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EFFECT OF NITROGEN AND SULPHUR ON YIELD ATTRIBUTES, YIELD, OIL AND PROTEIN CONTENT IN LINSEED (*Linum usitatissimum* L.) Cv. NEELAM

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ABSTRACT

The experimental entitled "Effect of Nitrogen and Sulphur on Yield Attributes, Yield, Oil and Protein content in Linseed (*Linum usitatissimum* L.) Cv. Neelam" was carried at College Research Farm, Chandeshwar, Azamgarh (U.P.) with nine treatments in four replications in randomized block design. The treatment combinations of Nitrogen (N) and Sulphur (S) were N_{40}, N_{80}, S_{20}, S_{40}, $N_{40}S_{20}$, $N_{40}S_{40}$, $N_{80}S_{20}$ and $N_{80}S_{40}$ with untreated control. The treatment of nitrogen and sulphur alone or in combination showed better result than untreated control. The treatment N_{80} and S_{40} was found more effective than their lower dose as well as untreated control, but less effective than their combined effect. $N_{80}S_{40}$ was found more effective than all the treatments in increasing all the yield attributes, yield, oil and protein content of seed.

KEYWORDS : Biological yield, Harvest index, Test-weight, Trichloroacetic acid (TCA),Nessler's reagent

Among the oil seed crops, linseed or flax has got a specific importance and fourth most important oilseed crops in India. Owing to its various uses and special qualities, linseed is of great importance. Linseed is grown both for its seed as well as fibre which is used for manufacture of linen. Seed is directly used for edible purpose. Seeds contain 33-47% oil which is used for both edible and industrial purpose (paint, varnishes, printing ink, pad ink, soaps, patent lether etc.)

Researches on crop physiological and agronomical practices have been shown that the crop yield can be increased considerably with judicious application of fertilizers and by selecting high yielding varieties of linseed. Nitrogen being a most important major constituents of protein and nuclic acid which favoures the synthesis of protoplasm in plant body, promotes photosynthesis, size of plant, yield contributing characters and yield of crops (Pramanik et al., 1996; Arthamwar et al. 1996).

Sulphur is now recognised as the fourth major nutrient in addition to nitrogen, phosphorus and potash. Sulphur is involved in the formation of chlorophyll, activation of enzymes and improvement in crop yield and oil % (Tandon, 1995).

Keeping in view the importance of Nitrogen (N) and Sulphur (S) the field experiment was conducted on Physiological studies in Linseed.

MATERIALS AND METHODS

At the time of land preparation, urea granules and elemental sulphur were used to supply 40 and 80 kg N/ha; 20 and 40 kg S/ha alone and in combination. The seeds of linseed (*Linum usitatissimum* L.) cv. Neelam treated with bovistin @ 2g/kg seed, were sown @ 25 kg/ha in furrows opened by kudali maintaining a distance of 20 cm with 3-4 cm depth on Nov. 10, 2010 and Nov. 12, 2011 respectively. During the crop season. light irrigation was done at 25, 40, 55 and 70 days after sowing. Interculture operation was done to remove the weeds. After harvesting, the data on yield attributes and yield (capsules/plant), seed/plant, biological yield g/plant, straw yield g/plant, seed yield g/plant, harvest index, 1000-seed weight (test weight), and seed yield q/ha were recorded. The oil content (%) of seed were determined by Soxhlet's Extraction Method using Petroleum ether at solvent. For protein content (%), the seeds treated with 10% TCA (trichloroacetic acid) were digested by micro-method of Doneen, (1932). After digestion, the colour intensity was measured in Kelt Summerson Photoelectric Colorimeter using Nessler's regent to obtain Organic-N. Then the protein content (%) was calculated from organic-N by multiplying with the factor 6.25. The data were statistically analysed and critical differences (CD) were calculated.

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Table 1:Effect of Nitrogen (N) and Sulphur (S) on yield attributing characters, yield, oil and Protein content (%) in Linseed (*Linum usitatissimum* L.) cv. Neelam

Treatments	Capsules/ Plant	Seeds /Plant	Biological yield (g/plant)	Straw Yeild (g/plant)	Seed Yeild (g/plant)	Harvest Index (%)	1000-seed Weight (g)	Seed Yeild (q/ha)	Oil Content %	Protein Content %
Control	35.0	353.3	4.16	2.57	1.59	38.0	4.16	16.60	40.84	22.80
N_{40}	38.2	347.1	4.55	2.76	1.79	39.2	4.30	17.40	40.86	24.06
N_{80}	41.0	389.9	4.96	2.98	1.98	40.8	4.65	17.85	41.20	24.06
S_{20}	38.0	370.1	4.48	2.72	1.76	39.0	4.28	17.38	40.85	23.85
S_{40}	39.8	386.7	4.89	2.93	1.96	40.0	4.50	17.80	41.00	24.20
$N_{40}S_{20}$	40.0	382.0	5.00	3.00	2.00	39.5	4.35	17.95	40.98	24.10
$N_{40}S_{40}$	41.0	388.1	5.05	2.95	2.10	39.9	4.75	18.25	41.20	24.48
$N_{80}S_{20}$	42.2	400.0	5.28	3.10	2.18	41.2	4.78	18.35	41.45	24.68
$N_{80}S_{40}$	48.5	410.0	5.35	3.15	2.20	42.2	5.10	18.75	41.60	24.80
C.D. at 5% Level of Significance	4.45	19.37	0.75	0.27	0.35	0.45	0.18	0.75	NS	0.85

RESULT AND DISCUSSION

In general, the untreated control plant contained 35.0 capsules/plant whereas the plants treated with N_{40} and N_{80} produced 38.2 and 41.0 capsules/plant respectively. With increasing the number of capsules/plant, the number of seeds/plant was also found to increase over control. There were 353.3 seeds/plant in control and 374.1 and 389.9 seeds/plant in N_{40} and N_{80} treated plants respectively (Table,1). Similar results were also obtained by Guleria et al. (1984) in linseed with nitrogen application. The application of sulphur S_{20} and S_{40} to linseed cv. Neelam was also found to increase the number of capsules and seeds/plant over control as supported by the findings of Tripathi and Sharma ,(1993). Also, in this experiment, the combined effect of N and S eg. $N_{40}S_{20}$ $N_{40}S_{40}$ $N_{80}S_{20}$ and $N_{80}S_{40}$ was found more effective than N and S applied alone (Table,1).

On an average, the biological yield, straw yield and seed yield/plant was 4.16, 2.57 and 1.59 g/plant in untreated control. All the treated plants gave better response than control. The higher dose of nitrogen (N_{80}) and Sulphur (S_{40}) alone and in combination gave better performance than rest of the treatments. The biological yield was 4.96 g in N_{80}; 4.89 g in S_{40} and 5.35 g/plant in $N_{80}S_{40}$ treated plants respectively. The straw yield was 2.98 g in N_{80}; 2.92 g in S_{40} and 3.15 g/plant in $N_{80}S_{40}$ treated plants whereas it was 2.57 g/plant in control. Similarly, the seed yield g/plant, harvest index (%) and test weight (1000-seed weight) were also find to increase over control in all the treated plants. The best results was obtained in case of $N_{80}S_{40}$ treated plants (Table-1) as suggested by the findings of Guleria et al., (1984), Ramaswami and Manickam ,(1985) respectively.

The seed yield q/ha was also found to increase over control with nitrogen and sulphur applied alone or in combination. The seed yield was 16.60 q/ha in control whereas it was 17.85 q/ha in N_{80}, 17.80 q/ha in S_{40} and 18.75 q/ha in $N_{80}S_{40}$ treated plants (Table,1). Similar results were also obtained by Kumar et al., (1992) and Tandon,(1995) respectively.

The oil content in untreated control was 40.84% whereas it was 41.20% in N_{80}, 41.0% in S_{40} and 41.95% in

$N_{80}S_{40}$ treated plants respectively (Table,1). The protein content in seed of untreated control plants was 22.80% whereas it was 24.46% in N_{40}, 24.20% in S_{40} and24.85% in $N_{80}S_{40}$ treated plants respectively (Table,1). The combined effect of nitrogen and sulphur was found better than all the other treatments including control. Similar results were also obtained by Sharma and Kumar (1990) and Kute, (1995) respectively.

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