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## EFFECT OF VERMICOMPOST AND MUSTARD OIL CAKE ON YIELD OF POTATO (*SOLANUM TUBEROSUM* L.) VAR. KUFRI KHYATI UNDER GWALIOR REGION OF INDIA

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### ABSTRACT

The present investigation entitled “Impact of vermicompost and mustard oil cake on growth, yield and quality of potato (*Solanum tuberosum* L.) var. Kufri Khyati under Gwalior region” was conducted at Research Field CRC-3, Turari, ITM University, Gwalior (M.P.). Potato (*Solanum tuberosum* L.) known as ‘The king of vegetables’ is a significant food crop grown worldwide. It is a crop of great importance for the densely populated regions of Asia, yielding higher quantities of dry matter food, protein that is well-balanced and caloriesthan other main food crops, both in terms of time and land area per unit. Synthetic fertilizers and organic manures combined with an integrated strategy to nutrient supply is becoming more and more important, particularly for heavy feeder crops. Furthermore, when organic and synthetic fertilizers are used together, the quantity and quality of a comprehensive and responsive crop, such as potatoes have been shown to significantly improve when compared to the recommended dose of nutrients applied with synthetic fertilizers alone. Three replications of the experiment were set up by using a Randomized Block Design. Each replication having ten treatment combinations of mustard oil cake and vermicompost and applied prescribed doses of fertilizer in potato variety Kufri Khyati. The findings showed that the growth, yield and quality characteristics of potatoes at different growth stages were strongly impacted by the various treatments of vermicompost and mustard oil cake with varying recommended doses of fertilizers. The treatment T<sub>10</sub>-100% RDF + Vermicompost+ Mustard oil cake was noted the best treatment as contrast to rest of treatments and it also provided the utmost growth, yield and quality traits of potato. Maximum net returns ( ₹ 267434 /ha) was recorded in treatment T<sub>10</sub>-100% RDF + Vermicompost+ Mustard oil cake, while the utmost benefit : cost ratio (4.0) was observed in treatment T<sub>4</sub>-50% RDF + Vermicompost + Mustard oil cake, T<sub>7</sub>-75% RDF + Vermicompost + Mustard oil cake and T<sub>10</sub>-100% RDF + Vermicompost + Mustard oil cake.

**Key words** : Potato, Mustard oil cake, Vermicompost.

### Introduction

One of the main food crops in the world is the potato (*Solanum tuberosum* L.), sometimes referred to as “The king of vegetables.” It is a crop of great importance for the densely populated regions of Asia, yielding higher quantities of dry matter food, protein that is well-balanced, and calories per unit of time and land as compared to other important food crops. Synthetic fertilizers and organic manures combined with an integrated strategy to nutrient supply is becoming more and more important, particularly for heavy feeder crops. Further, considerable

improvement in quantity and quality of exhaustive and responsive crop like potato has been observed under integrated use of organic and inorganic fertilizers as compared to recommended dose of nutrients applied with inorganic fertilizers alone (Baishya *et al.*, 2012). Big amounts of organic matter in different forms, fertilizing effect, accumulation of heat from sunshine at the beginning of growth, and contribution to the development of organic-mineral complex are the main benefits of this mulching material (Elbl *et al.*, 2014). There have been recommendations to replace artificial crop cultivation with

a variety of organic manures, bio-pesticides, natural plant compounds and natural enemies. Crop residue management practices and increased use of organic sources of nutrients can help restore ecological homeostasis, which will not only meet human needs for food, fiber and shelter but also address ecological balance. Agro-ecosystem instability can be traced back to the heavy use of inorganic fertilizers and burning of crop straw in fields.

### Material and Methods

Three replications of the experiment were set up using a Randomized Block Design. Every replication had ten treatments *viz.*, T<sub>1</sub>-100% RDF, T<sub>2</sub>-50% RDF + Vermicompost, T<sub>3</sub>-50% RDF + Mustard oil cake, T<sub>4</sub>-50% RDF + Vermicompost + Mustard oil cake, T<sub>5</sub>-75% RDF + Vermicompost, T<sub>6</sub>-75% RDF + Mustard oil cake, T<sub>7</sub>-75% RDF + Vermicompost + Mustard oil cake, T<sub>8</sub>-100% RDF + Vermicompost, T<sub>9</sub>-100% RDF + Mustard oil cake and T<sub>10</sub>-100% RDF + Vermicompost + Mustard oil cake applied with various suggested fertilizer dosages the potato variety Kufri Khyati.

### Results and Discussion

Result reported that the utmost yield parameters *viz.*, tuber yield per plot (kg), tuber yield per hectare (q), number of tubers/plant at harvest, average diameter of tubers/plot at harvest (cm), average tuber weight per plot (g) and harvest index (%) were recorded in treatment

T<sub>10</sub>-100% RDF + Vermicompost+ Mustard oil cake and it was the best treatment for enhancing the yield characteristics of the potato in comparison to the other treatments but treatment T<sub>1</sub>-100% RDF was discovered to have the minimal yield parameters. This could be because of the increased growth of the foliage and cell division, which absorb an increasing amount of solar radiation. This eventually builds up a sufficient amount of photosynthate, which is then divided in the construction of more tuber initiation begins. Because this process requires more energy and compensates for it with higher input levels of nitrogen, it is more energy-intensive than the plants, which are negatively impacted by the plot's lower nitrogen content. Phosphorus plays a role in tuber formation, blooming, plant strength, cell division, root development, crop maturation and crop quality. Application of potassium additionally promotes photosynthate translocation and increases tuber numbers per plant. The outcome highlighted the necessity of using chemical fertilizers and organic manures in tandem to improve potato tuber development and tuber bulking. For the majority of the traits, comparable outcomes were likewise reported by Koodi *et al.* (2017), Sikder *et al.* (2017), Barman *et al.* (2018), Mohammed *et al.* (2018), Khan (2018), Pandit *et al.* (2018b) and Khan *et al.* (2019).

It was obtained that the treatment T<sub>10</sub>-100% RDF +

**Table 1 :** Effect of vermicompost and mustard oil cake on yield parameters of potato.

Treatment details	Tuber yield per plot (kg)	Tuber yield per hectare (q)	Number of tubers/plants at harvest	Average diameter of tubers/plot at harvest (cm)	Average tuber weight per plot (g)	Harvest index (%)
T <sub>1</sub> -100% RDF	18.00	198.04	8.02	4.72	45.05	55.90
T <sub>2</sub> -50% RDF + Vermicompost	21.78	239.60	9.19	4.94	47.41	60.31
T <sub>3</sub> -50% RDF + Mustard oil cake	29.31	322.41	11.15	5.76	52.64	65.80
T <sub>4</sub> -50% RDF + Vermicompost + Mustard oil cake	37.80	415.80	12.45	6.29	60.77	70.02
T <sub>5</sub> -75% RDF + Vermicompost	26.08	286.90	10.48	5.33	49.86	64.27
T <sub>6</sub> -75% RDF + Mustard oil cake	31.57	347.23	11.67	5.92	54.00	66.64
T <sub>7</sub> -75% RDF + Vermicompost + Mustard oil cake	39.71	436.83	12.90	6.65	61.66	70.40
T <sub>8</sub> -100% RDF + Vermicompost	27.21	299.34	10.85	5.55	50.06	64.30
T <sub>9</sub> -100% RDF+ Mustard oil cake	35.70	392.75	12.08	6.02	59.09	69.05
T <sub>10</sub> -100% RDF+ Vermicompost+ Mustard oil cake	40.62	446.79	13.12	6.80	62.13	70.36
<b>SEm±</b>	<b>1.570</b>	<b>17.273</b>	<b>0.504</b>	<b>0.270</b>	<b>2.185</b>	<b>1.286</b>
<b>CD 5%</b>	<b>4.666</b>	<b>51.323</b>	<b>1.498</b>	<b>0.803</b>	<b>6.494</b>	<b>3.820</b>

**Table 2 :** Effect of vermicompost and mustard oil cake on quality parameters of potato.

Treatment details	Dry matter content per 100g of edible portion	TSS at harvest (°B)	Starch content of tubers at harvest (%)
T <sub>1</sub> -100% RDF	18.57	4.41	17.08
T <sub>2</sub> -50% RDF + Vermicompost	19.42	4.50	17.65
T <sub>3</sub> -50% RDF + Mustard oil cake	20.85	4.60	18.78
T <sub>4</sub> -50% RDF + Vermicompost + Mustard oil cake	22.98	4.73	20.17
T <sub>5</sub> -75% RDF + Vermicompost	19.72	4.54	18.02
T <sub>6</sub> -75% RDF + Mustard oil cake	21.45	4.66	19.33
T <sub>7</sub> -75% RDF + Vermicompost + Mustard oil cake	23.45	4.77	20.53
T <sub>8</sub> -100% RDF + Vermicompost	20.57	4.57	18.49
T <sub>9</sub> -100% RDF + Mustard oil cake	22.52	4.69	19.86
T <sub>10</sub> -100% RDF + Vermicompost+ Mustard oil cake	24.15	4.82	21.10
<b>SEm±</b>	<b>1.107</b>	<b>0.069</b>	<b>0.570</b>
<b>CD 5%</b>	<b>3.290</b>	<b>0.204</b>	<b>1.693</b>

Vermicompost+ Mustard oil cake was noted the best treatment among all treatments and it gave the utmost quality parameters were provided, including the amount of dry matter per 100g of edible part, the TSS at harvest (°B) and the percentage of starch in the tubers at harvest. On the other hand, under treatment T<sub>1</sub>-100% RDF, the minimal quality values were noted. The beneficial reaction of organic manure to improve crop quality may also be related to the availability of adequate plant nutrients during the growing season, particularly during crucial crop growth periods, which leads to improved uptake, plant vigor, superior yield, and quality attributes. The highest tuber TSS content may result from the tuber's maximum moisture content and dry weight because organic fertilizers contain nearly all of the micro- and macronutrients needed for plant growth. Additionally, continuous application of vermicompost and mustard oil cake increases plant photosynthesis, which may have improved the synthesis of sugar, starch, and cellulose. The findings of Singh *et al.* (2017), Islam *et al.* (2017), Mondal *et al.* (2016), Kumar and Singh (2016) and Mohammed *et al.* (2018) corroborate these conclusions.

### Conclusion

The study's findings indicated that the yield and quality traits of potatoes at various growth stages were considerably impacted by the various treatments of vermicompost and mustard oil cake with varying recommended doses of fertilizers. The treatment T<sub>10</sub>-100% RDF + Vermicompost + Mustard oil cake was noted the best treatment in comparison to the other treatments and also produced the highest production and

quality standards for potatoes.

### References

- Baishya, M.K., Ghosh L.K., Gupta D.C., Dubey V.K., Anup S.K. and Patel D.P. (2012). Productivity and soil health of potato (*Solanum tuberosum* L.) field as influenced by organic manures, inorganic fertilizers and biofertilizers under high altitudes of Eastern Himalayas. *J. Agricult. Sci.*, (Toronto), **4(5)**, 223-234.
- Barman, K.S., Kumar A., Kasera S. and Ram B. (2018). Integrated nutrient management in potato (*Solanum tuberosum*) cv. Kufri Ashoka. *J. Pharmacog. Phytochem.*, **SP1**, 1936-1938.
- Elbl, J., Plošek L., Kintl A., Hynšt J., Záhora J., Javoreková S., Charousová I., Kalhotka L. and Urbánková O. (2014). Effects of drought on microbial activity in rhizosphere, soil hydrophobicity and leaching of mineral nitrogen from arable soil depending on method of fertilization. *Int. J. Agricult. Biosyst. Engg.*, **8**, 844-850.
- Islam, M.A., Islam S., Akter A., Rahman M.H. and Nandwani D. (2017). Effect of organic and inorganic fertilizers on soil properties and the growth, yield and quality of tomato in Mymensingh, Bangladesh. *Agriculture*, **7(18)**, 2-7.
- Khan, J. (2018). Effect of different levels of NPK fertilizers on potato tuber yield. *Sarhad J. Agricult.*, **9(6)**, 543-550.
- Khan, M.S. *et al.* (2019). Impact of vermicompost and mustard oil cake on potato growth and yield: a meta-analysis. *J. Agricult. Sci.*, **14(3)**, 86-92.
- Koodi, S., Singh S.P., Rolaniya M.K., Gathala S. and Choudhary R. (2017). Effect of NPK, FYM and vermicompost on growth, yield and quality of sweet potato (*Ipomoea batatas* Lam.). *Chem. Sci. Rev. Lett.*, **6 (21)**, 495-499.
- Kumar, R. and Singh N.D. (2016). Effect of inorganic and organic sources of nutrients on nutrient uptake, yield and economics of processing potato (*Solanum*

- tuberosum* L.). *Int. J. Adv. Res.*, **4(4)**, 498-503.
- Mohammed, A., Mohammed M., Dechasa N. and Abduselam F. (2018). Effects of Integrated Nutrient Management on Potato (*Solanum tuberosum* L.) Growth, Yield and Yield Components at Haramaya Watershed, Eastern Ethiopia. *Open Access Library J.*, **5**, e3974.
- Mondal, B., Dash S., Sethi D. and Banerjee M. (2016). Effect of Different Nutrient Management on Growth and Productivity of Potato. *Adv. Life Sci.*, **5(7)**, 2697-2702.
- Pandit, A., Raj R.K., Kumar S., Kumari S. and Singh U. (2018b). Effect of integrated nutrient management on yield and economics of potato (*Solanum tuberosum* L.). *The Pharma Innov. J.*, **10(8)**, 1871-1874.
- Sikder, R.K., Rahman M.M., Bari S.M. Washim and Mehraj H. (2017). Effect of organic fertilizers on the performance of seed potato. *Int. J. Trop. Plant Res.*, **4(1)**, 104–108.
- Singh, M.D, Biswas S.K., Nagar D., Lal K. and Singh J. (2017). Impact of Bio-fertilizer on Growth Parameters and Yield of Potato. *Int. J. Curr. Microbiol. App. Sci.*, **5**, 1717-1724.