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Short Note

Effect of S and Zn with N P K on yellow mustard (*Brassica campestris* L.): An economic analysis

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Abstract
The field experiment was carried out at Department of Soil Science, Sam Higginbottom Institute of Agriculture, Technology and Science, Allahabad, India during *rabi season*. The experiment was laid out in 3×3 factorial randomized block design with 9 treatments in three replications. It indicates that application of sulphur and zinc increased the total cost of cultivation of yellow mustard markedly. The maximum total cost of cultivation (₹ 34610.68 ha^{-1}) and the minimum net return (₹ 18159.72 ha^{-1}) was computed with application of 30 kg S ha^{-1} and 5.5 kg Zn ha^{-1} while the maximum net return₹$^{-1}$ invested (1.89) was recorded with the application of 45 kg S ha^{-1} and 1.35 kg Zn ha^{-1}. There should be a chance of better yield and net income, suggested all operations will be performing timely for this crop, because time is a very important factor and play great role for greater yield and its quality, before time or after time any operations in the field of agriculture production and quality will goes down. However, since these findings are based on one-year experiment and therefore, further research may be conducted to substantiate it under Allahabad agro climatic conditions.

Keywords: Sulphur, zinc, yellow mustard, economic analysis

Introduction
The acreage under brown mustard is steadily on the increase at the expense of other Brassicae due to its higher production, greater tolerance to pests and diseases and moisture stress. Mustard yield the most important edible oil. The content of the seeds or different forms ranges from 30 to 48 per cent. The oil obtained is the main cooking medium in our country, which cannot be easily replaced by any other edible oil. The seed and oil are used as a condiment in the preparation of pickles and for flavouring curries and vegetables. The oil cake is mostly used as a cattle feed. The leaves of young plants are used a green vegetable. The use of mustard oil for industrial purposes is rather limited on account of its high cost. This crop requires relatively cool temperatures for satisfactory growth. In India, mustard is grown in the Rabi season from September to October, successfully grown in light to heavy loam soils, light soil area also good for this. A fine seed bed is required to ensure good germination. Nitrogen application in this crop in to three equal splits increase the seed, Stover and biological yield. Water and fertilizers are scare and costly commodities and their judicious application is a must to achieve higher benefits under limited resource condition. Oil seed crops require more of sulphur for their oil and protein synthesis, which indicated considerable increase in the yield and its quality. Sowing of the crop at adequate time is an important noncash input for boosting crop productivity. Use of all advanced package of practices property and timely resulted optimum cost with better quality of yield. The first position in area and second position in Production after China (Anonymous 2009) [1]. Rape seed and mustard crops are cultivated in 53 countries across the globe covering an area of 24.2 million hectare. Indians contribution to world hectare and production is 28.3 and 19.8 percent respectively**.** Potassium is one of the seventeen elements which are essential for growth and development of plants. It's for improving the yield and quality of different crops because of its effect on photosynthesis, water use efficiency and plant tolerance to diseases, drought and cold as well for making the balance between protein and carbohydrates. (Singh *et al*., 2010) [7]
The technology mission in oilseed initiated in 1986 paved the way to meet different challenges and complexities in the oilseed sector.

There was five times increase in oilseed production during the period revising 1950-2004 under predominantly rainfed agro-ecological conditions. These were higher than even the corresponding production increase in total food grains during 2003-2004. Even with a record oilseed production of 25.1 million tonnes, India imported 51 lakh tones of vegetable oils costing more than Rs. 11000 crores. The country's demand for vegetable oils is expected to increase from the current level of 13 million tonnes to 14.8, 18.3 and 21.8 million tons by 2010, 2015 and 2020 respectively (Hedge, 2007) [5]. In Uttar Pradesh, mustard occupies an area of 0.781 million hectares and production of 0.957 million tonnes (Hedge, 2007) [5]. Nearly 76% oilseeds area is rainfed which is often subjected to erratic monsoon.

Materials and methods

The experiment was conducted during *rabi season* of 2014-15 at Crop research farm Department of Soil Science Allahabad School of Agriculture SHIATS-DU Allahabad. The experimental site is located in the sub – tropical region with 25^0 27^1 N *latitude* 81^0 51^1 E longitudes and 98 meter the sea level *altitudes.* The experiment was laid out in a 3^2 RBD factorial design with three levels of each Sulphur and Zinc with nine treatments, each consisting of three replicates. The total number of plots was 27. Yellow Mustard (*Brassica campestris* L.) Var. Krshna Super Goldi' were sown in Rabi season plots of size 2 x 2 m with row spacing 30 cm and plant to plant distance 10 cm. The Soil of experimental area falls in order of Inceptisols and is alluvial in nature, both the mechanical and chemical analysis of soil was done before starting of the experiment to ascertain the initial fertility status. The soil samples were randomly collected from0-15cm depths prior to tillage operations. The treatment consisted of nine combination of inorganic source of fertilizers T_1 (@ 15 kg S ha^{-1} + 1.35 kg Zn ha^{-1}), T_2 (@ 15 kg S ha^{-1} + 2.75 kg Zn ha^{-1}), T_3 (@ 15 kg S ha^{-1} + 5.5 kg Zn ha^{-1}), T_4 (@ 30 kg S ha^{-1} + 1.35 kg Zn ha^{-1}), T_5 (@ 30 kg S ha^{-1} + 2.75 kg Zn ha^{-1}), T_6 (@ 30 kg S ha^{-1} + 5.5 kg Zn ha^{-1}), T_7 (@ 45 kg S ha^{-1} + 1.35 kg Zn ha^{-1}), T_8 (@ 45 kg S ha^{-1} + 2.75 kg Zn ha^{-1}), T_9 (@ 45 kg S ha^{-1} + 5.5 kg Zn ha^{-1}). The source of Sulphur and Zinc as Milvet Sulphur and Zinc sulphate respectively.

Results and discussion

Table 1: Economics of different treatment combinations

Treatments	Seed Yield (q ha^{-1})	Stover yield	Sale Rate (ha^{-1})		Gross return (ha^{-1})	Cost of cultivation (ha^{-1})	Net return (ha^{-1})	B:C ratio
			Seed ha^{-1}	Stover				
T1	15.47	2.84	49493.33	312.03	49805.37	28110.68	21694.69	1.77
T2	15.70	2.68	50240.00	294.80	50534.80	30360.68	20174.12	1.66
T3	15.90	2.50	50880.00	275.00	51155.00	32610.68	18544.32	1.57
T4	16.20	2.63	51840.00	289.30	52129.30	30110.68	22018.62	1.73
T5	14.40	2.49	46080.00	273.90	46353.90	32360.68	13993.22	1.43
T6	16.40	2.64	52480.00	290.40	52770.40	34610.68	18159.72	1.52
T7	16.53	2.31	52906.67	254.17	53160.84	28110.68	25050.16	1.89
T8	17.20	2.26	55040.00	248.60	55288.60	30360.68	24927.92	1.82
T9	16.70	2.45	53440.00	269.87	53709.87	32610.68	21099.19	1.65

Cost of cultivation was worked out on per hectare basis. Economics of different treatment combinations was worked out by taking into account the cost of cultivation and sale value of produce. The gross income and return $_{\text{₹}}^{-1}$ invested were worked out as follows for each treatment combination:

- Gross income (ha^{-1}) = Cost of mustard seed (ha^{-1}) + Cost of stover (ha^{-1}).
- Net return (ha^{-1}) = Gross income (ha^{-1}) − Total cost of cultivation (ha^{-1}).
- Net return$_{\text{₹}}$ ha^{-1}invested= Net return (ha^{-1})/ Total cost of cultivation (₹ ha^{-1}).

The data given in Table 1 indicates that application of sulphur and zinc increased the total cost of cultivation of yellow mustard markedly. The maximum total cost of cultivation (34610.68 ha^{-1}) and the minimum net return (18159.72 ha^{-1}) was computed with application of 30 kg S ha^{-1} and 5.5 kg Zn ha^{-1} while the maximum net return $_{\text{₹}}^{-1}$ invested (1.89) was recorded with the application of45 kg S ha^{-1} and 1.35 kg Zn $ha^{-1.}$

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Conclusion

The maximum net return$_{\text{₹}}^{-1}$ invested (1.89) was recorded with the application of 45 kg S ha^{-1} and 1.35 kg Zn $ha^{-1.}$

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