

## Effect of different nutrient management practices on the growth and yield of mustard (*Brassica Juncea L.*)

### Abstract

A field experiment was conducted at experimental farm, Department of Agronomy, Faculty of Agriculture and Veterinary Sciences, Mewar University Gangrar, Chittorgarh (Rajasthan) during Rabi season of 2023-24 to effect of different nutrient management on growth and yield of mustard variety "NRCHB-506" was used in this study. The required quantities of fertilizers as per treatments were applied. The experiment was laid out in randomized block design with three replications consisting of ten treatments. The data recorded maximum growth parameters such as plant population (19.65 per m<sup>2</sup>), plant height (134.85 cm), number of branches per plant (11.95), dry matter accumulation (38.65 g), length of siliqua (4.72 cm), days required for maturity (130.45 days), leaf area index (2.48) and yield parameter such as number of siliqua per plant (265.08), number of seed per siliqua (11.95), seed yield (2120.44 kg/ha), straw yield (5125.12 kg/ha), biological yield (7245.56 kg/ha) recorded with treatment T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter. Therefore, conclude that application 100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter superior among all treatments.

**Keywords:** -Sulphur; Zinc; Yield, Mustard; Azotobacter

### 1. Introduction

Oilseed crops are next to cereals in production of agricultural commodities in India, and they play a critical role in the Indian economy. Indian mustard (*Brassica juncea* L.) is predominantly cultivated in the states of Rajasthan, Uttar Pradesh, Haryana, Madhya Pradesh, and West Bengal, out of which about 46.0% of total production contributed by Rajasthan state alone. Domestic production of edible oils meets only 50% of the total requirements, while rest is imported (Kumar *et al.* 2011). It is one of the most important edible oils of northern and eastern parts of India and traditionally grown everywhere in the country due to their high adaptability in conventional farming systems. It is the second most important edible oilseed after groundnut, with a total area of 6.23 m ha and an output of 9.34 mt (Anonymous, 2019). It covers area 2.37 m ha in Rajasthan, with production and productivity of 4.08 mt and 1720 kg ha<sup>-1</sup>, respectively (Anonymous, 2019).

Nitrogen is an important element for the growth and development of most plants.

**Comment [SM1]:** Include experiment objectives and conclusion

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Nitrogen is also an integral part of chlorophyll, which is the primary absorber of light energy needed for photosynthesis. Phosphorus is second most critical plant nutrient. But for pulses, it assumes primary importance, owing to its important role in root proliferation, which are the seat of biological N fixation and helps plants to draw nutrients from lower layers and consequently thrive under moisture stress conditions (Taliman *et al.*, 2019). Sulphur is an essential important component in deciding the seed yield of mustard. The amount of oil content and tolerance to various biotic and abiotic stresses. Besides encouraging the formation of chlorophyll and the processing of oil, It's component of seed protein, amino acids, enzymes and glucosinolate. Zinc is essential in formation of a large number of enzymes and plays an essential role in DNA transcription. It plays a vital role especially translocation of nitrogen and synthesis of protein (Bisht *et al.* 2018).

## **2. Materials and Methods**

A field experiment was conducted during Rabi season of 2022-23 at experimental farm, Department of Agronomy, Faculty of Agriculture and Veterinary Sciences, Mewar University Gangrar, Chittorgarh (Rajasthan). Soil of the experimental field was sandy loam in texture, saline in reaction with a pH value of 7.6, poor in organic carbon (0.16%), deficient in available zinc (0.48 ppm) and iron (1.2 ppm) low in available nitrogen (176 kg/ha) and phosphorus (20.2 kg/ha) but medium in available potassium (320 kg/ha). The experiment was laid out in randomized block design with three replications consisting of ten treatments viz. T<sub>1</sub>-Control, T<sub>2</sub>-100% RDF, T<sub>3</sub>-100% RDF + Sulphur (40 kg/ha), T<sub>4</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha), T<sub>5</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha), T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter, T<sub>7</sub>-75% RDF + Sulphur (40 kg/ha), T<sub>8</sub>-75% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha), T<sub>9</sub>-75% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) and T<sub>10</sub>-75% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter. The required quantities of fertilizers as per treatments were applied. The doses of NPK were applied in the form of urea, diammonium phosphate, and muriate of potash respectively. The half dose of nitrogen gives basal dose and remain two split doses after irrigation and full dose of phosphorus and potassium at basal dose. Vermicompost apply in field at field preparation before sowing.

## **3. Results and Discussion**

### **3.1 Growth attributes**

Application of different nutrient management practices was noticed significant effect on growth attributes of mustard. The data presented in Table 1.0 – 2.0. The maximum plant stand with T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (19.65 per m<sup>2</sup>). The minimum plant population recorded with control treatment (15.25 per m<sup>2</sup>). The maximum plant height was recorded with treatment was recorded T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (105.48 and 134.84 cm). The minimum plant height was recorded with control treatment (78.25 and 98.35 cm) at 60 DAS and at harvest, respectively. The the maximum number of branches per plant was recorded with treatment was recorded T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (9.85 and 11.95). The minimum number of branches per plant was recorded with control treatment (7.12 and 9.15). The maximum dry matter accumulation was recorded with treatment T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (38.65 g). The minimum dry matter accumulation was recorded with control treatment (29.58 g). The maximum length of siliqua was recorded with treatment T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (4.72 cm). The minimum length of siliqua was recorded with control treatment (4.25 cm). The maximum days required for maturity was recorded with treatment T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (130.45 days). The minimum days required for maturity was recorded with control treatment (120.36 days). The maximum leaf area index was recorded with treatment T<sub>5</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) (2.48). The minimum leaf area index was recorded with control treatment (1.85). These findings also supported by Choudhary (2006), Kumar *et al.* (2011), Chauhan *et al.* (2012), Kumar *et al.* (2017), Yadav *et al.* (2017) and Bisht *et al.* (2018).

### 3.2 Yield attributes and yield

Application of different nutrient management practices was noticed significant effect on yield attributes and yield of mustard. The data presented in Table 3.0 and Figure 1.0. The maximum number of siliqua per plant was recorded with treatment T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (265.08). The minimum number of siliqua per plant was recorded with control treatment (170.36). The maximum number of seed per siliqua was recorded with treatment T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (11.95). The minimum number of seed per siliqua was recorded with control treatment (10.20). The maximum seed yield was

recorded with treatment T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (2120.44 kg/ha). The minimum seed yield was recorded with control treatment (985.36 kg/ha). The maximum straw yield was recorded with treatment T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (5125.12 kg/ha). The minimum straw yield was recorded with control treatment (3600.25 kg/ha). The maximum biological yield was recorded with treatment T<sub>6</sub>-100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter (7245.56 kg/ha). The minimum biological yield was recorded with control treatment (4585.61 kg/ha). Similar result also reported by Fuller *et al.* (2008), Sahoo *et al.* (2010), Dubey *et al.* (2013), Bhati *et al.* (2014), Dashora *et al.* (2014) and Mondal *et al.* (2015)

### Conclusion

The findings of present investigation revealed that effect of different nutrient management practices on growth and yield of mustard (*Brassica juncea* L.). Among different treatment 100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter registered the maximum production and productivity. So, the treatment. 100% RDF + Sulphur (40 kg/ha) + Zinc sulphate (25 kg/ha) + Boron (1 kg/ha) + Azotobacter superior among all treatments.

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**Table.1.0**Effect of different nutrient management on growth attributes of mustard

Treatments	Plant population per m <sup>2</sup>		Plant height (cm)			Number of branches per plant		
	20 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
T <sub>1</sub>	24.33	15.25	11.85	78.25	98.35	3.25	7.12	9.15
T <sub>2</sub>	25.66	16.25	12.08	89.25	110.36	3.58	8.35	10.45
T <sub>3</sub>	25.85	16.48	12.25	92.25	113.45	3.65	8.55	10.52
T <sub>4</sub>	25.96	17.45	12.95	98.02	125.02	3.95	8.92	10.90
T <sub>5</sub>	26.50	18.52	13.45	102.45	132.14	4.15	9.48	11.40
T <sub>6</sub>	26.85	19.65	12.78	105.48	134.85	4.25	9.85	11.95
T <sub>7</sub>	26.65	16.65	12.02	82.65	105.45	3.55	8.30	10.35
T <sub>8</sub>	26.12	16.85	12.45	94.25	118.25	3.75	8.75	10.70
T <sub>9</sub>	26.10	17.02	12.68	95.12	121.47	3.82	8.80	10.85
T <sub>10</sub>	26.45	17.85	13.08	100.02	128.66	4.02	9.18	11.20
S. Em. (±)	0.55	0.65	0.89	1.86	2.45	0.15	0.24	0.28
C.D.(P=0.05)	NS	1.96	NS	5.60	7.32	NS	0.75	0.82

**Table.2.0**Effect of different nutrient management on growth attributes of mustard

<b>Treatments</b>	<b>Dry matter accumulation per plant at harvest (g)</b>	<b>Length of siliqua at harvest (cm)</b>	<b>Days required for maturity</b>	<b>Leaf area index</b>
T <sub>1</sub>	29.58	4.25	120.36	1.85
T <sub>2</sub>	34.36	4.35	123.55	2.05
T <sub>3</sub>	34.45	4.38	124.25	2.12
T <sub>4</sub>	35.86	4.52	126.03	2.32
T <sub>5</sub>	36.82	4.65	128.65	2.48
T <sub>6</sub>	38.65	4.72	130.45	2.41
T <sub>7</sub>	33.25	4.31	124.12	2.08
T <sub>8</sub>	34.52	4.45	125.33	2.18
T <sub>9</sub>	35.02	4.48	125.89	2.25
T <sub>10</sub>	36.52	4.58	127.36	2.38
S. Em. (±)	0.72	0.05	1.12	0.04
C.D. (P=0.05)	2.15	0.15	3.32	0.12

**Table.3.0 Effect of different nutrient management on yield attributes of mustard**

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Treatments	Number of siliqua per plant	Number of seed per siliqua	Seed yield (kg/ha)	Straw yield (kg/ha)	Biological yield (kg/ha)
T <sub>1</sub>	170.36	10.20	985.36	3600.25	4585.61
T <sub>2</sub>	202.12	10.45	1352.65	4355.32	5707.97
T <sub>3</sub>	215.32	10.62	1485.25	4458.42	5943.67
T <sub>4</sub>	240.33	11.05	1753.66	4752.11	6505.77
T <sub>5</sub>	255.14	11.65	1985.33	4952.22	6937.55
T <sub>6</sub>	265.08	11.95	2120.44	5125.12	7245.56
T <sub>7</sub>	208.36	10.55	1378.65	4325.33	5703.98
T <sub>8</sub>	222.77	10.68	1558.78	4562.88	6121.66
T <sub>9</sub>	228.02	10.89	1632.69	4632.33	6265.02
T <sub>10</sub>	250.14	11.25	1865.78	4855.77	6721.55
S. Em. (±)	5.14	0.26	88.66	92.36	102.81
C.D. (P=0.05)	15.40	0.77	264.02	276.18	308.65

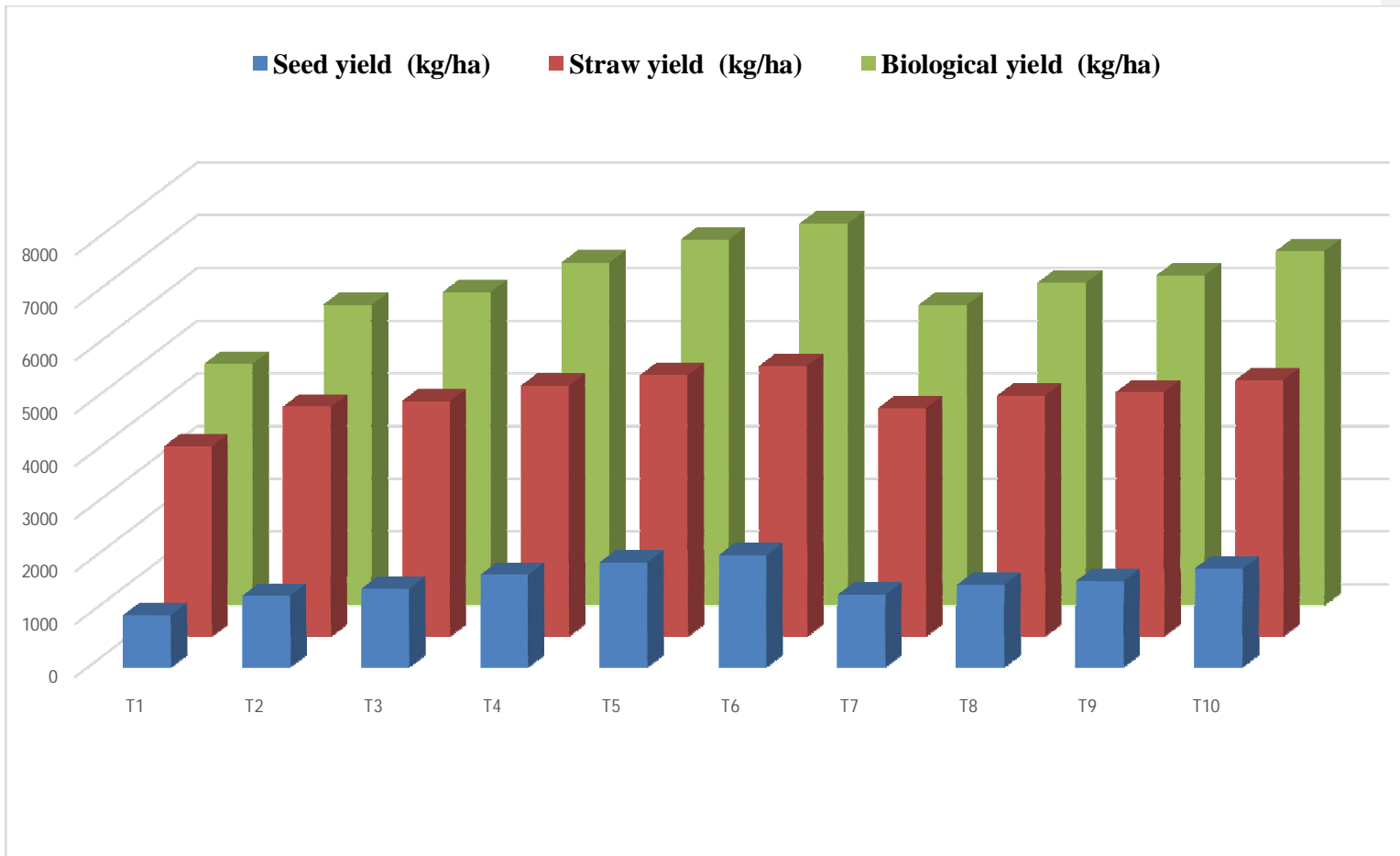


Figure 1.0 Effect of different nutrient management on yield of mustard

Comment [SM6]: Include stand error on this graph

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