IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 07, 2022

Growth and yield response of wheat (*Triticum aestivum L*) to nutritional application of nitrogen and KSB levels.

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Abstract

A field experiment of present investigation was executed at the research farm , Department of Agronomy ,Faculty of Agriculture Science and Technology ,AKS university , Sherganj , Satna ., MP during Rabi season , 2021 . This experiment was executed in randomized Block design with factorial concept adopting three replications. Twelve treatment combinations were evaluated including four levels of nitrogen i.e. (0 kgN / ha , 80 kg N/ha , 100kg N/ha and 120 kgN/ha and KSB levels were 0.5 lit./ha ,lit/ha and 1.5 lit. /ha) . Individual incorporation of nitrogen and KSB could cause tremendous increase in growth as well as yield of wheat crop. Maximum values in wheat were recorded in height of the plant (81.59), number of leaves per plant (238.89), number of tillers per meter row (66.22), length of spike (8.98 cm), number of grain per spike (37.51) , test weight (39.98g), grain yield (47.51 q /ha)and straw yield (75.18 q/ha)when 120 kg nitrogen /ha was incorporated. Similarly KSB also brought paramount effect on above growth as well as yield and yield attributes of wheat crop . Interactive effect of nitrogen and potassium soluble bacteria was also positive and all the growth and yield and yield attributes were affecting favorably Maximum values with respect to these parameters were noted in height of the plant (89.04 cm) , number of leaves per plant (255.53) , number of grains per spike (38.27)test weight (41.79) , grain yield (49.03 q/ha), straw yield (76.64 q/ha)when combined use of 120 kg nitrogen and 1.5 li/ha was done.

Key words : Nitrogen , KSB, tillers and test weight.

Introduction

A large number of crops are kept in cereals , however ,wheat (triticum aestivum L) is one of them and is known as king of cereals .Wheat keeps third position in production after maize and rice in the world , however , it is second most important crop grown in India after rice in term of area and production . Wheat is grown in an area of 30.79 million ha with an annual production of about 98.51 million tons , and productivity is 3200kg /ha (anonymous 2015). It may also be mentioned that wheat contributes 13.3% towards national production from 9 % area of the country (Kumar. et al 2012) . It is consumed mostly in the form of bread as ‘’Chapatti’’. Wheat straw is used as feed of cattle.

Plant nutrient management is one of the key components for increasing agricultural production. Wheat is one of the important crops and dwarf cultivars are having great potential, however, due to exhaustive use of nutrient in nature and they require more nutrient and posed a grate threat to long term sustainability of wheat production. Nitrogen is an essential micro nutrient among the fertilizer and if a plant suffers from nitrogen deficiency it may not be produced good crop of wheat. Further, when required amount of nitrogen is supplied, there will be an optimum response to added nitrogen. Nitrogen plays a very important role in living plant tissues . No any other element has that tremendous effect on endorsing vital plant growth .Plentiful of protein keeps increasing the span of the leaves and in like manner to generate carbohydrate synthesis .

Potassium is found in the soil in the form of soil minerals (98%) which is unavailable to the crop , however , potassium solubilizing bacteria can make it available by slow solubilization or weathering process . Mineral potassium solubilization by microbes that enhances crop growth and yield which applied with a cheaper source of rock potassium .It may be ergonomically more feasible and environmentally more feasible that soluble potassium KSB are able to solubilize potassium rocks through the production and secretion of organic acids (Hanley 2005) . Potassium is one of the major nutrient required by almost all crops and vegetables, however, it is available in soil in mineral form which can be made available by using K solubilizer. The present investigation therefore, was planned and conducted to assess the exact application rates of nitrogen KSB and its impact on growth and yield of wheat crop .

Material methods

Field experiment was carried out at the research farm AKS university, Sherganj ,Satna during Rabi season , 2021. The experiment was conducted in randomized block design with factorial concept adopting three replications. Twelve treatment combinations of different levels were evaluated involving four levels of nitrogen , (0kg N/ha , 80 kgN/ha , 100kgN/ha , 120 kg N/ha .) and three levels of KSB (0.5 lit./ha , 1lit./ha , 1.5 lit. /ha) . Different combinations of treatment were allocated in design of experiment as mentioned above. Net plot size was 4.0x3,0 sq,m.,seed rate was used at the rate of 100kg /ha for sowing with 22.5 cmx5.0cm distance .Graded fertilizer were applied as per treatment . Whole dose of P&K was applied as basal dose. All the agronomical operation was done as and when required for good stand of the crop. Data were analyses statistically in order to draw the valid conclusion on the basis of CD value .

Result and Discussion

An examination of data presented in Table -1on account of height of the plant, number of leaves per plant , and number of tillers per meter row length at maximum crop growth rate of 90 DAS indicated that maximum plant height (81.59 cm.) , number of leaves per plant (238.89) , and number of tillers per meter row length (66.22) were recorded when 120 kg N/ha nitrogen was

applied while lowest values were noted when nitrogen was not applied . However , application of KSB @1.5 lit/ha could able to secure maximum height of the plant(77.58), number of leaves per plant (191.65)and number of tillers per meter row length (5.77).It was further also observed that combine use of 120 kg N/ha + use of KSB @ 1.5 lit/h could also showed marked effect on all the above growth parameters . The growth parameter recorded periodically exihibited interesting architectural variation due to various concentration of nitrogen. Nitrogen is an essential constituent of protein and is associated in all the vital process in the plant : which is utilized in inorganic form by crop plants . Therefore, to obtain maximum growth attributes, addition of nitrogen in the form of chemical is important . Nitrogen enhances cell division and elongation , which might have resulted in better growth of the crops. Similar finding as reported above also made by Kaur and Kumar (2018) ,Keerthe et al(2018)and singh et al (2019) the use of KSB which could able to convert insoluble form of soil potassium into soluble form. These Potassium solublelizing bacteria are able to solublizes rock Potassium through production and secretion of organic acids. The higher growth attributes of plants might be due to positive effect of which; ultimately enhances the higher plant growth due to augmentation of cell division. These result are already in agreement with those reported by Meena et al (2014) and Saha et al (2016).

Stastistical analysis of data displayed in table 1 indicated that highest length of spike (9.96). Number of grains per spike (38.27), test weight (41.79 g) , grain yield (49.03 q/ha)recorded more under the combined use of nitrogen @ 120 kg /ha with application of KSB @ 1.5 lit/ha . The yield of crop largely depends upon the source and sink relationship i.e.mobilization of photosynthesis from the synthesis site and temporarily storage organ towards the development of grains . Availability of essential plant nutrients resulted in a production of superior yield attributes. The sink capacity of grain is the product of number of grains set and growth characteristics of individual plant. These statements are in line with many findings of Mukherjee (2019) and Singh et al (2019). Potassium is a major plant nutrient which has absorbed by plant and its significant place is for the production of high yield. The increase in yield might be due to solubilization of nutrients in the soil by producing organic acids by KSB. These findings are in close agreement with result of Kumar et al (2014)

Table 1: Effect of Nitrogen and KSB Levels on Growth and Yield of Wheat

Treatment	Plant height (cm)	Number of leaves per plant	Number of tillers /m row length l.	Length of spike (cm)	Number of grains per spike	Test weight (g)	Grain yield(q/ha)	Stover yield (q/ ha)
Effect of nitrogen								
N0	69.68	117.11	28.82	3.16	27.27	32.80	26.84	43.74
N1	74.72	159.71	39.27	5.34	33.49	35.44	38.78	57.55

N2	77.68	197.93	49.47	6.90	35.78	37.63	44.00	66.94
N3	81.59	238.89	66.22	8.98	37.51	39.94	47.51	75.18
S,Em±	0.94	3.77	2.15	0.37	0.71	0.62	0.90	0.84
CD (P_2O_5)	2.77	11.05	6.31	1.08	2.08	1.83	2.65	2.47

Effect of KSB

K1	74.02	163.60	41.02	5.43	30.85	35.47	35.50	56.06
K2	76.15	179.98	46.05	6.16	34.33	36.43	40.61	61.66
K3	77.58	191.65	50.77	6.69	35.35	37.46	41.74	64.85
S,Em±	1.09	4.35	2.48					0.97
CD (P_2O_5)	3.19	12.76	7.28	1.25	2.40	2.12	3.06	2.85

Interaction effect between nitrogen and KSSB

N0K1	66.45	96.73	23.93	2.71	18.40	31.90	18.39	40.15
N0K2	73.18	147.20	36.53	4.39	32.73	34.36	33.50	46.31
N0K3	76.85	185.13	46.33	6.56	35.33	36.62	43.61	63.41
N1K1	79.60	225.33	57.27	8.07	36.93	39.00	46.00	74.35
N1K2	70.68	125.33	29.53	3.30	31.27	33.01	30.53	45.45
N1K3	75.06	155.67	38.47	5.45	33.20	35.68	40.56	63.06
N2K1	77.81	203.13	49.67	6.97	35.53	38.00	43.86	63.57
N2K2	81.06	235.80	66.53	8.90	37.33	39.02	47.50	74.56
N2K3	71.93	129.27	33.00	3.45	32.13	33.49	31.11	45.63
N3K1	75.93	176.27	42.80	6.17	34.53	36.28	42.28	63.35
N3K2	78.38	205.53	52.40	7.16	36.47	38.26	44.53	73.85
N3K3	84.09	255.53	74.87	9.96	38.27	41.79	49.03	76.64
S.Em	0.54	2.18	1.24	0.21	0.41	0.36	0.52	0.49
CD(P=0.05)	1.13	4.51	2.57	0.44	0.85	0.75	1.08	1.01

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