*IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*
*e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 15, Issue 12 Ser. I (December 2022), PP 45-50*
*www.iosrjournals.org*

# Performance of Different Levels of Sulphur and Moisture on Yield, Content and Uptake in Mustard

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***Abstract***
*An experiment wasconducted at Agricultural research farm of Barrister Thakur Chhedilal College of Agriculture & Research Station, Sarkanda, Bilaspur (C.G.), during Rabiseason 2021to study the effect of different levels of sulphur and moisture on yield of mustard under drip environment. The experiment was laid out in a Strip Plot Design with treatment combinations and replicated thrice. Treatment combinations included three irrigation levels on strip A viz., $I_1$ (80% PE), $I_2$ (60% PE) and $I_3$ (40% PE) through drip and four nutrient level application on strip B viz., $F_1$ (75% RDF + 10kg S), $F_2$ (75% RDF + 20kg S), $F_3$ (75% RDF + 30kg S) and $F_4$ (100% RDF + soil application). Irrigation at 60% PE ($I_2$) through drip recorded highest seed yield (2.44 t ha$^{-1}$) and stover yield (5.89 t ha$^{-1}$) which was at par with 80% PE ($I_1$). Maximum seed yield (2.48t ha$^{-1}$) and stover yield (5.78t ha$^{-1}$) was obtained by $F_3$ (75% RDF + 30 kg S) when compared to $F_1$ (75% RDF + 10 kg S) and $F_4$ (100% RDF + soil application) but found to be at par with $F_2$ (75% RDF + 20 kg S).The maximum content and uptake of N, P, K and S in grain and straw reported with the irrigation 60% PE ($I_2$) while in terms of nutrient level application $F_3$ (75% RDF + 30 kg S) recorded maximum content and uptake of N, P, K and S in mustard crop.*

***Keywords***- *Yield, Drip, Irrigation, Uptake, Mustard*

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Date of Submission: 02-12-2022 Date of Acceptance: 14-12-2022

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## I. Introduction:

Rapeseed mustard is India's second essential oilseed crop, behind soybean, accounting for over one-fourth of both area and production(Jat*et al.*,2019). It is cultivated in an area of 6.3 million hectares with a production of 8.0 million tonnes yielding 13.24 q ha$^{-1}$, (DOAC 2017). There exists a huge gap between the global productivity (20.47q ha$^{-1}$) and India's productivity (13.24 q ha$^{-1}$) which need to be bridged with the expansion of area under high yielding varieties (hybrids) due to their improved genetic potential (Rana *et al.*,2019).After nitrogen, phosphorus, and potassium, sulphur ranks as the fourth most important plant nutrient for Indian agriculture. It activates the plant's enzyme system and is crucial for the synthesis of amino acids, proteins, oils, and a component of vitamin A.Sulphur also contributes to the synthesis of chlorophyll, glucosides, glucosinolates (mustard oils), enzyme activation, and the sulphydryl (SH-) linkages that give oilseeds their pungent flavour. Therefore, sufficient sulphur is absolutely essential for oilseed crops.Proper

nutrient management, along with one to three irrigation applications, is the most important factor in increasing mustard yield (Piri *et al.,* 2011).all *Brassica spp.* had negative effects from the inadequate water supply on growth, development, and production. Additionally, they observed that *B. juncea* displayed the maximum expression of production in regular irrigated conditions (Singh *et al.,* 2002). Improper scheduling of irrigation often leads to reduction in crop yields. It may be possible to schedule irrigation as and when necessary to meet the complete water needs of crops and achieve optimal yields in places with abundant and affordable water resources with assured supplies throughout the crop season.The current study on irrigation on loamy sand soil in the state's semi-arid region seeks to determine the ideal number of irrigations and the proper timing for their distribution under limited irrigation water. Since water is a limited resource, studies on irrigation scheduling, water use efficiency, consumptive use of water, and moisture distribution patterns in the soil are directly relevant to increasing agricultural output, particularly when more than 95% of the net irrigated area is managed by wells.

## II. Material Method:

The present study was carried at Agricultural research farm of Barrister Thakur Chhedilal College of Agriculture & Research Station, Sarkanda, Bilaspur (C.G.), during *Rabi*season 2021to study the effect of different levels of sulphur and moisture on yield of mustard under drip environment. The field was a plain land with well drained sandy loam texture having a neutral pH value 7.7 and 0.53% organic matter content. The experiment was laid out in a two-factor randomized block design with four replications. The experiment was laid out in a Strip Plot Design with treatment combinations and replicated thrice. Treatment combinations included three irrigation levels on strip A viz., $I_1$ (80% PE), $I_2$ (60% PE) and $I_3$ (40% PE) through drip and four nutrient level application on strip B viz., $F_1$ (75% RDF + 10kg S), $F_2$ (75% RDF + 20kg S), $F_3$ (75% RDF + 30kg S) and $F_4$ (100% RDF + soil application).The harvested crop was separately bundled, properly tagged and then threshed from each plot. The seeds were cleaned and sun dried and data from $plot^{-1}$ were recorded. Dried straw and seed were grinded and used for following chemicalAnalysis of nutrient content and nutrient uptake of N, P, K and S. The nutrient uptake was calculated by multiplying percent concentration of aparticular nutrient with seed and straw yields. The uptake of the nutrients obtained inrespect of grain and straw was summed up to compute the amount of total nutrientremoved by the crop.

Uptake of major nutrients (kg $ha^{-1}$) =Content (%) x Yield (kg/ha)
100

## III. Results And Discussion

**Seed yield**

The seed yield data presented on (Table 1) showed significant difference due to the effect of different treatments of irrigation and sulphurlevels in respect to the seed yield of mustard. Among the different irrigation $I_2$ (60% PE) gave highestseed yield (2.44 t $ha^{-1}$) and $I_3$ (40% PE) was recorded the lowest seed yield (1.84 t $ha^{-1}$).The seed yield (2.48 t $ha^{-1}$) was observed to be significantly highest with the application of $F_3$ (75% RDF + 30 kg S) followed by $F_2$ (75% RDF + 20 kg S) as compared to $F_1$ (75% RDF + 10 kg S) and $F_4$ (100% RDF + Soil app). The least seed yield (1.85 t $ha^{-1}$) was recorded in treatment $F_1$ (75% RDF + 10 kg S). Interaction effect on seed yield between irrigation and sulphurlevels options was found non-significant.Dongarkar*et al*., (2005) and Rana *et al.,* (2005) experienced similar outcomes as well. It was found that irrigation water has a beneficial impact on seed output according to Chitale and Bhambri (2001). Sulphur promotes the pod environment as well. Oil production and seed development in mustard seeds. Furthermore, it raises the biological, seed, and stover yields ofmustard.

**Straw yield**

The data on stover yield as affected by irrigation and sulphurlevels have been presented in (Table 1). It was clearly observed that in various irrigation levelstreatment $I_2$ (60% PE) produced significantly higheststover yield (5.89 t $ha^{-1}$) and was found *at par* with $I_1$ (60% PE). However, lowest stover yield was obtained under $I_3$ (40% PE).The highest Stover yield (5.78 t $ha^{-1}$) was obtained with $F_3$ (75% RDF + 30 kg S) followed by $F_2$ (75% RDF + 20 kg S) over rest of two sulphurlevels $F_1$ (75% RDF + 10 kg S) and $F_4$ (100% RDF + Soil app). Treatments $F_2$ (75% RDF + 20 kg S) and $F_3$ (75% RDF + 30 kg S) were found *at par*. Interaction effect on Stover yield between irrigation and sulphurlevels was found non-significant.Ghimire and Bana (2011), Singh *et al*., (2010), and Sharma (2013) all noted similar outcomes. With higher quantities of fertilizer and irrigation, toria's seed and stover output was greatly boosted.

**Nitrogen content and Uptake in grain and straw**

A keen examination of the data (Table 2) shows the significant influence on nitrogen content and uptake due to the various irrigation and sulphurlevels. Maximum nitrogen content(3.06% in seed and 0.56% in straw) and

uptake (64.54 kg $ha^{-1}$ in seed and 29.50kg $ha^{-1}$ in straw) was observed in the irrigation levels $I_2$ (60% PE). The data depicts that $I_2$ (60% PE) had reported highest total N uptake (94.04 kg $ha^{-1}$). Minimum N content and uptake was observed in the irrigation levels $I_3$ (40% PE).

Whereas, among the Sulphurlevels the highest nitrogen content(3.07% in grain and 0.56% in straw) and uptake (65.95 kg $ha^{-1}$ in seed 29.89kg $ha^{-1}$ in straw) was found with $F_3$(75% RDF+30 kg S). The treatment $F_3$ (75% RDF + 30 kg S) reported highest total N uptake (95.85 kg $ha^{-1}$). Least nitrogen content and uptake were recorded with $F_1$(75% RDF+ 10 kg S).

The interaction effect of irrigation and sulphurlevels on nitrogen content in stover was determined to be non-significant.The increasedN content due to sulphur application has also been reported by Sharma *et al*. (1990), Lekh Chand *et al*. (1996) and Chauhan (1998).The outcomes on uptake are similar with finding of Mishra (2001). Researchers have reported similar results were Chaubey and Dwivedi 1995, Biswas *et al.*1995 and Kumar (1995).

**Phosphorus content and Uptake in grain and straw**

Persual of the data (Table 3) shows the significant difference on phosphorus content and uptake due to the various irrigation and sulphurlevels. Highestphosphorus content(0.70% in seed and 0.33% in straw) and uptake (14.87kg $ha^{-1}$ in seed and 17.57 kg $ha^{-1}$in straw) was observed in the irrigation levels $I_2$ (60% PE). The data depicts that $I_2$ (60% PE) had reported highest total P uptake (32.44kg $ha^{-1}$). Minimum P content and uptake was observed in the irrigation levels $I_3$ (40% PE).

Among the Sulphurlevels the highest phosphorus content(0.71% in seed and 0.34% in straw) and uptake (15.32kg $ha^{-1}$in seed 18.20 kg $ha^{-1}$ in straw) was found with $F_3$(75% RDF+30 kg S). The treatment $F_3$ (75% RDF + 30 kg S) reported highest total P uptake 33.52kg $ha^{-1}$). Least phosphorus content and uptake were recorded with $F_1$(75% RDF+ 10 kg S).

The interaction effect of irrigation and sulphurlevels on phosphorus content uptakein stover was determined to be non-significant.Jat andMehra (2007) stated that the application of sulphur significantlyincreased thephosphorus content. Similar results were alsoreported on phosphorus uptake by Mishra (2001),Singh *et al*.(1988), Jain *et al.* (1995).

**Potassium content and Uptake in grain and straw**

The data on potassium content and uptake (Table 4) shows the significant difference due to the various irrigation and sulphurlevels. At irrigation levels, highest potassium content(0.89% in seed and 1.22% in straw) and uptake (18.87 kg $ha^{-1}$in seed and 64.35 kg $ha^{-1}$in straw) was observed in the irrigation levels $I_2$ (60% PE). The data depicts that $I_2$ (60% PE) had reported highest total K uptake (83.22kg $ha^{-1}$). Minimum K content and uptake was observed in the irrigation levels $I_3$ (40% PE).

Among the Sulphurlevels the highest potassium content(0.90% in seed and 1.23% in straw) and uptake (19.36kg $ha^{-1}$in seed 65.21kg $ha^{-1}$ in straw) was found with $F_3$(75% RDF+30 kg S). The treatment $F_3$ (75% RDF + 30 kg S) reported highest total K uptake 84.57kg $ha^{-1}$. The lowest content and uptake of uptake were recorded with $F_1$(75% RDF+ 10 kg S).

The interaction effect of irrigation and sulphurlevels on phosphorus content uptakein stover was determined to be non-significant.Similar result showed thatGrewal *et al.* (2009),Mishra (2003) reported that the sulphurshowed synergistic relationship with potassium.Similar results were alsoreported on potassium uptakeby Kumar (1995) and Srivastava andSrivastava (1996).

**Potassium content and Uptake in grain and straw**

The sulphur content and uptake (Table 5) in seed and straw of mustard significantly influenced by the different levels of irrigation and sulphur. The keen investigation the data reported that the irrigation levels $I_2$ (60% PE) was foundto be highest sulphur content(0.83% in seed and 0.49% in straw) and uptake (17.67 kg $ha^{-1}$in seed and 25.90 kg $ha^{-1}$in straw) was observed in the irrigation levels $I_2$ (60% PE). The data depicts that $I_2$ (60% PE) had reported highest total S uptake (43.57kg $ha^{-1}$). Minimum S content and uptake was observed in the irrigation levels $I_3$ (40% PE).

In the Sulphurlevels highest sulphur content(0.84% in seed and 0.51% in straw) and uptake (18.10kg $ha^{-1}$in seed 26.84 kg $ha^{-1}$ in straw) was found with $F_3$(75% RDF+30 kg S). The treatment $F_3$ (75% RDF + 30 kg S) reported highest total S uptake 44.95kg $ha^{-1}$. The lowest content and uptake of uptake were recorded with $F_1$(75% RDF+ 10 kg S).

The interaction effect of irrigation and sulphurlevels on sulphur content in stover was determined to be non-significant. The results of present investigation corroborate with the findings of Patel (1992), Jain *et al.*(1995) and Chauhan (1998).The enhanced sulphur uptake may be related to the administration of sulphur, which improved mustard seed output and S content. The result of present investigation is corroboration with the findings of Jat and Mehra(2007).The increase in seed and straw yield and sulphur content with increasing level

of irrigation was the cause of the rise in sulphur uptake with rising level of sulphur. Both Bharati *et al.* (2003) and Raut *et al.* (2003) found similar outcome.

**Table 1:** Effect of irrigation and sulphur levels on seed yield (t $ha^{-1}$) of mustard seed yield and straw yield

| Treatments | Seed yield (t $ha^{-1}$) | Straw yield (t $ha^{-1}$) |
|---|---|---|
| **Irrigation levels (I)** | | |
| $I_{1(80\%PE)}$ | 2.18 | 5.15 |
| $I_{2(60\%PE)}$ | 2.44 | 5.89 |
| $I_{3(40\%PE)}$ | 1.84 | 4.74 |
| **SEm ±** | **0.08** | **0.20** |
| **CD (5%)** | **0.32** | **0.79** |
| **Sulphur levels (F)** | | |
| $F_{1(75\% RDF + 10kg S)}$ | 1.85 | 4.80 |
| $F_{2(75\% RDF + 20kg S)}$ | 2.24 | 5.32 |
| $F_{3(75\% RDF + 30kg S)}$ | 2.48 | 5.78 |
| $F_{4(100\% RDF + Soil app.)}$ | 2.04 | 5.15 |
| **SEm ±** | **0.12** | **0.21** |
| **CD (5%)** | **0.42** | **0.51** |
| $I_4F_4$ Border strip (Check**)** | 1.98 | 4.88 |
| **Interaction I x F** | **NS** | **NS** |

**Table 2**: Effect of sulphur and irrigation on nitrogen content (%) and uptake (kg/ha)

| Treatments | Grain N content (%) | Straw N content (%) | Grain N uptake (kg/ha) | Stover N uptake (kg/ha) | Total N uptake (kg/ha) |
|---|---|---|---|---|---|
| **Irrigation levels (I)** | | | | | |
| $I_{1(80\%PE)}$ | 3.03 | 0.53 | 56.23 | 26.60 | 82.82 |
| $I_{2(60\%PE)}$ | 3.06 | 0.56 | 64.54 | 29.50 | 94.04 |
| $I_{3(40\%PE)}$ | 2.92 | 0.49 | 44.32 | 21.04 | 65.36 |
| **SEm±** | **0.02** | **0.01** | **2.28** | **0.87** | **2.89** |
| **CD (5%)** | **0.08** | **0.04** | **8.99** | **3.41** | **11.38** |
| **Sulphur levels (F)** | | | | | |
| $F_{1(75\% RDF + 10kg S)}$ | 2.94 | 0.50 | 44.95 | 21.28 | 66.23 |
| $F_{2(75\% RDF + 20kg S)}$ | 3.03 | 0.53 | 57.93 | 27.56 | 85.49 |
| $F_{3(75\% RDF + 30kg S)}$ | 3.07 | 0.56 | 65.95 | 29.89 | 95.85 |
| $F_{4(100\% RDF + Soil app.)}$ | 2.98 | 0.51 | 51.29 | 24.09 | 75.39 |
| **SEm±** | **0.02** | **0.01** | **3.44** | **0.89** | **3.96** |
| **CD (5%)** | **0.06** | **0.04** | **11.93** | **3.08** | **13.72** |
| $I_4F_4$Border strip (Check**)** | 2.97 | 0.51 | 50.95 | 23.94 | 74.89 |
| **Interaction IxF** | **NS** | **NS** | **NS** | **NS** | **NS** |

**Table 3:**Effect of sulphur and irrigation on phosphorus content (%) and uptake (kg/ha**)**

| Treatments | Grain P content (%) | Straw P content (%) | Grain P uptake (kg/ha) | Stover P uptake (kg/ha) | Total P uptake (kg/ha) |
|---|---|---|---|---|---|
| **Irrigation levels (I)** | | | | | |
| I1(80%PE) | 0.67 | 0.31 | 12.50 | 15.28 | 27.78 |
| I2(60%PE) | 0.70 | 0.33 | 14.87 | 17.57 | 32.44 |
| I3(40%PE) | 0.60 | 0.28 | 9.21 | 12.05 | 21.27 |
| **SEm±** | **0.01** | **0.01** | **0.70** | **0.74** | **1.22** |
| **CD (5%)** | **0.06** | **0.03** | **2.75** | **2.90** | **4.80** |
| **Sulphur levels (F)** | | | | | |
| F1(75% RDF + 10kg S) | 0.60 | 0.28 | 9.30 | 11.83 | 21.13 |
| F2(75% RDF + 20kg S) | 0.67 | 0.32 | 13.05 | 16.01 | 29.06 |
| F3(75% RDF + 30kg S) | 0.71 | 0.34 | 15.32 | 18.20 | 33.52 |
| F4(100% RDF + Soil app.) | 0.64 | 0.29 | 11.12 | 13.82 | 24.94 |
| **SEm±** | **0.01** | **0.01** | **0.70** | **0.69** | **1.36** |
| **CD (5%)** | **0.04** | **0.04** | **2.44** | **2.40** | **4.72** |
| I4F4Border strip (Check**)** | 0.65 | 0.30 | 11.23 | 13.66 | 24.89 |
| **Interaction IxF** | **NS** | **NS** | **NS** | **NS** | **NS** |

**Table 4:**Effect of sulphur and irrigation on potassium content (%) and uptake (kg/ha)

| Treatments | Grain K content (%) | Straw K content (%) | Grain K uptake (kg/ha) | Stover K uptake (kg/ha) | Total K uptake (kg/ha) |
|---|---|---|---|---|---|
| **Irrigation levels (I)** | | | | | |
| $I_{1(80\%PE)}$ | 0.87 | 1.21 | 16.13 | 59.08 | 75.21 |
| $I_{2(60\%PE)}$ | 0.89 | 1.22 | 18.87 | 64.35 | 83.22 |
| $I_{3(40\%PE)}$ | 0.82 | 1.19 | 12.45 | 50.31 | 62.76 |
| **SEm±** | 0.01 | 0.01 | **0.77** | **1.37** | **2.20** |
| **CD (5%)** | 0.04 | 0.02 | **3.04** | **5.38** | **8.64** |
| **Sulphur levels (F)** | | | | | |
| $F_{1(75\% RDF + 10kg S)}$ | 0.82 | 1.19 | 12.57 | 50.23 | 62.80 |
| $F_{2(75\% RDF + 20kg S)}$ | 0.87 | 1.21 | 16.65 | 60.00 | 76.66 |
| $F_{3(75\% RDF + 30kg S)}$ | 0.90 | 1.23 | 19.36 | 65.21 | 84.57 |
| $F_{4(100\% RDF + Soil app.)}$ | 0.85 | 1.20 | 14.68 | 56.22 | 70.90 |
| **SEm±** | 0.01 | 0.01 | **0.90** | **2.16** | **2.34** |
| **CD (5%)** | 0.04 | 0.02 | **3.13** | **7.47** | **8.11** |
| $I_4F_4$Border strip (Check**)** | 0.84 | 1.2 | 14.42 | 56.21 | 70.63 |
| **Interaction IxF** | **NS** | **NS** | **NS** | **NS** | **NS** |

**Table 5:**Effect of sulphur and irrigation on sulphur content (%) and uptake (kg/ha)

| Treatments | Grain S content (%) | Straw S content (%) | Grain S uptake (kg/ha) | Stover S uptake (kg/ha) | Total S uptake (kg/ha) |
|---|---|---|---|---|---|
| **Irrigation levels (I)** | | | | | |
| $I_{1(80\%PE)}$ | 0.79 | 0.47 | 14.88 | 22.88 | 37.76 |
| $I_{2(60\%PE)}$ | 0.83 | 0.49 | 17.67 | 25.90 | 43.57 |
| $I_{3(40\%PE)}$ | 0.72 | 0.40 | 11.01 | 17.29 | 28.30 |
| **SEm±** | 0.01 | 0.01 | **0.80** | **1.13** | **1.64** |

| | | | | | |
|---|---|---|---|---|---|
| **CD (5%)** | 0.05 | 0.04 | **3.17** | **4.45** | **6.45** |
| **Sulphur levels (F)** | | | | | |
| $F_{1(75\% RDF + 10kg S)}$ | 0.71 | 0.40 | 10.93 | 16.87 | 27.81 |
| $F_{2(75\% RDF + 20kg S)}$ | 0.81 | 0.47 | 15.90 | 23.61 | 39.51 |
| $F_{3(75\% RDF + 30kg S)}$ | 0.84 | 0.51 | 18.10 | 26.84 | 44.95 |
| $F_{4(100\% RDF + Soil app.)}$ | 0.76 | 0.44 | 13.15 | 20.76 | 33.91 |
| **SEm±** | 0.01 | 0.01 | **0.74** | **1.19** | **1.45** |
| **CD (5%)** | 0.04 | 0.04 | **2.56** | **4.12** | **5.02** |
| $I_4F_4$Border strip (Check**)** | 0.75 | 0.45 | 13.27 | 20.64 | 33.91 |
| **Interaction IxF** | **NS** | **NS** | **NS** | **NS** | **NS** |

## IV. Conclusion

From the above summary of findings, it may be concluded that, 60% PE ($I_2$)through drip with the sulphur level application 75% RDF+30 kg S ($F_3$) significantly enhanced the yield, content and uptake of nutrients of the mustard crop.

## References


[1]. Bharati, V., Prasad, U. K., & Singh, J. P. (2003). Irrigation and sulphur on yield and nutrient uptake of Indian mustard. Journal of Farming Systems Research & Development, 8: 97-98.

[2]. Biswas, D. R., Ali, S. A., &Khera, M. S. (1995). Nitrogen-sulphur interaction on the uptake of P, K, Zn, Cu, Fe and Mn by Gobhi sarson (Brassica napus L., ISN-706). Journal of the Indian Society of Soil Science, 43(2): 280-281.

[3]. Chaubey, A. K., & Dwivedi, K. N. (1995). Effect of N, P and S and Their Interactions on Yield of and Nutrient Uptake by Linseed (Linumusitatissimum). Journal of the Indian Society of Soil Science, 43(1): 72-75.

[4]. Chauhan, D. R., Paroda, S., & Ram, M. (1996). Response of Indian mustard (Brassica juncea) to biofertilizers, sulphur and nitrogen fertilization. Indian Journal of Agronomy, 41(4): 620-623.

[5]. Chitale, S., & Bhambri, M. C. (2001). Response of rapeseed-mustard to crop geometry, nutrient supply, farmyard manure and interculture-A review. Ecology environment and conservation, 7: 387-396.

[6]. DOAC. Agricultural Statistics at a Glance, Directorate of Economics and Statistics, Department of Agriculture and Cooperation. Ministry of Agriculture, Government of India 2017.

[7]. Dongarkar, K. P., Pawar, W. S., Khawale, V. S., Khutate, N. G., &Gudadhe, N. N. (2005). Effect of nitrogen and sulphur on growth and yield of mustard (Brassica juncea L.). Journal of Soils and Crops, 15(1):163-167.

[8]. Ghimire TB and Bana OPS. 2011. Effect of fertility levels on mustard (B. juncea) seed yield, quality and economics under varying poplar (Populus deltoides) tree densities. Indian J Agron 56: 346-350.

[9]. Grewal KS, Godara OP, Malik RS. Effect of potassium application on mustard yield, quality and nutrient uptake in soils of Southern. Haryana Journal of Agronomy 2009;25(1/2):43-47.

[10]. Jain, N.K. et al. (1995). Ann. Agric. Res., 16: 389-390.

[11]. Jat, J. R., & Mehra, R. K. (2007). Effect of sulphur and zinc on yield, macronutrient content in and uptake by mustard on haplustepts. Journal of the Indian Society of Soil Science, 55(2): 190-195.

[12]. Kumar, K. (1995). Effect of phosphorus and sulphur nutrition on yield quality and nutrient uptake of Indian rape (Brassica napus) in acid Hap aquept. Ann. Agric. Res, 16: 36-39.

[13]. Mishra, S. K. (2001). Effect of sulphur and zinc on yield, uptake of nutrients and quality of mustard. Annals of Plant and Soil Research, 3(2), 206-213.

[14]. Piri, I., Nik, M. M., Tavassoli, A., Rastegaripour, F., &Babaeian, M. (2011). Effect of irrigation frequency and application levels of sulphur fertilizer on water use efficiency and yield of Indian mustard (Brassica juncea). African Journal of Biotechnology, 10(55): 11459-11467.

[15]. Rana, K., Singh, J. P., & Parihar, M. (2019). Manifestation of improved cultivars, irrigation and sulphur in mustard growth, productivity, quality and profitability: A review. Journal of Pharmacognosy and Phytochemistry, 8(3): 2778-82.

[16]. Raut, R. F., Abdul, H., Hadole, S. S., &Jeughale, G. S. (2000). Effect of irrigation and sulphur on concentration, uptake and availability of sulphur, nitrogen and phosphorus in mustard (Brassica juncea). Journal of Soils and Crops, 10(1), 145-148.

[17]. Singh, A. K., Singh, S. N., Singh, O. P., & Khan, M. A. (2008). Quality of Indian mustard (Brassica juncea L.) as affected by nitrogen and sulphur fertilizers in a nutrient deficient soil. Indian Journal of Agricultural Biochemistry, 21(1and2): 39-41.

[18]. Singh, R. K., Singh, A. K., & Kumar, R. (2010). Effect of fertility level on nutrient uptake, yield and quality of Indian mustard [Brassica juncea (L.) Czern and Coss.] varieties under late sown condition. Environ Ecol, 28: 1764-1767.

[19]. Singh, R. K., Singh, Y., Singh, A. K., Kumar, R., & Singh, V. K. (2010). Productivity and economics of mustard (Brassica juncea) varieties as influenced by different fertility levels under late sown condition. Indian Journal of Soil Conservation, 38(2): 121-124.

[20]. Srivastava, A. K., & Srivastava, O. P. (1996). Comparative efficacy of single versus combined application of gypsum and pyrites in a Typic Nat aqualf. ORYZA, 33: 55-58.


Amit Kumar Pradhan, et. al. "Performance of Different Levels of Sulphur and Moisture on Yield, Content and Uptake in Mustard." *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 15(12), 2022, pp. 45-50.