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Impact of Seed Rhizome Size on Growth and Yield of Turmeric

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In India, spices occupy an important place among the agro products exported. Spices are the low volume and high value crop. Spices can improve the palatability and appeal of dull diets and they have anti-bacterial and preservative action. Spices are not only used for culinary purpose, most of the spice crops are used as a medicine as they posses high medicinal value. Curcuma longa known as yellow turmeric (Manjal in Tamil) is an important, sacred and ancient spice of India. It is a rhizomatous herbaceous plant belonging to the family Zingeberaceae. Curcumin is the pigment that lends the bright stunning yellow colour to turmeric which can be used as a dye. Because of its brilliant yellow colour, it is also known as "Indian saffron". It is a sterile triploid and it is vegetatively propagated by dibbling the seed rhizomes [1]. Rhizome is of two types' viz., mother rhizomes and finger rhizomes also known as daughter rhizomes. The traditional method of propagation using 15g mother or seed rhizomes. Traditional method requires the seed rate of 2000-2500 kg ha-1 of

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rhizomes if it is sown as a sole crop. It makes the cultivation expensive for large scale production. The cost of planting material amounts to 50% of crop production in turmeric. Since rhizome multiplication is slow and maintenance of planting material is expensive, there is a need to review the effect of size of seed rhizomes on growth and yield of turmeric to reduce the cost of cultivation.

Keywords: Turmeric; seed rhizomes; propagation; reduced cost of cultivation.

1. INTRODUCTION

India is endowed with a remarkably heterogeneous area characterized by a great diversity of agro climatic zones suitable for cultivation of various horticultural crops such as fruits, flowers, spices, vegetables, plantation crops, root and tuber crops, aromatic and medicinal crops. *Curcuma longa* known as yellow turmeric (Manjal in Tamil) is an important, sacred and ancient spice of India. It is a rhizomatous herbaceous plant belonging to the family Zingeberaceae under the order scitaminae. Turmeric is a very important spice crop of India that grows to a height of about 1 to 1.8 meter and has deep orange yellow fleshy rhizomes. India alone produces nearly 80 per cent of the entire world's production. India is also the largest exporter of turmeric in the world. "In Southeast Asia, turmeric is used not only as a principle spice but also as a major component in religious ceremonies. It has vast ethno botanical value, already known in India as a tonic, carminative, antidote to snake bite, astringent and also used for bruises, corns and sprains. It has been widely used in ayurvedic medicines used externally in the treatment of various skin diseases like scabies owing to antifungal and antimicrobial activity and are traditionally used exhibit anti-inflammatory activities" (Sasi kumar, 2000). "Turmeric is a sterile triploid and it is vegetatively propagated by dibbling the seed rhizomes" [1]. Both mother and finger rhizomes are used for propagation. However, primary finger rhizomes are commonly used for planting due to its large availability and Mother rhizomes are found better than finger rhizomes [2,3]. The traditional method of propagation using 15g mother or seed rhizomes. Traditional method requires the seed rate of 2000-2500 kg ha^{-1} of rhizomes if it is sown as a sole crop. It makes the cultivation expensive for large scale production. The cost of planting material amounts to 50% of crop production in turmeric. In turmeric, the sprouting, vigour and viability hold a direct relationship with the size of planting material. Hence there is a need to study the effect rhizome size on growth and yield of turmeric plants.

2. REVIEW OF LITERATURE

The experiment on effect of seed rhizome size on growth and yield of turmeric var. BSR-1 was conducted by Jagesingh et al. [4]. The experiment consisted of treatments with four rhizome sizes (whole mother rhizomes weighing 70-80 g; half cut mother rhizomes weighing 34-40 g and finger rhizomes weighing 40-45 g and 20-25 g). They reported that Plant emergence was highest in whole mother rhizomes and finger rhizomes weighing 40-45 g, more number of tillers and yield was obtained in plants from whole mother rhizomes.

According to Wang *et al*. [5] the seed rhizome size of 35-40 g resulted in better plant height, number of leaves, and leaf area and rhizome yield of ginger (*Zingiber officianalle*). According to Zaman et al. [6] the highest yield (72.27 t ha^{-1}) was obtained from half cut mother rhizome which was statistically similar to that of whole mother rhizome (69.12 t ha^{-1}) and significantly higher than other seed rhizomes used in turmeric (*Curcuma longa*).

"The effects of seed rhizome size on growth and yield of turmeric was evaluated by using daughter rhizomes of 5 to 50 g and mother rhizomes of 48 to 52 g. The results revealed that heavier the seed rhizome size up to 40 g, better the plant growth" [7].

The experiment on the effect of planting materials on plant growth, yield and rhizome size of turmeric (*Curcuma longa*) was conducted by Dhatt et al*.* [8]. The results of the experiment revealed that "as planting material, mother rhizome and primary fingers were significantly better than secondary fingers in respect to plant growth characters like plant height, number of leaves, and leaf area etc. and yield per plant and size of mother rhizome, primary finger and secondary finger production. Mother rhizome and primary fingers were at on par in terms of plant growth, yield and size of secondary fingers. They recommended use of either mother rhizome or primary fingers as planting material to raise the turmeric crop" [9].

"The study on the effect of seed rhizome size on growth and yield of ginger was conducted" by Girma and Kindie., [10]. Rhizomes of 4 to 32 g were studied and among the treatments, the rhizomes with 32g gave better plant height, number of leaves, leaf area and number of tillers per plant. Based on the studies conducted by Olojede *et al.* [11] on 3 rhizome types of turmeric (whole mother rhizome, primary rhizome and secondary rhizome) and 2 seed bed types (planting on ridge and flat), better growth and higher yield can be obtained when mother rhizomes were used for planting compared to primary and secondary rhizomes. According to Balwinder and Gill [12] "when mother rhizomes of turmeric used as a planting material it resulted in better emergence, taller plants with more number of leaves and leaf area index, more tillers per plant, higher number and weight of total rhizomes per plant as compared to use of primary and secondary fingers as planting material. Planting of mother rhizomes produced highest fresh, dry and processed yield". However curcumin content was not affected due to size of planting materials. In a rapid multiplication trial in turmeric (*Curcuma longa*), minisetts weighing 5g took the lowest number of days to sprout (17.7 days) and obtained the highest fresh rhizome yield of 296.7g per plant [13].

An experiment on the effect of planting materials in turmeric was conducted by Manhas and Gill [12] and their results revealed that, mother rhizome recorded better yield and quality as compared to primary and secondary rhizomes. Based on the study conducted by Sengupta and Dasgupta [13] on "the effect of weight of planting material on growth and yield of ginger, the seed rhizome pieces weighing 40 g each were found to be optimum for planting, which resulted in increased in plant height (74.58 cm), number of pseudostems per clump (4.73), number of leaves (54.79 per clump) and yield (49.08 tonnes per ha) compared to smaller rhizomes weighing 10, 20 or 30 g" [14,15].

3. CONCLUSION

From this review it can be concluded that, size of the seed rhizomes used for turmeric propagation play a vital role in the growth and yield of turmeric and this may be due to the presence of more viable buds in larger seed bits that may leads to accumulation of higher content of reserve food material that might have induced early sprouting and higher sprouting percentage. Malhaotra *et al.,* 2016 stated that in turmeric, sprouting and sprouting percentage can be increased by increasing the weight of the planting material.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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