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Effect of integrated nutrient management on yield, nutrient uptake and quality of Linseed (*Linum ustiatissimum* L) in central plane zone of U.P.

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Abstract
A field experiment was conducted in *Rabi* season 2013-14 at Nawabganj Research Farm of C. S. Azad University of Agri. & Tech., Kanpur U.P. to find out integrated nutrient management effect on linseed (*Linum ustiatissimum* L) with ten treatments i.e. (i) 125 % RDN (ii) 100 % RDN (iii)100% RDN + 25 %N through FYM (iv) 100 % RDN + 25 % N through FYM + 30 kg S ha^{-1} (v) 100 % RDN + 25 % N through FYM + 30 kg S ha^{-1} + 5 kg Zn ha^{-1} (vi) 75 % RDN (vii) 75 % RDN + 25 % N through FYM (viii) 75 % RDN + 25 % N through FYM + 30 kg S ha^{-1} (ix) 75 % RDN + 25 % N through FYM + 30 kg S ha^{-1}+ 5 kg Zn ha^{-1} (x) Control, in randomized block design with three replications. The soil of the experimental field was slightly alkaline in nature having pH 8.3, ECe 0.35 dSm^{-1}, low in organic carbon (0.35 %), available nitrogen (170 kg ha^{-1}), available Sulphur (16 kg ha^{-1}) and available Zn (0.54 ppm) and medium in available phosphorus (12.0 kg ha^{-1}) and Potassium (132 kg ha^{-1}).The result showed highest grain yield (17.0 q ha^{-1}) and stover yield (34.80 q ha^{-1}) with the application of 100 % RDN + 30 kg S ha^{-1} + 5 kg Zn ha^{-1}, which was 98.8 and 85.0 percent higher than lowest grain (8.90 q ha^{-1}) and stover (18.18 q ha^{-1}) yield at control. Substitution of 25 % N through FYM with 75% RDN produced grain yield (11.60 q ha^{-1}) and stover yield (23.41 q ha^{-1}) which was found at par to the yield of 100% RDN indicting the possibility to reduce N fertilizer need by 25% through the application of FYM along with chemical fertilizers. Application of 30 kg S ha^{-1} produced maximum 32 percent higher grain and 16.66 percent higher straw yields than 100% RDN. Likewise, S application of 5 kg Zn ha^{-1} also produced 7.27 percent increase in grain and 5.27 percent increase in straw than 100 % RDN + 25 % N through FYM + 30 kg S ha^{-1}.Maximum increase in N, P, K, S and Zn content and uptake was also recorded with 100 % RDN + 25 % N through FYM + 30 kg S ha^{-1} + 5 kg Zn ha^{-1} in comparison to other treatments. Oil content, oil yield and protein content were also recorded maximum with 100 % RDN + 25 % N through FYM + 30 kg S ha^{-1} and 5 kg Zn ha^{-1}.

Keywords: economics, INM, linseed, nutrient uptake, oil content, protein content

Introduction
Linseed is an important *rabi* oilseed crop predominantly grown under rainfed, utera and irrigated condition. The national average productivity of linseed is very low as compared to that of world average. Low productivity of linseed may be ascribed to many reasons, but inadequate and imbalanced fertilization are the major factor. To enhance the productivity of linseed, use of balanced fertilization by the application of chemical fertilizer, along with organic manures is of great importance. Integration of inorganic fertilizer with organic manure will not only help to sustain the crop productivity but also effective for keeping good soil health and hastening the nutrient use efficiency (Verma *et al*, 2005) [1]. Keeping these facts in view, the present field experiment was undertaken to find out integrated nutrient management effect on linseed in central plain zone of U. P.

Material and Methods
A field experiment was conducted during *Rabi* 2013-14 at C. S. Azad University of Agriculture and Technology, Kanpur, U.P. to find out effect of integrated nutrient management on Linseed. The experiment was comprised of 10 treatments. *i.e.* (i) 125 % RDN (ii) 100 % RDN (iii)100% RDN + 25 %N through FYM (iv) 100 % RDN+ 25 % N through FYM + 30 kg S ha^{-1} (v) 100 % RDN + 25 % N through FYM + 30 kg S ha^{-1} + 5 kg Zn ha^{-1} (vi) 75 % RDN (vii) 75 % RDN + 25 % N through FYM (viii) 75 % RDN + 25 % N through FYM + 30 kg S ha^{-1} (ix) 75 % RDN + 25 % N through FYM + 30 kg S ha^{-1}+ 5 kg Zn ha^{-1} (x) Control, in randomized block design with three replications. The soil of the experimental field was slightly alkaline in nature having pH 8.23, ECe 0.35dSm^{-1}, medium in organic carbon (0.35%),

Low in available nitrogen (170 kg ha^{-1}), available sulphur (16.00 kg ha^{-1}), available Zinc (0.54ppm), medium in available phosphorus (12.0 kg ha^{-1}) and potassium (132.0 kg ha^{-1}). The recommended dose of fertilizer as NPK was 100:60:40 kg ha^{-1}. The quantity of FYM for substituting the specified amount of nitrogen (N) as per treatment was calculated and incorporated in the plots 15 days before sowing the content of used FYM was 0.50 N, 0.21 P_2O_5 and 0.50 K_2O. As per treatment 30 kg S ha^{-1} and 5 kg Zn ha^{-1} were applied as basal through elemental sulphur and Zinc chloride, respectively. All the treatments received a fixed dose of phosphorus (P) and potassium (K) through DAP and MOP, respectively. Nitrogen applied through DAP was adjusted in the quantity of urea. Half of N was applied at the time of sowing and remaining half of nitrogen was applied in one split after first irrigation at 30-35 DAS. Protein content in grain was calculated by multiplication of N content in seed with 6.25. The economics was computed at prevailing local market price during 2013-14. The benefit cost ratio was calculated with division of gross return by cost of cultivation. The grain and straw samples were collected for the determination of N P K S and Zn at the time of crop harvest. The samples were powdered and digested in a triacid mixture of concentrated H_2SO_4: HNO_3: $HClO_4$ (10:4:1) and P in the extract was determined by calorimetric and K by Flame photometer. The Grain and straw samples were digested in diacid mixture of conc. HNO_3 and $HClO_4$ (9:1) for analysis of Sulphur and Zinc. Sulphur was estimated by turbidimetric method and zinc was estimated by Atomic absorption spectrophotometer. The soil samples were analysed for pH, EC, Organic carbon, available N, P, K, S and Zinc by Standard method before sowing and after harvest of the crop.

Results

The result showed highest grain yield (17.00 q ha^{-1}) and stover yield (34.80 q ha^{-1}) with the application of 100 % RDN + 30 kg S ha^{-1} + 5 kg Zn ha^{-1}, which was 98.8 and 85.0 percent higher than lowest grain yield (8.90 q ha^{-1}) and stover yield (18.18 q ha^{-1}) at control. Super-imposition of 25% N through FYM with 100% RDN produced 13.65 q ha^{-1} grain yield and 29.65 q ha^{-1} straw yield and found at par to the yield of 125% RDN. Substitution of 25 % N through FYM with 75% RDN produced grain yield (11.60 q ha^{-1}) and stover yield (23.41 q ha^{-1}) which was found at par to the yield of 100% RDN. Above result are indicting the possibility to reduce N fertilizer need by 25% through the application of FYM along with chemical fertilizers. The increase in yield might be owning to beneficial effect of FYM in improving the soil environment resulting in better absorption of moisture, nutrient and thus resulting in higher yields. Similar findings were also reported by Dalel *et al*, 2014 [2]. Application of 30 kg S ha^{-1} produced 32 percent higher grain and 16.66 percent higher straw yield than 100% RDN. Likewise S application of 5 kg Zn ha^{-1} also increase the grain yield by 7.27 % and straw yields by 5.27 % over 100 % RDN + 25 % N through FYM + 30 kg S ha^{-1}.Enhancement in grain and straw yields with the adding of sulphur and Zn could be explained on the basis of proper nutritional environment for vegetative and reproductive growth of the crops. These results are in conformity with the finding of Kumar *et al*, 2009 [6]. Highest cost of cultivation Rs. 23610 ha^{-1} gross return Rs. 56806 ha^{-1}, net income of Rs. 32970 ha^{-1} and B:C ratio (1:2.39) was noted with 100% RDN+25% N through FYM+30 kg S ha^{-1}+5 kg Zn ha^{-1} and minimum with control. It was also observed that 100% RDN treatment was found economically superior to 75 RDN+25 N through FYM treatment but the difference was found nominal. All the treatments showed significant increase in N, P, K, S and Zn accumulation in grain and straw in comparison to control. Maximum accumulation of N, P, K, S and Zn was recorded with 100% RDN + 25% N through FYM + 30 kg S ha^{-1} + 5 kg Zn ha^{-1} and minimum at control. Substitution of FYM and integration of sulphur and zinc with 100% RDN and 75% RDN also influenced the N, P, K, S and Zn uptake. Influence in uptake with the integration of sulphur and Zn could be ascribe to better availability and synergistic effect of applied nutrients. These findings are corroborating the findings of chaudhary. *et al*, 2003 [4] and Tiwari. *et al*, 2012 [5]. Highest oil content 40.75% was recorded with 100% RDN + 25% N through FYM + 30 kg S ha^{-1} + 5 kg Zn ha^{-1} which was computed 6.95% higher than control. Integration of sulphur and zinc with 100% RDN and 75% RDN also influenced the oil content. Likewise oil content maximum oil yield of 753.71 kg ha^{-1} was also recorded with 100% RDN + 25% N through FYM + 30 kg S ha^{-1} and 5 kg Zn ha^{-1}. Integration of sulphur and zinc also showed positive effect on oil yield when applied with 100% RDN and 75% RDN. Improvement in oil content due to application FYM compared to inorganic fertilizer was also reported by Ramesh *et al* (2009) [8] and improvement in oil content and oil yield with the integration of sulphur and zinc in Mustard was also reported by Kumar and Yadav (2007) [6]. Highest protein content 21.87% was recorded with 100% RDN + 25% N through FYM + 30 kg S ha^{-1}+ 5 kg Zn ha^{-1} and minimum 19.5% at control. Integration of sulphur and zinc with 100% RDN and 75% RDN showed positive increase in protein content. These results are in conformity with the findings of Karthikeyan and Shukla, 2008 [7].

Table 1: Effect of integrated nutrient management on yield and economics of linseed.

S. N.	Treatments	Yield kg ha^{-1}		Cost of Cultivation (Rs ha^{-1})	Gross Return (Rs ha^{-1})	Net Return (Rs ha^{-1})	B:C Ratio
		Grain	Straw				
1	125 % RDN	14.75	29.50	21650	47200	25550	2.18
2	100 % RDN	12. 50	28.80	20660	40080	19420	1.93
3	100% RDN + 25 %N through FYM	13.65	29.25	22730	43775	21045	1.92
4	100 % RDN + 25 % N through FYM + 30 kg S ha^{-1}	16.50	33.60	23180	52860	29680	2.28
5	100 % RDN + 25 % N through FYM + 30 kg S ha^{-1} + 5 kg Zn	17.70	34.80	23610	56585	32970	2.39
6	75 % RDN	10.87	21.40	19180	34750	15570	1.80
7	75 % RDN + 25 % N through FYM	11.60	23.41	21230	37140	15910	1.74
8	75 % RDN + 25 % N through FYM + 30 kg S ha^{-1}	13.33	27.90	21860	42770	20910	1.95
9	75 % RDN + 25 % N through FYM + 30 kg S ha^{-1}+ 5 kg Zn ha^{-}	14.20	29.25	22370	45525	23155	2.03
10	Control	8.90	18.18	18560	28518	9958	1.53
11	SE (m)	1.78	0.94	-	-	-	-
12	CD at 5%	2.49	1.99	-	-	-	-

Table 2: Effect of integrated nutrient management on uptake of Nutrients and quality of linseed

S. No.	Treatments	N (kg ha^{-1})	P(kg ha^{-1})	K (kg ha^{-1})	S (kg ha^{-1})	Zn (g ha^{-1})	Oil Content (%)	Oil yield (kg ha^{-1})	Protein Content (%)
1	125 % RDN	66.08	13.73	49.57	11.14	883.47	39.58	618.63	21.25
2	100 % RDN	53.48	11.26	40.80	9.10	753.08	39.30	491.06	20.24
3	100% RDN + 25 %N through FYM	58.74	12.63	48.11	11.16	866.73	39.50	551.67	20.56
4	100 % RDN + 25 % N through FYM + 30 kg S ha^{-1}	75.73	15.77	52.22	12.81	1073.40	40.50	628.25	21.68
5	100 % RDN + 25 % N through FYM + 30 kg S ha^{-1} +5 kg Zn ha^{-1}	81.43	16.74	54.97	13.63	1159.36	40.75	753.71	21.87
6	75 % RDN	43.56	9.25	34.33	7.46	575.51	38.60	393.46	19.87
7	75 % RDN + 25 % N through FYM	47.65	10.19	38.25	8.17	649.25	35.41	403.20	20.00
8	75 % RDN + 25 % N through FYM + 30 kg S ha^{-1}	58.39	12.49	45.52	9.89	700.75	39.15	514.74	20.50
9	75 % RDN + 25 % N through FYM + 30 kg S ha^{-1} + 5 kg Zn ha^{-1}	62.19	13.21	46.58	10.64	812.62	39.35	566.64	20.93
10	Control	35.39	6.70	25.73	4.23	425.32	38.10	260.34	19.50
	SE (m) +	11.12	2.54	0.64	0.92	70.58	1.62	34.76	-
	CD at 5%	23.56	5.36	1.67	1.97	149.93	NS	73.60	-

Conclusion

From the results of the present investigation summarized above it may be concluded, that integration of 30 kg S ha^{-1} + 5 kg Zn ha^{-1} with 100% RDN is utmost beneficial and essential to get highest yield and economic return. It should be practiced by the cultivators especially in the central plain zone of U.P. It is also concluded that substitution of 25% N through FYM with 75% RDN produced yield and economic return at par to 100% RDN indicating the possibility to reduce N fertilizer need by 25% through the application of self prepared FYM along with chemical fertilizer by small and marginal farmers of central plain zone of U. P.

References

1. Verma A, Nepolia V, Kanthaliya PC. Effect of continuous cropping and fertilization on crop yield and nutrient status of typic haplustept. Journal of Indian Society of Soil Science. 2005; 53(2):365-68.
2. Dalel BD, Panda S, Kheroar S, Deshmukh MR. Effect of Integrated nutrient management on growth yield and economics of Niger (*Guizotia abyssinica* L F). Oilseed Research. 2014; 31:46-48.
3. Kumar A, Singh P, Kumar A, Maurya CL. Effect of applied S and Zn on seed yield, quality and oil content of linseed (*Linum ustiatissimum* L) Journal of Oilseed Research. 2009; 26:287-289.
4. Chaudhary SS, Godara PK. Singh Nihal Response of mustard to doses and sources of sulphur. Ann. Pl. Soil Res. 2003; 5:90-92.
5. Tiwari US, Yadav BK, Pandey RK, Dubey SD. Effect of integrated nutrient management on yield, nutrient uptake and quality of Indian mustard (*Brassica Juncea* L.) in central plain zone of U. P. Journal of oil seed Research. 2012; 29:168-169.
6. Kumar H, Yadav DS. Effect of phosphorus and sulphur level on growth, yield and quality of Indian mustard (*Brassica Juncea* L.) culture. Indian Journal of Agronomy. 2007; 52:154-157.
7. Karthikeyan K, Shukla LM. Effect of boron-sulphur interaction on their uptake and quality parameters of mustard (*Brassica juncea* L.) and sunflower (*Helianthus annuus* L.) Indian Society of Soil Science. 2008; 56:225-230.
8. Ramesh P, Panwar NR, Singh AB, Ramana S. Effect of organic nutrient management practices on the production potential, nutrient uptake, soil quality, input use efficiency and economics of mustard (*Brassica Juncea* L.) Indian journal of agriculture science. 2009; 79:40-44.