Int.J.Curr.Microbiol.App.Sci (2018) *7*(7): 458-464

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 7 Number 07 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.707.055

Effect of Sowing Dates and Levels of Nitrogen on Growth and Yield of Barley (*Hordeum vulgare* L.)

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Keywords

Barley, date of sowing, Level of nitrogen, Growth and Yield

Article Info

Accepted:
06 June 2018
Available Online:
10 July 2018

ABSTRACT

A field experiment was conducted during the *rabi* season of 2017 in Barley crop (var. “RD2035”) at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Allahabad (U.P.). The experiment was laid out in a Randomized Block Design with treatment combinations, consisting of Four nitrogen levels (45,60,75 and 90 kg N ha^{-1}) on different date of sowing viz., 20 Oct, 30 Oct, 10 Nov. The experimental result reveals that growth parameters viz. plant height, no. of tillers per $hill^{-1}$, crop-growth rate (CGR), relative growth rate (RGR), plant dry weight and Yield attributes viz. No. of effective tillers m^2, grains $spike^{-1}$ and grain yield (5.23 t/ha) and straw yield (8.37 t/ha) recorded to be were significantly higher with treatment T_{11} (10 November+75 Kg Nitrogen ha^{-1}), whereas Length of $spike^{-1}$were significantly higher with treatment T_3 (20 October + 75 Kg Nitrogen ha^{-1}) and test weight was significantly higher with treatment T_9 (10 November+ 45Kg Nitrogen ha^{-1}).

Introduction

Barley (*Hordeum vulgare* L.) is an important cereal crop from all over the world. Among cereals, it ranks fourth with respect to area and production after wheat, rice and maize and is a hardy crop grown throughout the temperate, tropical and sub-tropical regions of the world. It is a *rabi* cereal crop is India and usually used as food for human beings and feed for animals and poultry birds (Singh *et al.,* 2012). There are evidences to indicate that it is one of the oldest crops known to have been cultivated in India. Barley is quite nutritious cereal. The grains of barley contain 8-10% protein, good amount of carbohydrates, minerals and vitamin. B complex and forms a staple food for many people in India. The dishes like chapati, sattu etc. are prepared from barley flour are still highly popular. In addition, the energy rich drinks are also prepared from the malt extracts of barley. In India, about 90% of the barley produced is used for human consumption, while in USA and European countries most of it is used as cattle feed. The barley grains make palatable and nutritious livestock feed, the straw is used as forage and green forage either directly fed to the animals or used for making hay and silage. It is a *rabi* cereal crop is India and usually used as food for human beings and feed for animals and poultry birds (Singh *et al.,* 2012).

Traditionally considered as a poor man's crop,barley in India is favoured because of its low input requirement and better adaptability to harsh environments, likely drought, salinity/alkalinity and marginal lands. Barley occupied nearly 5.90 lac ha^{-1} area producing nearly 15.05 lac tones of grain, with aproductivity of 2552 kg/ha during 2015-16 in India (Anonymous *et al.,* 2016).

Different doses of nitrogen significantly influenced the grain yield and yield parameters. For the highest grain yield, nitrogen doses of 100 kg N ha^{-1} were the best treatment when considering nitrogen fertilizer only. Irrigation regimes also have significant effect on yield and growth parameters of barley (Shirazi *et al.,* 2014). Increasing levels of nitrogen from 60 to 90 kg ha^{-1} significantly enhanced plant height, number of effective tillers, spike length, number of grains $spike^{-1}$ and test weight and grain yield ha^{-1} of malt barley G.P. Narolia *et al.,* (2013).

Date of sowing is one of the most important factors for higher yield production as it determines the optimum time of sowing of the crop. An optimum time of sowing enhances the efficiency of barley by exploiting growth factors in an effective manner. As dual purpose barley plant provides green fodder during lean period, the right time of sowing for availability of green fodder for longer time should be optimally utilized and therefore, the effects of various dates of sowing on dual purpose barley are quite remarkable. The staggered sowing is a common practice to obtain high quality green fodder for longer duration. Optimum date of sowing is necessary for maximum possible yield of good quality green fodder because availability of highest nutritive stage for longer duration is desired. However it is essential to follow proper date of sowing to utilize the optimum time of sowing efficiently (Singh *et al.,* 2017).

Materials and Methods

An experiment was conducted during the *Rabi* season of 2017 in barley crop at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Allahabad (U.P.). The experiment consisted of four nitrogen levels, viz. 45, 60,75 and 90 kg N ha^{-1} and date of sowings 20 Oct, 30 Oct, 10 Nov, laid out in a Randomized Block Design with twelve treatment combinations which replicated thrice. The soil of the experimental field was sandy loam in texture with pH 7.6, low in organic carbon 0.42%, available P 13.50 kg ha^{-1} and available K 257.04 kg ha^{-1}. Nitrogen, Phosphorus and Potassium were applied through urea, DAP (Di Ammonium Phosphate) and muriate of potash, respectively. Half dose of nitrogen was applied as per treatment and full dose of phosphorus, potassium was applied as basal and remaining nitrogen as per treatment was top dressed at tillering stage. The crop received five uniform irrigations. All the growth and yield attributes were recorded using standard procedure and grain yield was calculated at 12% moisture content. The crop growth rate (CGR) and Relative Growth Rate (RGR) was calculated using the standard procedure and formulae.

Results and Discussion

Effect on growth attributes and growth rates

Among the treatments T_{11} (10 November + 75 Kg N ha^{-1}) produced significantly higher growth attributing characters, i.e. plant height (78.34 cm),No. of tillers per $plant^{-1}$ (5.21), dry weight (18.77 g) and Crop growth rate (0.64 g m^2 day), at 60-80 DAS and Relative growth rate (0.11 g g^{-1} $days^{-1}$) at 60-80 DAS (Table 1–3).

Table.1 Effect of sowing date and level as of nitrogen on growth attributes of barley

Treatments No.	Treatments combination	Growth attributes 100 DAS			Growth rate (60-80DAS)	
		Plant height (cm)	**Number of tillers plant^{-1}**	**Plant Dry weight (g)**	**Crop growth rete (g m^{-2} Days^{-1})**	**Relative growth rate (g m^{-2} days^{-1})**
T_1	20October+45 Kg Nitrogen ha^{-1}	55.05	3.13	13.79	0.44	0.09
T_2	20 October + 60 Kg Nitrogen ha $^{-1}$	54.67	4.46	14.64	0.16	0.01
T_3	20 October + 75 Kg Nitrogen ha^{-1}	59.85	5.00	14.30	0.35	0.06
T_4	20 October+ 90Kg Nitrogen ha^{-1}	59.77	4.06	12.66	0.22	0.01
T_5	30 October + 45Kg Nitrogen ha^{-1}	64.19	4.26	15.08	0.40	0.06
T_6	30 October + 60 Kg Nitrogen ha^{-1}	62.8	4.26	16.02	0.41	0.08
T_7	30 October + 75 Kg Nitrogen ha^{-1}	65.98	4.40	15.90	0.54	0.06
T_8	30 October + 90 Kg Nitrogen ha^{-1}	70.62	4.66	15.02	0.62	0.08
T_9	10 November+ 45Kg Nitrogen ha^{-1}	72.96	3.04	13.76	0.20	0.04
T_{10}	10 November + 60 Kg Nitrogen ha^{-1}	75.68	3.13	12.77	0.39	0.01
T_{11}	10 November + 75 Kg Nitrogen ha^{-1}	78.34	5.24	18.77	0.64	0.11
T_{12}	10 November + 90 Kg Nitrogen ha^{-1}	74.12	5.10	12.62	0.60	0.03
	F test	S	S	S	S	S
	SEd (±)	1.49	0.50	1.40	0.12	0.01
	CD (P=0.05)	3.09	1.04	2.90	0.24	0.03

Table.2 Effect of sowing date and level as of nitrogen on yield attributes barley

Treatments No.	Treatments combination	Yield attributes			
		Number of spikelets hills^{-1}	**Length of spik (cm)**	**Number of grains spike^{-1}**	**Test weight (g)**
T_1	20October+45 Kg Nitrogen ha^{-1}	5.73	8.14	53.53	40.27
T_2	20 October + 60 Kg Nitrogen ha $^{-1}$	4.80	7.86	52.80	42.15
T_3	20 October + 75 Kg Nitrogen ha^{-1}	5.60	8.94	59.06	40.72
T_4	20 October+ 90Kg Nitrogen ha^{-1}	4.80	7.80	51.60	42.45
T_5	30 October + 45Kg Nitrogen ha^{-1}	4.46	7.96	50.40	41.84
T_6	30 October + 60 Kg Nitrogen ha^{-1}	5.00	8.62	56.86	41.71
T_7	30 October + 75 Kg Nitrogen ha^{-1}	5.20	7.82	54.33	41.01
T_8	30 October + 90 Kg Nitrogen ha^{-1}	5.00	8.23	55.13	43.83
T_9	10 November+ 45Kg Nitrogen ha^{-1}	4.66	7.46	53.8	43.85
T_{10}	10 November + 60 Kg Nitrogen ha^{-1}	4.73	8.00	57.06	41.32
T_{11}	10 November + 75 Kg Nitrogen ha^{-1}	5.73	7.73	61.06	42.70
T_{12}	10 November + 90 Kg Nitrogen ha^{-1}	4.86	8.35	59.20	41.79
	F test	S	S	S	S
	SEd (±)	0.37	0.29	2.85	0.72
	CD (P=0.05)	0.77	0.6	5.91	1.49

Table.3 Effect of sowing date and level as of nitrogen on yield barley

Treatments No.	Treatments combination	Yield		Harvest index (%)
		Grain yield ($t\ ha^{-1}$)	**Straw yield ($t\ ha^{-1}$)**	
T_1	20October+45 Kg Nitrogen ha^{-1}	3.90	8.08	32.55
T_2	20 October + 60 Kg Nitrogen ha^{-1}	4.79	6.30	43.19
T_3	20 October + 75 Kg Nitrogen ha^{-1}	4.68	8.30	36.05
T_4	20 October+ 90Kg Nitrogen ha^{-1}	4.03	7.56	32.16
T_5	30 October + 45Kg Nitrogen ha^{-1}	3.91	6.07	39.17
T_6	30 October + 60 Kg Nitrogen ha^{-1}	4.19	4.94	45.89
T_7	30 October + 75 Kg Nitrogen ha^{-1}	3.50	6.15	36.26
T_8	30 October + 90 Kg Nitrogen ha^{-1}	3.99	7.53	34.63
T_9	10 November+ 45Kg Nitrogen ha^{-1}	4.02	7.3	35.51
T_{10}	10 November + 60 Kg Nitrogen ha^{-1}	4.80	7.42	39.27
T_{11}	10 November + 75 Kg Nitrogen ha^{-1}	5.23	8.37	42.55
T_{12}	10 November + 90 Kg Nitrogen ha^{-1}	4.43	7.89	35.95
	F test	S	S	NS
	SEd (±)	0.43	0.94	4.28
	CD (P=0.05)	0.88	1.94	--

Mukherjee *et al.,* (2012) reported that more biomass production was recorded with November 15th sowing, which was on par with November 30th sowing.

It might be due to cumulative effect of optimum temperature at the vegetative and reproductive stages that provided highest number of fertile tillers plant-1, highest number of spikelets spike-1 and highest 1000-grain weight Alam *et al.,* (2007).

It might be due to improved biomass per plant at successive growth stages and increase in various morphological parameters like plant height, number of tillers and RGR. Increase in N level from 0 to 90 kg/ha in barley also fetched additional returns with a higher benefit: cost ratio over the control, primarily owing to higher grain yield with comparatively lesser additional cost of N Sharma and Verma (2010).

The results of the present investigation are in close conformity with those of Meena *et al.,* (2012), G.P. Narolia *et al.,* (2013).

Effect on yields and yield attributes

Effective number of Spike Per hill^{-1} (5.73), Number of tillers per plant^{-1} (5.24) number of grains spike^{-1} (61.06) significantly higher with treatment T_{11} (10 November + 75 Kg Nitrogen ha^{-1}). The results are in close agreement with the findings of Alam *et al.,* (2007) and Ghasemi *et al,* (2012) and Baladezaie *et al,*. (2011. The length of spike (8.94 cm) was significantly higher with T_3 (20 October + 75 Kg Nitrogen ha^{-1}). Similar findings were also reported by Singh and Misra. (1979) and G.P. Narolia *et al.,* (2013). The test weight (43.85 g) was significantly higher with T_9(10 November+ 45Kg Nitrogen ha^{-1}) Similar findings were also reported by Tripathi *et al.,* (2013) and Sawar *et al.,* (2010). The grain yield (5.23 t ha^{-1}) and Straw yield (8.37 t ha^{-1}), was also higher with treatment. T_{11}(10 November + 75 Kg Nitrogen ha^{-1}) It might be due to cumulative effect of growth and yield-attributing characters owing to fertilization. Greater availability of metabolites (phossynthates) and nutrients to developing reproductive structures seems to have resulted in increase in all the yield-attributing characters which ultimately improved the yield of the crop (Singh *et al.,* 2010).

Similar findings were also reported by Mukherjee *et al.,* (2012) Meena *et al.,* (2012) and singh *et al.,* (2013).

On the basis of above findings it can be concluded that the grain yield (5.23t ha^{-1}), straw yield (8.37t ha^{-1}), number of tillers per plant^{-1} and other growth and yield attributes were found to be the best with treatment T_{11} (10 November + 75 kg Nitrogen ha^{-1}). These findings are based on 1 season; trial therefore, further trials may be required for considering it for recommendation.

References

Alam M.Z., S.A. Haider and N.K. Paul, 2007. Yield and and Yield Components of Barley (*Hordeum vulgare L)* cultivars in Relation to Nitrogen Fertilizer. J. Appl. Sci. Res., 3(10): 1022-1026.

Anonymous *et al.,* 2016: Progress Report of All India CoordinatedWheat and Barley Improvement project 2015-16.*Director's Report*, G. P. Singh (ed.). ICAR-Indian Institute of Wheat and Barley Research, Karnal, India.p. 96.

Aslani, F. and Mehrvar, M. R., 2012, Responses of wheat genotypes as affected by different sowing dates. *Asian J. Agric. Sci.*, 4(1): 72-74.

Baladezaie, R. R., Nemati, N. A., Mobasser, H. R., Malidarreh, G. A. and Dastan, S., 2011, Effects of sowing dates and CCC application on yield and yield components of barley (*Hordeum vulgare* L.) cultivars in the north of Iran. *American Eurasian J. Agric. & Environ. Sci.*, 11(1): 49-54.

G.P.Narolia and., R.S. Yadav, (2013).Effect of Nitrogen Levels and its Scheduling on Growth, Yield and Grain Quality of Malt Barley (*Hordeum vulgare* L.) under Normal and Late Sown Conditions in North-West Rajasthan. Annals of Arid Zone 52(2): 95-99, 2013.

Ghasemi, *et.al.*, (2012). Agronomicaltraits. Effect of irrigation withdrawal and N fertilization rates on yield and of triticale in Birjand, Iran. M.Sc. Thesis, Islamic Azad University, Department of Agriclture, Birjand, Iran.

Jasvinder Singh1, S.S. Mahal and Avtar Singh., (2013). Productivity and quality of malt barley (*Hordeum vulgare*) as affected by sowingdate, rate and stage of nitrogen application. *Indian Journal of Agronomy* 58 (1): 72-80 (March 2013).

Magan Singh, Avinash,Chauhan, Rakesh Kumar, Deepa Joshi, Pooja, Gupta, Soni and V.K. Meena.(2017). Dual purpose barley as affected by date of sowing, varieties andstage of harvesting-A review. Agricultural Reviews, 38 (2) 2017: 159-164.

Meena, L.R., Mann, J.S and Meena, S.L. (2012). Effect of levels and mode of nitrogen application on dual purpose barley (*Hordeum vulgare* L.) under semi-arid condition. *Indian Journal of Agronomy* 57(2): 168-170.

Mukherjee,*et.al.*, 2012, Effect of different sowing dates on growth and yield of wheat (*Triticum aestivum*) cultivars under mid hill situation of West Bengal. *Indian J. Agron.*, 57 (2): 152-156.

Tripathi, S. C., Chander, S. and Meena, R. P., 2013, Effect of early sowing, n levels and seed rateson yield and yield attributes of different wheat (*Triticum aestivum*) varieties. *Indian J.Agron.*, 58 (1): 63-66.

Shirazi, S.M., Zulkifli, Y., Zardari, N.H. and Ismail, Z.2014. Effect of irrigation regimes

and nitrogen levels on the growth and yield of barley. *Advancesin Agriculture*.5: 1-6.

Sharma, R.K. and Verma, R.P.S. 2010.Effect of irrigation, nitrogen and varieties on the productivity and grain malting quality in barley. *Cereals Research Communication* 38: 419–28.

Singh A., Agrawal M., Marshall F.M. (2010): The role of organic vs. inorganic fertilizers in reducing phyto availability of heavy metals in a wastewater-irrigated area. Ecological Engineering, *36*: 1733–1740.

Singh, B., Dhaka, A.K. and Kumar, M. 2016. Performance of dual purpose barley varieties under different nitrogen application schedules. *Forage Research.* 41(4): 246-248.

Singh, J., Mahal, S.S. and Manhas, S.S. (2012). Effect of sowing methods, nitrogen levels and irrigation scheduling on yield and quality of malt barley (*Hordeum vulgare* L.) *Indian Journal of Agrnomy*, 57(3): 259-264.

Singh, K. N. and Misra, B. N., 1979, Performance of hulled and hulless barley under different dates of planting and levels of nitrogen in the Indian plains. *Indian J. Agron.*, 25(1): 83-87.

Sarwar, N., Maqsood, K., Mubeen, M., Shehjad, M., Bhuller, M.S., Qamar, R. and Akba, N. 2010. Effect of different level of irrigation on yield and yield component of wheat

cultivars. *Pakistan Journal of Agricultural Sciences*. 47(3): 371-374.

How to cite this article:

Borra Chandrasekhar Reddy and Rajesh Singh. 2018. Effect of Sowing Dates and Levels of Nitrogen on Growth and Yield of Barley (*Hordeum vulgare* L.). *Int.J.Curr.Microbiol.App.Sci.* 7(07): 458-464. doi: https://doi.org/10.20546/ijcmas.2018.707.055