhardwaj, V. Yadav, and B. S. Chauhan, Effect of nitrogen application timings and varieties on growth and yield of wheat grown on raised beds. *Archives of Agronomy and Soil Science*, *56(2),* 2010, 211-222.

[8] M. Sohail, I. Hussain, R. U. Din, S. H. Abbas, M. Qamar, and M. Noman, Effect of split N fertilizer application on physioagronomic traits of wheat (*Triticum aestivum* L.) under rainfed conditions, *Pakistan Journal of Agricultural Research*, *26(2),* 2013, 71-78.

[9] H. Ram, G. S. Buttar, I. Bhagat, I. Sharma, G. S. Mavi, and M. M. Jindal, Influence of varieties and seeding rates on growth, productivity, disease reaction and economics of wheat in Northwest India, *The Journal of Agricultural Sciences, 8(3),* 2013, 122-135.

[10] L. Lopez-Bellido, R. J. Lopez-Bellido, and R. Redondo, Nitrogen efficiency in wheat under rainfed Mediterranean conditions as affected by split nitrogen application, *Field Crops Research, 94,* 2005, 86-97.