Original Research Article

Effect of Distinct Levels of Nitrogen on Growth and Produce ofLinseed(*Linumusitatissimum*L.)

ABSTRACT

Aim: The current investigation was carried out to analysis the effect of phosphorus and linseed assortments on development, yield and nature of linseed.

Study Design: The experiment consisted of randomize block design.

Plan and duration of study: The experiment was having three replications which was conducted in Sanjeev Agrawal Global Educational (SAGE) University experimental field which is under the supervision of School of Agriculture; during *rabi* 2022-23.

Methodology: In this experiment, 7 treatment combinations including four levels of nitrogen as N1- 0 kg/ha, N2- 60 kg/ha, N3- 10 kg/ha, N4-20 kg/ha, N5-30 kg/ha, N6-40 kg/ha, and N57- 50 kg/ha, respectively. These treatments were treated on the popular variety; Jawahar-7.Results: Results revealed that the highest plant height (79.21 cm), number of branches per plant (7.78), number of capsules per plant (36.24), test weight (9.96 g), seed yield (17.65q/ha) and stover yield (28.67 q/ha), highest gross return (104541.00 Rs/ha, net returns (81425.00 Rs/ha) and benefit cost ratio (3.87) at maximum crop growth stage was recorded in plots treated with application of nitrogen @ 60 kg/ha followed by the 40 kg/ha, and 50 kg/ha nitrogen application rate. The sequential increase in fertilizer levels of nitrogen gives the higher growth and yield attributes.

Conclusion: Nitrogen supply, N @ 60 kg/ha should be more profitable for the improved growth and development of the crop resulting in enhancement of yield and yield attributing traits which can directly affect money-making more economically.

Key words: Linseed, Nitrogen level, Growth yield, B:C ratio

INTRODUCTION

Oilseeds are found to be very important place in human life. And among these, linseed is being one of the most important as per its multiple purposes. Linseed (*Linum usitatissimum* L.)is one of the oldest crop plants cultivated for the purpose of fibre and seed oil. It is one of the important oilseed crops in India next to rapeseed-mustard, commonly recognized as flax. India holds fifth position in area

whileranks sixth in production after Kazakhstan, Canada, Russian Federation, China and USA [1]. It is accumulated with 33-34% oil and 24% content of protein. Linseed is built up with so many characteristics like tolerance to abiotic and biotic stresses, high iodine value which is being used as an industrial applicant as well as its oil is rich in Omega-3.Likewise, the stem yields good quality of fibre to those of cotton [2]. Almost each and every part of the linseed plant can be utilized for marketable purpose.One of them is linseed cake which can also be also be utilized as an organic manure.

The average yield of 544 kg/ha in India was observed to be very low while comparing to the world average yield of 927 kg/ha and highest average yield of 1497 kg/ha in Canada [3]. Low crop yields also results due to poor fertility, traditional crop management practices and inadequate use of fertilizers. Among these, the imbalance of nutrients appears to be the most serious one.Research proved that crop yield can be increased by choosing high yielding linseed varieties with considerable supply of nutrients via fertilizers[4].

Among the major and essential elements, nitrogen is one of the primenutrients required by plants for their improved growth and developmenttherefore suitable supply ofnitrogen is advantageous. It promotes cell division and cell enlargement, resulting in more leaf area thus insuring better growth, plant vigour and yield [5]. Considering this,an experiment was conducted to estimate the effects of distinct levels of nitrogen on growth andyield for the linseed cultivar Jawahar-7.

MATERIALS AND METHODS

The experiment was demonstrated in Sanjeev Agrawal Global Educational (SAGE) University experimental field which is under the supervision of School of Agriculture; during *rabi* 2022-23. The field is locatedon an altitude of 500 m above mean sea level with 23°5'N latitude and 77°10'E longitude in the Vindhya plateau region of Bhopal, Madhya Pradesh, India. The soil was sandy loam in texture having obtainable N (180.25 kg/ha) P (14.25 kg/ha), potassium (157.68 kg/ha) and organic carbon of soil was of 0.32 % with 6.5 available pH of soil. The design used for this experiment was RandomizedComplete Block Design (RCBD) with three replicationshaving gross and net plot size was 2.5 m x 3.5 m and 2.0 m x 3.0 m, respectively and 7 treatments. The 7 treatment combinations including T1- Control, T2- RDF (100%) + Nitrogen 0 kg/ha, T3- RDF (P, K100%) + Nitrogen 10 kg/ha, T4- RDF (P, K100%) + Nitrogen 20 kg/ha, T5- RDF (P, K100%) + Nitrogen 30 kg/ha, T6- RDF (P, K100%) + Nitrogen 40 kg/ha and T7- RDF (P, K100%) + Nitrogen 50 kg/ha, respectively. The

recommended dose of fertilizer was 60:30:40 kg/ha NPK. Nutrients, nitrogen (N2O) was applied as per the treatments. Half dose of nitrogen and full dose of phosphorus and potassium was applied as basal dose and remaining half dose of nitrogen was applied in two equal splits during first and second irrigation. All the other agronomic practices were applied uniformly to all the treatments. The experimental variety used for this experiment was 'Jawahar-7'.

All the significant observations like growth, yield attributes, yield etc. were recorded. For recording the growth and yield attributes, five randomly selected plants of respective treatments were tagged. The collected data was statistically examinedwith the help of analysis of variance (ANOVA)[6]. The critical difference (C.D.) was worked out at 5 per cent level of significance for treatment comparison where the 'F' test revealed the significant effect.

RESULTS AND DISCUSSION

The result shows that plant height, number of branches per plant, number of capsules per plant, test weight, seed yield and stover yield was influenced knowingly due to different concentrations of nitrogen.[4] and [5] also observed the similar status seeing the increasing levels of nitrogen on various yield attributes.

Table 1 shows the observations regarding these various traits as given above. Statistical analysis of the data revealed that maximum plant height, number of branches and capsules per plant at maximum crop growth stage (79.21 cm, 7.78 and 36.24 respectively) were recorded in the plot (N2) treated with the application of nitrogen @ 60 kg/ha while, lowest value was observed in plot that received no nitrogen (N1).

It was seen that plant development expanded steadily with the ideal nitrogen portion. This may be because of higher accessibility of nitrogen that dynamically improved the vegetative development of the plant [7]. The quick expansion in plant level in the beginning phase of plant development might be credited to the larger number of leaves creating higher food material for development of the plant. As a matter of fact, more and enormous measured leaves were liable for planning more food photosynthates which expanded cell division and brought about fast growth and expansion of the plants [8]. Comparable results were reported by [9], [10] and [11]. Results about the number of capsules were also confined by [12].

Nitrogen is additionally a significant supplement in linseed crop. Being a viable extractor of soil nitrogen is thought of. The expansion in development boundaries is credited to the more grounded job

of N in cell division, cell extension and broadening which at last influence the vegetative development of yield and powerful usage of supplements through the broad root foundation created by crop plants under coordinated N application.

The critical variation in plant level might be because of the way that nitrogen application further developed the underground root growth through speeding up inner physiological processes. The expansion in plant level and number of branches per plant was likewise revealed by [13] and [14].

Data regarding test weight, seed yield, stover yield and harvest index is reported in (Table 2). Statistical analysis revealed that test weight, seed yield, stover yield and harvest index (9.96 g, 17.65q/ha, 28.67 q/ha and 38.51 respectively) was recorded highest in plots treated with the application of nitrogen @ 60 kg/ha followed by the application nitrogen @ 50 kg/ha, while lowest values were observed in plot that received no nitrogen.

Utilization of nitrogen was seen as altogether unrivaled for endlessly yield credits as well as oil content. The plant treated with ideal nitrogen dosages, coming about expanded the root through better root advancement and more supplement accessibility, bringing about enthusiastic plant development and dry matter collection prompting blossoming, fruiting and case arrangement. The most extreme number of containers per plant with ideal nitrogen rates was owing to more readily establish development which thus prompted expansion in seed yield. These discoveries matchedthe results of [15] and [16]. This might be due to nitrogen application which results in the root foundation through speeding up different metabolic cycles like cell division, cell advancement and cell expansion in roots.

The upgraded seed and stover yield because of nitrogen application might be ascribed to the actuation of metabolic cycles. The excitement impacts of N on development and yield credits and upgraded nitrogen movement in plant which thus thought about emphatically financial yield of the harvest. The better ripeness status of the plots, which got higher measure of nitrogen in linseed, could have further developed the plant development and yield ascribes. Higher take-up of supplements improved the photosynthetic proficiency as well as movement of photosynthates from source to sink which came about an expansion in yield. The outcomes are in close similarity with the discoveries of [17].

Harvest index was functioned out based on the economic and biological yield of individual treatments and subjected to analysis. The application of N @ 60 kg/ha recorded the highest harvest index

(38.51). The difference in harvest index may be the impact of better yield, yield attributes and better relationship of the source and sink [4] and [18]. Also, the highest benefit cost ratio (3.87: 1) was observed among the application of N @ 60 kg/ha by calculating gross monetary as well as net monitory returns on various treatments (Table 3). Adding levels of nitrogen significantly increased the net returns and benefit cost ratio [19]. This might be due to maximum retrieval from application of nitrogen with less disbursement. Similar outcomes were recorded by [5] and [18].

Table 1. Effect of nitrogen levels on growth parameters of linseed

Treatments	Plant height (cm)	Number of branches/Plant	Number of capsules per plant	Number of leaves / plants
Effect of nitrogen				
T1	65.42	4.14	18.68	41.03
T2	79.21	7.78	36.24	49.21
T3	68.55	4.56	23.05	42.47
T4	71.12	5.11	24.25	43.17
T5	73.61	5.46	26.79	44.54
T6	75.19	6.32	29.46	45.87
T7	77.32	6.89	33.24	47.62
S. Em±	1.44	0.49	2.29	1.10
C.D. (P=0.05)	2.45	2.21	3.79	2.10

Table 2. Effect of nitrogen levels on yield attributes of linseed

Treatments	Dry weight (g)	Test weight (g)	Seed yield (q/ha)	Straw yield per hectare (q/ha)	Biological yield per hectare (q/ha)	Harvest index (%)
Effect of nitrogen						
T1	2.15g	7.79	11.35	24.27	35.96	34.12
T2	3.77g	9.96	17.65	28.67	47.39	38.51
T3	2.27g	8.03	12.85	24.89	36.61	34.78
T4	2.35g	8.34	13.36	25.45	37.39	35.45
T5	2.46g	8.69	14.07	26.12	39.47	36.21

T6	2.78g	8.92	15.81	26.96	41.34	37.33
T7	3.59g	9.45	16.33	27.65	43.87	38.14
S. Em±	0.24	0.29	0.83	0.59	1.46	0.63
C.D. (P=0.05)	0.62	1.74	1.39	1.32	2.54	1.82

Table 3. Effect of nitrogen levels on economics of linseed

Treatments	Gross Return (Rs/ha)	Net Return (Rs/ha)	Benefit - Cost Ratio
Effect of nitrogen			
T1	74230.00	58725.00	2.42
T2	104541.00	81425.00	3.87
T3	78780.00	60818.00	2.47
T4	83408.00	64273.00	2.64
T5	86737.00	68731.00	2.87
T6	88387.00	71521.00	3.14
T7	97505.00	75826.00	3.44
S. Em±	3965.84	3093.25	0.20
C.D. (P=0.05)	9356.71	7074.98	0.54

CONCLUSION

From the conclusion part it seems to be observed that the Nitrogen supply, N @ 60 kg/ha should be more profitable for the improved growth and development of the crop resulting in enhancement of yield and yield attributing traits which can directly affect money-making more economically. Hence it is more appreciable and preferable to farmers for increasing the returns from this minor crop by utilizing minor inputs.

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