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EFFECT OF PHOSPHORUS AND SULPHUR LEVELS ON GROWTH AND YIELD, OF INDIAN MUSTARD (*Brassica juncea* L.).

Tadang Meena[1], Lipi Rina[2], Gonya Dirchi [3]and Chukhu Mercy[4]

Department of Agriculture, Himalayan University, Jullang, Itanagar, Arunachal Pradesh.

[1&3]Subject Matter Specialist (Agronomy), KVK Papum Pare, Subject Matter Specialist (Plant Protection), Krishi Vigyan Kendra, Upper Siang, Arunachal Pradesh, India.
(Corresponding author: tadang.m@gmail.com)
[2&4] Assistant Professor, Himalayan University, Itanagar-791111, Arunachal Pradesh, India.

ABSTRACT

A field experiment was conducted during *rabi* season 2023-2024 at Crop Research Farm (CRF), Department of Agronomy, Himalayan University, Itanagar Arunachal Pradesh, India to study the Effectof phosphorus and sulphur levels on growth and yield of Indian mustard (*Brassica juncea* L.).The experiment was laid out in randomized block design with ten treatments *viz.*, T2- 45kg/ha phosphorus + 25kg/ha sulphur, T3- 45kg/ha phosphorus + 35kg/ha sulphur , T4- 45kg/ha phosphorus + 50kg/ha sulphur, T5- 60kg/ha phosphorus + 25kg/ha sulphur, T6- 60kg/ha phosphorus + 35kg/ha sulphur, T7- 60kg/ha phosphorus + 50kg/ha sulphur, T8- 65kg/ha phosphorus + 25kg/ha sulphur, T9- 65kg/ha phosphorus + 35kg/ha sulphur , T10- 65kg/ha phosphorus + 50kg/ha sulphur were compared with T1 Control. The treatments were replicatedthree times. Growth attributes *viz*., plant height (138.40 cm at 90 DAS), number of leaves and dry weight (43.60 g at 90 DAS) were significantly higher under the treatment T10 (65kg/ha phosphorus + 50kg/ha sulphur), respectively. Crop yield *viz.*, seed yield (1.91 t ha-1) and stoveryield (3.98 t ha-1) significantly higher were recorded in treatment combination T10 (65kg/ha phosphorus + 50kg/ha sulphur), respectively.

Keywords: Phosphorus, Sulphur, Growth attributes and Yield.

Introduction

Oilseed crop has been the backbone for agriculture economy of India from time immemorial. Amongst the various oilseeds, rapeseed, and mustard *(Brassica spp.)* are the third most important oilseed crop after groundnut and soybean in India occupying 6.18 M/ha acreage,
7.36 Mt production and 1109 kg hectare productivity. In India *Brassica* species are mostly grown in North India Region Consisting of Rajasthan, Uttar Pradesh, Parts of Madhya Pradesh,Gujarat, Punjab, Haryana Part of Himanchal Pradesh and are adopted to varies agro-climatic condition. Mustard is also called as raj Raya or Laha it is supposed to be native of India. AmongIndia Sates, Rajasthan First

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Ranks First Both Area and production of mustard with 2.33 Mt and
2.70 Mt, respectively it is followed the state of Uttar Pradesh where mustard is grown on 12.95lakh/ha with 8.00 lakh ton seed production and 730. kg /ha productivity (Economic survey 2008-2009). However, Gujarat states highest productivity of mustard (1510 kg/ha) in the country.

Deficiency of phosphorus restricts growth of roots and of aerial parts of rapeseed and mustardplants and in extreme cases can prevent flowering. The crop remains dwarf with small leaves and no inflorescence. Where phosphorus deficiency is slight, growth is restricted in the rosettestage but the crop tends to recover and the flowering stage may be little affected. Flowering may be delayed by a day or two by slight phosphorus deficiency as may ripen of the seed Trivedi, S,K and Kumar, R (2012) .

Mustard is responsive to sulphur in comparison to other crops. Sulphur fertilization has also been shown to increase the oil content in seeds of rapeseed-mustard. Sulphur is the key component of balanced nutrient application for higher yields and superior quality produce of mustard. Sulphur plays a vital role in the synthesis of amino acids, chlorophyll and certain vitamins (Joshi., D,C *et al*., 1973)

Materials and methods Study
and area description

The experiment was conducted on Indian mustard during the *rabi* season of 2023 at Crop Research Farm (CRF), Department of Agronomy, Himalayan University, Arunachal Pradesh, India. The experimental site is located at 27.140 N latitude and 93.620 E longitudes and at an altitude of 320 m above mean sea level. The site comes under the Eastern Himalayanregion and the Argo-climatic zone is under sub-Tropical zone of Arunachal Pradesh.

Experimental design and analysis

The experiment consisted of two factors phosphorus and sulphur, the total treatment combinations were ten and the experiment laid out in randomized block design with three replications. The treatment details are T1 Control, T2- 45kg/ha phosphorus + 25kg/ha sulphur,T3- 45kg/ha phosphorus + 35kg/ha sulphur, T4- 45kg/ha phosphorus + 50kg/ha sulphur, T5- 60kg/ha phosphorus + 25kg/ha sulphur, T6- 60kg/ha phosphorus + 35kg/ha sulphur, T7- 60kg/ha phosphorus + 50kg/ha sulphur, T8- 65kg/ha phosphorus + 25kg/ha sulphur, T9- 65kg/ha phosphorus + 35kg/ha sulphur, T10- 65kg/ha phosphorus + 50kg/ha sulphur. The experimental data were analyzed statistically using analysis of variation (ANOVA) for Randomized Block Design and by applying the technique of analysis of variance prescribed for the design to test and conclusions were drawn at

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5% probability levels.

Results and Discussion

Yield

During the present experiment data (Table 1) noticed that the seed yield (1.91 t/ha) significantly higher and stover yield (3.98 t/ha), respectively were recorded in treatment T10 (65kg/ha phosphorus + 50kg/ha sulphur).

The high seed yield obtained because higher levels of phosphorus provide better environment of nutrition for active growth of plants at vegetative stages and also help in multiplication, elongation, and expansion of cell in plant body (Sahoo *et al*., 2019).

The increase in seed yield is probably due to the fact that application of phosphorus and sulphur favourably influence the photosynthesis, biosynthesis of proteins and phospholipids and other metabolic processes of the plant. Phosphorus and sulphur also increase the formationof siliqua and formation of seed in siliqua (Patel *et al*., 2016). The lowest seed yield was recorded under control treatment which is attributed due to the insufficient nutrient available to crop plants and increasing in weed plants.

Conclusion

This study indicated that growth attributes and productivity of Indian mustard under combination of 65kg/ha phosphorus + 50kg/ha sulphur was found to be more growth, seed yield and stover yield. Second best treatment combination is 65kg/ha phosphorus + 35kg/hasulphur and the lowest yield was found in control treatment.

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Table 1: Effect of phosphorus and Sulphur levels on yield of Indian mustard

Treatments details	Seed yield (t/ha)	Stover yield (t/ha)	Harvest index (%)
T1 = control	0.76	2.18	25.87
T2 = 45kg/ha phosphorus + 25kg/ha sulphur	0.90	2.57	25.90
T3 = 45kg/ha phosphorus + 35kg/ha sulphur	1.42	3.00	32.10
T4 = 45kg/ha phosphorus + 50kg/ha sulphur	1.12	3.07	26.75
T5 = 60kg/ha phosphorus + 25kg/ha sulphur	1.31	3.28	28.59
T6 = 60kg/ha phosphorus + 35kg/ha sulphur	1.36	3.26	29.44
T7 = 60kg/ha phosphorus + 50kg/ha sulphur	1.18	3.10	27.63
T8 = 65kg/ha phosphorus + 25kg/ha sulphur	1.21	3.11	28.03
T9 = 65kg/ha phosphorus + 35kg/ha sulphur	1.70	3.60	32.07
T10 = 65kg/ha phosphorus + 50kg/ha sulphur	1.91	3.98	32.45
F test	S	S	S
Sem (±)	0.04	0.08	0.16
CD (P = 0.05)	0.10	0.22	0.46

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