**Evaluate the economics of Sulphur and Nitrogen treatments on Mustard crop in Jaunpur(*Brassica juncea* L.)**

**Abstract—** This research aims to evaluate the total money requited for application of Sulphur and Nitrogen fertilizers on Mustard crop in Jaunpur, Uttar Pradesh. The field experiment on the topic “Evaluate the economics of Sulphur and Nitrogen treatments on Mustard crop(*Brassica juncea* L.)” was conducted in eastern U.P. in Pilikothi research farm Tilak Dhari P.G. College Jaunpur in *Rabi* season 2023-24 from November to march. The soil of experiment field is well drained sandy loam soil with low organic content and average in nitrogen, phosphorous and potash content. The soil of the field is slightly alkaline nature and the electrical conductivity of the soil is 0.580dsm-1. The variety of mustard used is VIGOUR-2311. This experiment is conducted with three levels of nitrogen (0, 60, 120 kg ha-1) and three levels of sulphur (0, 30, 40 kg ha-1) in Factorial Randomized Block Design (FRBD). The data of Economics like “total cost of cultivation, gross income, net income and B:C ratio” of different treatment combinations of above nutrients are evaluated after harvest of mustard crop and the result is as expected means the higher dose combination of applied nutrient have higher value of economic data parameters and that combination gave amazing profit in this cultivation.

***Keywords*- Nitrogen, Sulphur, Mustard, economics, Total cost, Gross income, Net income, B:C ratio**

**1.Introduction**

Mustard (*Brassica spp*.) is a major oilseed crop cultivated worldwide, contributing significantly to edible oil production. Oil content and quality are vital determinants of its economic value. India is one of the largest mustard growing countries in the world, occupying the first position in area and third position in production after China and Canada. Rapeseed and mustard is the third important oilseed crop in the world after Soybean (*Glycine max*) and Palm (*Elaies guineensis*). Among the seven edible oil seeds cultivated in India, rapeseed mustard (*Brassica spp.*) contributes 28.6 % in the total production of oil seed crops. Mustard is an important *Rabi* crop of Rajasthan, Gujarat, M.P., Uttarakhand, Uttar Pradesh, Bihar, West Bengal and Assam. In India, cultivation of mustard is done over an area or about 8.8 million hectares with production and productivity of 11.35 million tonnes and 1151 Kg ha-1, respectively (Anonymous). In India, Rajasthan ranks first both in area and production and Gujarat state has the highest productivity of mustard. In U.P., Mustard is grown on 1.08 million hectare with production of 1.62 million tonnes and productivity of 1497 Kg ha-1 (Indian Stat 2022-23). Nitrogen is a crucial macronutrient for oilseed crops, directly influencing the synthesis of amino acids, taking direct role in plant height increment. Despite its importance, nitrogen deficiency in soils has become a widespread issue, limiting the productivity and quality of mustard crops. The importance of nitrogen to achieve the higher production potential in mustard is well recognized. Nitrogen is an important metabolic element for growth and development of plant. Significant response of seed crops to the tune of 30-40 % was recorded due to the use of secondary and micronutrients and with significant residual effect in cropping system. It is the constituent of the amino acids like methionine, cysteine and cystine. Sulphur level significantly influenced the seed and Stover yield of mustard. This study aims to evaluate the total cost taken to grow mustard crop and what is the value of our product and find the b c ratio too. The use of Nitrogen and Sulphur are more important in mustard field because both are necessary for height, seed yield, oil content of the crop. What is total cost is used for the application of these fertilizers *vs.* what is the total yield benefit are found on the application the above fertilizers are the key parameters of this research paper.( Add latest Reference authors name and year)

**2.Material and method**

The field experiment was conducted in eastern U.P. in Pilikothi research farm Tilak Dhari P.G. College Jaunpur Uttar Pradesh in *Rabi* season 2023-24 from November to march. The soil of experiment field is well drained sandy loam soil with low organic content. The soil of the field is slightly alkaline (pH 8.5) nature and the electrical conductivity of the soil is 0.580dsm-1. The available nutrient in the field is nitrogen- 51.75, phosphorous- 4.5 and potash- 100.8 kilogram per hectare. The mustard variety used in the experiment is VIGOUR-2311. This is a highly grown hybrid variety of the duration 110-120 days. The fertilizer used for nitrogen is Urea (46% N)and for sulphur is Sulphur bentonite (90% sulphur)**.** The doses of nitrogen used in the experiment are 0, 60, 120 kg ha-1 and the doses of sulphur 0, 30, 40 kg ha-1in factorial randomized block design within 3 replications. The total number of plot used is 27. The Phosphorous and Potassium are applied at the rate of 40 kg ha-1 and 40 kg ha-1 respectively and for them the fertilizers used are Single super phosphate (16% P2O5) and Muriate of potash (60% K2O) respectively. The complete dose of Phosphorus and Potash are given at the time of sowing (Basal dose). The application of sulphur is done at the time of sowing (Basal dose) according to treatment doses. The application of Nitrogen are as, half dose of nitrogen are applied at the time of sowing (basal dose) and the remaining half dose are applied at the time of first irrigation according to their appropriate treatments. The economic data analyses are done after the harvest of mustard crop. The all value analysis is done according to the prizing of Mustard at that time. Treatment combinations are following-

1. **S0N0**
2. **S0N1**
3. **S0N2**
4. **S1N0**
5. **S1N1**
6. **S1N2**
7. **S2N0**
8. **S2N1**
9. **S2N2**

**Where-**

* **N0** = 0 kg ha-1Nitrogen (Control)
* **N1** = 60 kg ha-1 Nitrogen
* **N2** = 120 kg ha-1 Nitrogen
* **S0** = 0 kg ha-1 Sulphur (Control)
* **S1** = 30 kg ha-1 Sulphur
* **S2** = 40 kg ha-1 Sulphur

**3.Result and discussion**

The data of result of economics are given in the following table-

**Table 1: Result of economics**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Treatment Combination** | **Yield Kg/ha** | **Cost of cultivation (₹ ha-1)** | **Gross income**  **(₹ ha-1)** | **Net income**  **(₹ ha-1)** | **B:C ratio** |
| **S0N0** |  | 30433 | 63473 | 33040 | 1.09 |
| **S0N1** |  | 32233 | 70044 | 37812 | 1.17 |
| **S0N2** |  | 33233 | 72933 | 39700 | 1.19 |
| **S1N0** |  | 30692 | 76254 | 45562 | 1.48 |
| **S1N1** |  | 32492 | 84052 | 51560 | 1.59 |
| **S1N2** |  | 33492 | 87518 | 54026 | 1.61 |
| **S2N0** |  | 31302 | 82607 | 51306 | 1.64 |
| **S2N1** |  | 33102 | 91054 | 57953 | 1.75 |
| **S2N2** |  | 34102 | 94854 | 60708 | 1.78 |

The data of economics in the table clearly shows that as we going through increment the doses the cost of cultivation is change simultaneously. The data is ranging from 30433₹ ha-1 to 34102₹ ha-1. The maximum cost of cultivation is found on the application of maximum doses S2N2 (40 kg + 120 kg + RDF) which are 34102₹ ha-1.

The gross income include total yield prize of seed and hay. The total yield of seed and hay is maximum on the application of higher dose of fertilizers i.e. 40 kg S ha-1 and 120 kg N ha-1 (S2N2) so that the gross return is maximum on the application combination of S2N2 (40 kg S + 120 kg N ha-1 + RDF) which is 94854₹ ha-1.

The net income includes only the total prize of seed which is get from the field. This is the income on which the whole profit or loss of the field is dependent. In the above table as we seen that the net income is lower in control plot (S0N0) which is 33040₹ ha-1 because the yield is lower due to no application of fertilizers except RDF. The maximum net income is got on the application of maximum dose combination i.e. S2N2 which is 60708₹ ha-1 because the yield is maximum on the application of that combination of doses.

Last and final discussion i.e. B:C ratio (Benefit : Cost ratio) which is calculated for knowing about field economics of different doses is beneficial or loss making. The B:C ratio of maximum treatment combination is high (1.78). ( Add latest Reference authors name with year on discussion part)

**4. Conclusion**

After all discussion and calculation we reached on our conclusion that the combination of **S2N2** (40 + 120 kg ha-1 + RDF) have highest cost of cultivation besides they give highest returns in this research and their B:C ratio is high too so this treatment combination are stand on our all economic parameters. That’s why the 40 kg S and 120 kg N ha-1 are recommended for application in the Mustard crop in Eastern U.P. (Jaunpur).

DISCLAIMER (ARTIFICIAL INTELLIGENCE) Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS: Authors have declared that no competing interests exist.

**References**

1. Anonymous. Government of India, Ministry of Agriculture & Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics and Statistics. 2021;72-73.
2. Ministry of Statistics and Programme Implementation. (2023). Indian Statistical Yearbook 2022-2023. Government of India.
3. Reddy CS, Reddy PR. Performance of mustard varieties on alfisols of Rayalaseema region of Andhra Pradesh, Journal of Oilseeds Research 1998;15:379-80.
4. **Kumar, P., & Singh, R. (2021).** Interaction effect of varying level of nitrogen and sulphur fertilizers on growth and yield of mustard (Brassica juncea L.). International Journal of Chemical Studies, 9(1), 2574-2578.Mandeewal RL, Soni ML, Gulati IJ, Shivran H, Choudhary R. Effect of Irrigation and Nitrogen Levels on Clusterbean (Cymopsis tetragonoloba) in IGNP Stage-II. Annals of Agriculture Research (New Series). 2020;41:360-365.
5. Nautiyal A, Barthwal A, Saxena AK. Growth and yield attributes of mustard (Brassica juncea L.), Var. Pant Brassica-21 scheduled on irrigation level and row spacing. J Pharmacogn Phytochem. 2020;9(2):300-303
6. **Mandeewal, R., & Meena, R. H. (2019).** Effect of nitrogen and sulphur in the production of the mustard crop (Brassica juncea L.). International Journal of Chemical Studies, 7(3), 123-126.
7. Chaurasiya A, Singh S, Singh V, Singh N, Singh A, Singh AK. Effect of nitrogen and Sulphur nutrition on integration effect, quality parameters, nutrient content or uptake &economics of Indian mustard (Brassica juncea L.). International Journal of Chemical Studies. 2019;7(1):787-791.
8. Dongarkar KP, Pawar WS, Khawale VS, Khutate NG, Gudadhe NN. Effect of nitrogen and Sulphur on growth and yield of mustard (Brassica juncea L.). Indian Journal of Soils and Crops. 2015;15(1):163-167.
9. Keivanrad, S, Zandi P. Effect of nitrogen levels on growth, yield and oil quality of Indian mustard grown under different plant densities. The Indian Journal of Agricultural Science. 2012;45(2):105-113.
10. Kumar M, Singh PK, Yadav KG, Chaurasiya A, Yadav A, Effect of nitrogen and Sulphur nutrition on growth and yield of Indian mustard (Brassica juncea L.) in Western Journal of Pharmacognosy and Phytochemistry. 2017;SP1:445-448.
11. Rajput RK, Singh SP, Verma J, Rajput P, Singh M, Nath S. Effect of different levels of nitrogen and Sulphur on growth and yield of Indian mustard (Brassica juncea L.) Czern and Cos.). Journal of Pharmacognosy and Phytochemistry. 2018;7(1):1053-1055.
12. Sharma *et al.*, (2008). Effectiveness of Gypsum and Pyrite for Sulfur Fertilization on Yield and Quality of Indian Mustard under Rainfed Conditions of North India. *Communications in Soil Science and Plant Analysis*, *39*(15–16), 2431–2439.