The Journal of Rural and Agricultural Research Vol. 15 No. 1, 46-48 (2015)
Received February 2015; Acceptance April 2015

Studies of biofertilizer, nitrogen and sulphur on the seed yield and quality parameters of linseed (*Linum usitatissimum* L.)

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Abstract

*A field experiment was conducted during the winter (*rabi*) season of 2007-08 and 2008-09 at R.B.S. College, Agricultural Research Farm, Bichpuri, Agra (U.P.) on a sandy loam soil to study the effect of biofertilizer, nitrogen and sulphur on the seed yield and quality parameters of linseed (*Linum usitatissimum *L.) crop. The experiment was carried out in split plot design with three replications. The treatments consisted of 4 lavels of N were (0, 25, 50 and 75 kg ha^{-1}) with and without biofertilizer and biofertilizer alone in main plots and 4 levels (0, 20, 40 and 60 kg ha^{-1}) of sulphur in sub- plots. The results showed that in both years of experimentations, seed yield (Pooled basis) of linseed (1322.29 kg ha^{-1}) increased significantly with the application of 50 kg N ha^{-1} + biofertilizer as compared to all other treatments; however, it was at par with 75 kg N ha^{-1} and 75 kg N ha^{-1} + biofertilizer. S application increased seed yield (1274.98 kg ha^{-1}) significantly with every increase in the level of sulphur up to 40 kg ha^{-1}. The application of nitrogen with and without biofertilizer decreased oil content but application of sulphur increased oil content of the linseed in both the years. Protein content in seed increased significantly with the application of 75 kg N ha^{-1} + biofertilizer as compared to all other treatments except 50 kg N ha^{-1} + biofertilizer and 75 kg N ha^{-1} and S application increased protein content significantly with every increase in the level of sulphur up to 40 kg ha^{-1}, while N application with and without biofertilizer decreased the iodine value of oil, whereas S application increased the iodine value of oil significantly with increase in level of sulphur up to 40 kg ha^{-1}.*

Key words: Linseed, Seed yield, Quality parameters, Biofertilizer (Azotobacter), Nitrogen, Sulphur

Introduction

Linseed or flax (*Linum usitatissimum* L.) is an important oil and quality fibre – bearing crop of sub tropical and temperate regions. India grown this crop an about 3.53 lakh ha producing 1.48 lakh tonnes of seed. It represents 21.4 and 10.14% of the global linseed acrage and production, respectively. Its cultivation under rainfed conditions with low use of fertilizers is the main cause of low yield. Among Rabi oilseeds, linseed is next to rapeseed mustard in area and production. Linseed oil is used for edible purpose and in the preparation of various oils and paints. Nitrogen plays an important role in synthesis of chlorophyll and amino acids which contribute to the building of units of proteins and thus growth of plants. Along with nitrogen, biofertilizer is considered to play an important role in the nutrition of the crop plants, to raise the crop productivity. Among the fertilizer elements sulphur (S) requirement of oilseed crops is quite high as compared to other crops (Das and Das, 1994). Sulphur is involved in the synthesis of fatty acids and S containing amino acidswhich improves the quality of linseed. Keeping the above mentioned facts in mind, the present study was undertaken to investigation the effect of biofertilizer, nitrogen and sulphur on seed yield and quality parameters of linseed.

Materials and Methods

A field experiment was conducted during winter (*rabi*) season of 2007-08 and 2008-09 on linseed crop (Cv. Subhra) at R.B.S. College, Agricultural Research Farm, Bichpuri, Agra (U.P.). The experimental soil was sandy loam (Typic ustochrept) which is poor in organic carbon (0.41 and 0.38%), low in available N (188.40 and 191.20 kg ha^{-1}), moderate in available P_2O_5 (29.80 and 30.30 kg ha^{-1}), rich in available K_2O (312 and 316 kg ha^{-1}) and low in available S (15.40 and 13.80 kg ha^{-1}). The oil content in seed was determined with Soxhlet extraction method. Iodine value were determined with the help of method suggest by (A.O.A.C., 1960). The treatments comprised 4 levels of nitrogen (0, 25, 50

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and 75 kg ha^{-1}) with and without biofertilizer and biofertilizer alone and 4 levels of sulphur (0, 20, 40 and 60 kg ha^{-1}) were tested in split plot design, keeping N levels with and without biofertilizer, biofertilizer alone in main plot and S levels in sub plot with 3 replications. A uniform dose of 40 kg P_2O_5 and 20 kg K_2O ha^{-1} were applied at the time of sowing as basal through triple super phosphate and muriate of potash, respectively. Biofertilizer (Azotobacter) applied through soil inoculation and half dose of N as per treatment was drilled at sowing and remaining N through urea was top dressed just after first irrigation. Sulphur was incorporated into soil before sowing as per treatment through elemental sulphur.

Results and Discussion

Seed yield

The seed yield of linseed increased significantly with increase in fertilizer level (Table 1). The response to applied biofertilizer was greater in absence of chemical fertilizer and the response decreased with increase in chemical fertilizer level. Application of biofertilizer alone resulted in 18.49% higher seed yield over absolute control. Seed yield (1322.29 kg ha^{-1}) increased significantly with the application of 50 kg N ha^{-1} + biofertilizer as compared to all other treatments; however, it was at par with 75 kg N ha^{-1} and 75 N ha^{-1} + biofertilizer. The results are in agreement with the findings of Singh *et al*. (2005), Reager *et al*. (2006), and Sarangthem *et al*. (2008). Significantly higher seed yield (1274.98 kg ha^{-1}) was recorded with the application of 40 kg S ha^{-1} over control and 20 kg S ha^{-1}. The increase in seed yield at 40 kg S ha^{-1} were 19.27% and 6.96% over control and 20 kg S ha^{-1}, respectively. Singh *et al*. (2008) have also observed similar results.

Seed quality

Oil content:

Nitrogen application decrease oil content in linseed (Table 1). Oil content was tended to decrease with increasing level of nitrogen with and without biofertilizer; there was corresponding reduction in oil content. The significantly lower oil content in seed was noted in 75 kg N ha^{-1} + biofertilizer as compared to all other levels of nitrogen except 50 kg N ha^{-1} + biofertilizer and 75 kg N ha^{-1}. Mangatram *et al*. (2003) also observed decrease in oil content due to nitrogen application. Application of sulphur increased significantly oil content in seed with every increase in the level of sulphur up to 40 kg ha^{-1}. Sarangthem *et al*. (2008) have also observed similar results.

Protein content

Protein content in seed increased significantly with the application of 75 kg N ha^{-1} + biofertilizer as compared to all other treatments except 50 kg N ha^{-1} + biofertilizer and 75 kg N ha^{-1}. The same trend was found by Mangatram *et al*. (2003). Significantly higher protein content in seed was recorded with the application of 40 kg S ha^{-1} over control and 20 kg S ha^{-1}. Venkatesh *et*

Table 1: Seed yield and quality parameters of linseed as affected by various treatments.

Treatments	Seed yield (kg ha^{-1})			Oil content (%)		Protein content (%)		Iodine value	
	2007-08	2008-09	Pooled	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
Biofertilizer and nitrogen levels									
Control	935.68	950.67	943.18	40.32	41.39	20.10	20.37	169.41	170.75
Azotobacter		(T_1)1104.41	1130.71	1117.56	39.49	40.51	21.04	21.07	168.20
169.68									
25 kg N ha^{-1}	1121.46	1148.87	1135.16	39.44	40.46	21.35	21.37	168.02	169.48
25 kg N ha^{-1}+Azotobacter	1234.18	1264.02	1249.10	38.89	39.88	22.97	22.90	166.03	167.39
50 kg N ha^{-1}	1248.97	1278.15	1263.56	38.81	39.80	23.10	23.14	165.38	166.71
50 kg N ha^{-1}+Azotobacter	1306.32	1338.26	1322.29	38.61	39.58	23.90	24.30	161.24	162.36
75 kg N ha^{-1}	1287.53	1318.13	1302.83	38.54	39.51	24.00	24.39	160.77	161.86
75 kg N ha^{-1}+Azotobacter	1298.33	1330.06	1314.20	38.48	39.40	24.42	24.82	160.43	161.56
SEm±	17.79	18.04	14.19	0.05	0.07	0.18	0.20	0.39	0.34
C.D. at 5%	53.98	54.72	43.06	0.15	0.21	0.54	0.60	1.19	1.04
Sulphur levels									
Control	1059.43	1078.45	1068.94	36.93	37.82	21.85	22.85	162.08	163.21
20 kg ha^{-1}	1177.41	1206.54	1191.98	38.97	39.97	22.14	23.23	164.90	166.16
40 kg ha^{-1}	1259.25	1290.70	1274.98	40.14	41.19	22.71	23.81	165.99	167.35
60 kg ha^{-1}	1272.35	1303.73	1288.04	40.22	41.28	22.96	24.08	166.61	167.98
SEm±	10.13	11.44	7.00	0.03	0.04	0.10	0.13	0.26	0.24
C.D. at 5%	28.07	31.71	19.41	0.09	0.10	0.27	0.36	0.72	0.67

al. (2002) also observed increase in protein content due to sulphur application.

Iodine value

Iodine value of oil decreased with increasing levels of nitrogen (Table 1). Iodine value of oil decreased with increasing level of nitrogen with and without biofertilizer; there was corresponding reduction in iodine value of oil. The significantly lower iodine value of oil was noted in 75 kg N ha^{-1} + biofertilizer as compared to all other treatments except 50 kg N ha^{-1} + biofertilizer and 75 kg N ha^{-1}. Application of sulphur increased the iodine value of oil significantly with every increase in the level of sulphur up to 40 kg ha^{-1}.

References

A.O.A.C. (1960). Official methods of analysis Benjamin Franklin Station, Washington, D.C.

Das, K.N. and Das, K. (1994). Effect of sulphur and nitrogen fertilization on yield and N uptake by rapeseed. Journal of Indian Society of Soil Science 42: 476-478.

Mangatram; Singh, Ishwar and Kumar, A. (2003). Oil yield and quality parameters of Indian mustard as influenced by varieties, irrigation and fertilizer levels. Haryana Journal of Agronomy 19 (1): 47-49.

Olsen, S.R.; Cole, C.V.; Watanabe, F.S. and Deam, L.A. (1994). Circular United States Department of Agriculture 939.

Reager, M.L.; Sharma, S.K. and Yadav, R.S. (2006). Yield attributes, yield and nutrient uptake of Indian mustard (Brassica juncea) as influenced by nitrogen levels and its split application in arid western Rajasthan. Indian Journal of Agronomy 5(13): 213-216.

Sarangthem, Indira; Singh, L. Somendro; Singh, N. Gopimohan and Sarkar, A.K. (2008). Response of rapeseed to nitrogen and sulphur. Journal of the Indian Society of Soil Science 56(2): 222-224.

Singh, M.M.; Maurya, M.L.; Singh, S.P. and Mishra, C.H. (2005). Effect of nitrogen level and biofertilizer inoculation on productivity of forage sorghum (Sorghum bicolor). Indian Journal of Agricultural Sciences 75(3): 167-168.

Singh, Varun; Lodhi, Matadin and Verma, Neeraj Kumar (2008). Effect of phosphorus and sulphur levels on growth and yield of mustard (Brassica juncea Coss) var. 'Varuna': Agricultural Science Digest 28(1): 59-60.

Venkatesh, M.S.; Majumdar, B. and Kumar, Kailash (2002). Relative performance of sulphur sources on sulphur nutrition on groundnut in acid alfisol of Meghalaya. Indian Journal of Agricultural Sciences 72(4): 216-219.