# RESPONSE OF GINGER TO APPLICATION OF POLYHALITE: A NOVEL BALANCED SLOW RELEASING FERTILIZER

Bassa Vasavi Kowsalya

Faculty, Dept of Agronomy,

Bharatiya Engineering Science & Technology Innovation University, Andhra Pradesh, India.

**Abstract**

Ginger (*Zingiber officinale* Roscoe) is an important spice crop cultivated for its aromatic underground rhizome. In Karnataka, commercial cultivation is concentrated in southern districts like Hassan, Mysore, Shivamogga, Chikkamagalore and Mandya. Western ghats area is prominently cultivating ginger. Major challenge noticed in this area is high intense rainfall during July & August month. This high rainfall not only threat from the point of rot diseases but also has high nutrient leaching losses also. Hence slow release fertilizer with all required plant nutrient elements is need of the hour in this region for any crop. Polyhalite, a mineral that contains potassium, magnesium, calcium, and sulfate, has received increasing recognition in recent years as a valuable asset in sustainable agriculture and can serve as a viable alternative to conventional fertilizers. This multi-nutrient fertilizer, mainly obtained from evaporite deposits is distinct combination of nutrients like 14% $K_2O$, 19% S, and 6% MgO, along with 17% CaO. Keeping these points in view, an observational trial was conducted at Spices Boards' regional research station - ICRI Sakleshpur, Karnataka during 2024-25. The experiment was conducted under irrigated condition. The soil of experimental plot was sandy loam in texture, pH 5.9 organic carbon content 1.3%, phosphorus 18 kg/ha, potassium 338 kg/ha. The trail was laid out in Randomized complete block design (RCBD) with four replications and five treatments. Ginger cultivar IISR Vajra was used in the trial. $T_1$: RDF (100:50:50 kg $ha^{-1}$),$T_2$: RDF + 3 foliar spray of IISR Ginger special ,$T_3$: RDF + Polyhalite @ 100kg /ha in single split – 60 DAP,$T_4$: RDF + Polyhalite @ 250kg /ha in two splits – 60 & 90 DAP and $T_5$: RDF + Polyhalite @ 500kg /ha in three splits – 60, 90 & 120 DAP. The plot size of 3m x 1m was maintained. The spacing followed was 30 cm x 20 cm. Application of polyhalite @ 500kg/ha and 250kg/ha to ginger at critical stages of crop nutrient requirement has helped in attaining significantly higher number of primary rhizomes (15.1 & 18.4), number of secondary rhizomes (33.1 & 38.2), fresh ginger yield per plant (308.6 & 328.4 kg/plant) and fresh rhizome yield per hectare (24.70 & 25.87 tonnes/ha) as compared to RDF and along with recommended micronutrient spray. Application of polyhalite at 250kg/ha in two splits along with RDF for ginger has helped to achieve higher net return (Rs

5,82,700) as well as BC ratio (2.36). Even though application of polyhalite @ 500kg/ha has recorded highest net return due to higher cost of production it has recorded lower B C ratio.

**Keywords:** Ginger, rhizome, polyhalite, nutrient and yield

## Introduction

Ginger (*Zingiber officinale* Roscoe), a valuable spice crop native to tropical Asia, has been cultivated since ancient times in India for its aromatic underground rhizome. It is nutritionally rich, containing carbohydrates, proteins, fats, fiber, minerals, and bioactive compounds such as gingerol (23-25%), shogaol (18-19%), and α-zingiberene, which contribute to its pungency, aroma, and medicinal properties (Vadivel *et al*., 2006; Swaminathan, 1974) [3, 4]. In Karnataka, commercial cultivation is concentrated in southern districts like Hassan, Mysore, Shivamogga, Chikkamagalore and Mandya. Western ghats area is prominently cultivating ginger. Generally, these areas are having acidic soils with high organic carbon in soil. Major challenge noticed here is high intense rainfall during July & August month. This high rainfall not only threat from the point of rot diseases but also has high nutrient leaching losses also. Hence slow release fertilizer with all required plant nutrient elements is need of the hour in this region for any crop. Polyhalite, a mineral that contains potassium,magnesium, calcium, and sulfate, has received increasing recognition in recent years as a valuable asset in sustainable agriculture and can serve as a viable alternative to conventional fertilizers. This multi-nutrient fertilizer, mainly obtained from evaporite deposits, serves as an important resource for enhancing soil quality and boosting crop production. Polyhalite's distinct combination of nutrients set it apart from standard fertilizers. It consists of approximately 14% $K_2O$, 19% S, and 6% MgO, along with 17% CaO. The availability of these nutrients (potassium, sulphur, magnesium and calcium) is vital for plant health, supporting photosynthesis, nutrient absorption, and other essential physiological processes. Recent research indicates that polyhalite can be specifically beneficial for crops with higher potassium demands, such as spices and plantation crops. Its slow release characteristic ensures a steady distribution of nutrients, reducing the likelihood of leaching and related environmental issues. Additionally, because it has a lower salt index than typical potassium fertilizers, polyhalite can enhance soil conditions and also aid inalleviating osmotic stress on plants (Bhatt *et al* 2021) [1]. Keeping these points in view, an observational trial was conducted at Spices Boards' regional research station of ICRI Sakleshpur, Karnataka during 2024-25. Main objective of the trial is to record the response of ginger to polyhalite application in addition to RDF.

**Material and Methods**

An observational field trial was conducted at Spices Board, Indian Cardamom Research Institutes' Regional Research Station, Sakleshpur, Karnataka, India. The study reported here was initiated in April 2024 (2024-2025). The study area falls under hilly zone, (IX agroclimatic zone of Karnataka). The experiment was conducted under irrigated condition. The soil of experimental plot was sandy loam in texture, pH 5.9 organic carbon content 1.3%, phosphorus 18 kg/ha, potassium 338 kg/ha. The trail was laid out in Randomized complete block design (RCBD) with four replications and five treatments. Ginger cultivar IISR Vajra was used in the trial. The treatment details as follows

**T1:** RDF (100:50:50 kg $ha^{-1}$)

**T2:** RDF + 3 foliar spray of IISR Ginger special

**T3:** RDF + Polyhalite @ 100kg /ha in single split – 60 DAP. **T4:** RDF + Polyhalite @ 250kg /ha in two splits – 60 & 90 DAP.

**T5:** RDF + Polyhalite @ 500kg /ha in three splits – 60, 90 & 120 DAP. The plot size of 3m x 1m was maintained. The spacing followed was 30 cm x 20 cm. All agronomic practices *viz*., irrigation, manuring, fertilizer application, weeding, plant protection was done according to the IISR Kozhikode guidelines Observations on growth attributes were recorded at 150 DAP. Obtained data was statistically analysed following statistical procedures outlined by Gomez and Gomez 1984 [2].

**Results and Discussion:** Varied approaches of nutrient management in ginger shows non-significant response for plant height of ginger. On the contrary significantly higher number of tillers per plant was recorded in treatment receiving RDF along with 250 kg of Polyhalite applied in two splits – (60 & 90 DAP) as compared to rest of the treatments. Data pertaining to the yield attributing characters like, number of primary rhizomes, number of secondary rhizomes, fresh ginger yield per plant and fresh rhizome yield per hectare varied significantly due to various nutrient management practices. Application of polyhalite @ 500kg/ha and 250kg/ha to ginger at critical stages of crop nutrient requirement has helped in attaining significantly higher number of primary rhizomes (15.1 & 18.4), number of secondary rhizomes (33.1 & 38.2), fresh ginger yield per plant (308.6 & 328.4 kg/plant) and fresh rhizome yield per hectare (24.70 & 25.87 tonnes/ha) as compared to RDF and along with recommended micronutrient spray.

**Table 1:** Effect of polyhalite fertilizer on growth and yield of Ginger

| **Treatments** | **Plant height (cm)** | **Number of tillers** | **No. of primary rhizome** | **No of secondary rhizome** | **Fresh rhizome yield (g/plant)** | **Fresh rhizome yield /ha (tonnes/ha)** |
|---|---|---|---|---|---|---|
| T1: RDF (100:50:50 kg $ha^{-1}$) | 78.6 | 16.8 | 6.8 | 20.6 | 278.5 | 22.28 |
| T2: RDF + 3 foliar spray of IISR Ginger special | 89.0 | 18.4 | 8.2 | 26.4 | 286.2 | 22.86 |
| T3: RDF + Polyhalite @ 100kg /ha in single split – 60 DAP. | 82.4 | 18.2 | 10.4 | 28.8 | 290.4 | 23.83 |
| T4: RDF + Polyhalite @ 250kg /ha in two splits – 60 & 90 DAP. | 88.0 | 26.8 | 15.1 | 33.1 | 308.6 | 24.70 |
| T5: RDF + Polyhalite @ 500kg /ha in three splits – 60, 90 & 120 DAP. | 86.4 | 26.2 | 18.4 | 38.2 | 328.4 | 25.87 |
| S.Em (±) | 4.1 | 1.8 | 1.18 | 2.08 | 7.23 | 0.64 |
| CD @5% | NS | 5.4 | 3.54 | 6.24 | 21.7 | 1.92 |

A yield advantage of 10-12% due to application of polyhalite @ 250 & 500 kgs/ha in ginger can be directly attributed for better growth attribute like higher number of tillers /plants. On the other side polyhalite being balanced slow releasing fertilizer has sustained progressive supply of required nutrient elements to ginger. Application of polyhalite can positively impact on soil quality by

boosting cation exchange capacity (CEC), enhancing both the fertility and structure of the soil. This enhancement not only helps retain moisture but also fosters beneficial microbial activity, which is vital for nutrient cycling and the breakdown of organic matter. Furthermore, adding polyhalite to soil can assist in reducing soil erosion. Its use can promote stronger root development in crops, leading to improved soilstability. Polyhalite consists of approximately 14% $K_2O$, 19% S, and 6% MgO, along with 17% CaO. Sustained availability of these nutrients is vital for spice crop like Ginger and turmeric to support photosynthesis, nutrient absorption, and other essential physiological processes. Recent research indicates that polyhalite can be specifically beneficial for crops with higher potassium demands, such as spices and plantation crops. Its slow release characteristic ensures a steady distribution of nutrients, reducing the likelihood of leaching and related environmental issues. Additionally, because it has a lower salt index than typical potassium fertilizers, polyhalite can enhance soil conditions and also aid in alleviating osmotic stress on plants (Vipin Kumar *et al.*, 2023) [5].

**Table 2:** Economics of ginger under different nutrient management systems

| Treatment | Cost of production (Rs) | Fresh rhizome yield tonnes/ha | oss Returns (Rs) | et Returns (Rs) | BC ratio |
|---|---|---|---|---|---|
| T1: RDF (100:50:50 kg $ha^{-1}$) | 4,05,000 | 22.28 | 913480 | 5,08,480 | 2.26 |
| T2: RDF + 3 foliar spray of IISR Ginger special | 4,18,000 | 22.86 | 937260 | 5,19,260 | 2.24 |
| T3: RDF + Polyhalite @ 100kg /ha in single split – 60 DAP. | 4,10,000 | 23.83 | 977030 | 5,67,030 | 2.38 |
| T4: RDF + Polyhalite @ 250kg /ha in two splits – 60 & 90 DAP. | 4,30,000 | 24.70 | 1012700 | 5,82,700 | 2.36 |
| e @ 500kg /ha in three splits – 60, 90 & 120 DAP. | 4,55,000 | 25.87 | 1060670 | 6,05,670 | 2.33 |

Selling price of fresh rhizome Rs 2100/ 50kg bag or Rs 42.00/kg

Application of polyhalite at 250kg/ha in two splits along with RDF for ginger has helped to achive higher net return (Rs 5,82,700) as well as BC ratio (2.36). Even though application of polyhalite @

500kg/ha has recorded highest net return due to higher cost of production it has recorded lower B C ratio. (table.2)

**Conclusion**

From the current study it can be concluded that, application of polyhalite fertilizer along with RDF in ginger @250 kg/ha under high rainfall areas certainly helps in realising higher rhizome yield as well as financial benefits.

**References**

1. Bhatt R, Singh P, Ali OM, Abdel Latef AA, Laing AM, Hossain A, *et al*. Polyhalite positively influences the growth, yield and quality of sugarcane (Saccharum officinarum L.) in potassium and calcium-deficient soils in the semi-arid tropics. Sustainability, 2021, 13(19).
2. Gomez KA, Gomez AA. Statistical Procedures for Agricultural Research. 2nd Edition, John Wiley and Sons, New York, 1984, 680.
3. Swaminathan M. Essentials of food and nutrition. Mysore: Mysore Printing and Publishing House,1974:2:484-485.
4. Vadivel V, Senthikumaran P, Madhusoodan KJ. Problems and prospective of ginger production and export. Spice India,2006:19(4):38-42.
5. Vipin Kumar, Kapila Shekhawat, Rajiv K Singh, Sanjay Singh Rathore, Sandeep Kumar. Effect of polyhalite on yield, nutrient uptake by wheat and soil properties. Annals of Plant and Soil Research, 2023:25(1):59-63.
https://doi.org/10.47815/apsr.2023.10236