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Effect of Seed Rhizome Treatment on Turmeric cv. Salem for Growth, Yield and Quality Attributes

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ABSTRACT

Common problems in storage of turmeric are rotting, sprouting, desiccation and attack of insects. Therefore adopting proper pre-storage treatments will help in minimizing the storage losses of valuable planting material of which turmeric is planted during May-June. Rhizomes are harvested during December- February, Therefore, it is inevitable to store the seed rhizomes in healthy and viable condition for 3 to 4 months before planting. In the cultivation of rhizomatic spices, the costliest input is the- seed rhizome. Nearly 17-20 per cent of the produce is retained for seed purpose and these rhizomes are perishable in nature, susceptible to rotting, sprouting and shriveling. Therefore proper seed rhizome treatment with suitable fungicides and insecticides is necessary to keep them in healthy and viable conditions.

Key words: Rhizome, Turmeric, Aromatic, Stimulative

INTRODUCTION

Turmeric (*Curcuma longa* L.), a rhizomatous herbaceous plant of the Zingiberaceae family, is usually used as a spice, cosmetic, coloring agent, flavourant and preservative, and also ascribed universally to its aromatic, stimulative and carminative properties. Commercially, it is traded as a spice, dye, oleoresin and source of industrial starch. It is an ancient spice and being used dates back nearly 4000 years to the Vedic culture in India as a culinary spice and dye, and had a wide range of spiritual significance of Hindu religion. Turmeric is valued for its underground rhizome containing a yellow phenolic pigment called curcumin which is used as natural colouring agent for food, cosmetics and dye. Curcumin, the main active ingredient of turmeric, functions as a medicine with anti-inflammatory, anti mutagenic, anti-carcinogenic, anti-tumor, anti-bacterial, anti-oxidant, anti-fungal, anti-parasitic and detoxifying properties[1]. India is the largest producer, consumer and exporter of turmeric that accounts about 80%, 90% and 60% share, respectively of the world's total[2].

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Turmeric is being largely grown in India, Pakistan, Myanmar, Japan and China. India is the major producer of turmeric, which occupies fifth place in area under spices and ranks second in production next to chillies. It occupies 6.3 per cent of spice area and shares 16.91 per cent of spice production. In India it is being cultivated in more than 20 states in an area of 1,94,000 ha with an annual production of 9,71,000 MT. In India, it is mainly grown in Andhra Pradesh, Orissa, West Bengal, Tamil Nadu, Assam, Maharashtra, Karnataka, Bihar and Kerala. Among these, Andhra Pradesh occupies 34.90 per cent of total area and 43.51 per cent of total production of the country.The national productivity of crop is 5 tons per hectare[3].

Though a lot of trials on varietal, fertilizer, spacing, date of planting, size of planting material, mulching material and irrigation schedule etc. have been conducted to increase the production but very little work has so far been undertaken to increase the production through rhizome treatments using various organic and inorganic sources. Common problems in storage of turmeric are rotting, desiccation and attack of insects. Therefore adopting proper pre-storage treatments will help in minimizing the storage losses of valuable planting material turmeric is planted during May-June[3]. Rhizomes are harvested during December- February under Kerala conditions . therefore, it is inevitable to store the seed rhizomes in healthy and viable condition for 3 to 3½ months before planting. In the cultivation of rhizomatic spices, the costliest input is the- seed rhizome. Nearly 17-20 per cent of the produce is retained for seed purpose and these rhizomes are perishable in nature, susceptible to rotting, sprouting and shrivelling, therefore proper seed rhizome treatment with suitable fungicides and insecticides is necessary to keep them in healthy and viable conditions. . Keeping this in view the present investigation was undertaken to study the effect of seed rhizome treatment on turmeric cv. Salem growth, yield and quality attributes.

Effect of seed rhizome treatments on the recovery of healthy rhizome, sprouting percentage and rotting percentage

Gajendran *et al.*[5] studied the effect of different insecticides on germination of turmeric. The germination percentage was maximum (95.00%) in treatments with Dichlorvos (0.01%), Phasalone (0.70%) and Methyl demeton (0.05%) whereas the germination in Monocrotophos (0.07%) and untreated check were 92.50 and 82.50 per cent, respectively.

Manmohandas *et at.*[6] conducted the studies on the efficiency of fungicides for checking rhizome rot of ginger and found that rhizome treated with Captan (0.2%) for 30 minutes recorded higher percentage of field germination and lower percentage of pre-emergence rhizome rot.

In order to control rhizome rot, Ridomil (0.4%), Bavistin (0.1 %), Blitox-50 (0.3%), Captan (0.25%), Dithane M-45 (0.3%) + Bavistin (0.1 %) were applied to ginger rhizome as pre-sowing dip treatment for 60 minute. The results indicated that pre-sowing treatment with combination of Bavistin and Dithane M-45 followed by Captan increased germination and reduced pre-emergent and post-emergent rot[7].

Seed treatment with Bavistin (0.1 %) and combination of Dithane M-45 (0.25%) and Bavistin (0.1 %) followed by Capt an (0.25%) for 60 minutes increased germination and reduced post-emergent rhizome rot of ginger[8].

Vanamala[9] reported that turmeric seed rhizome treated with Emisan-6 (0.2%) and stored in clay pots with sand did not show any symptom of rotting throughout the storage period of 3 months. Maximum field sprouting was recorded in the rhizome treated with 0.2 per cent Captan (92.37%) followed by Emisan-6 (82.22%).

Anandam *et al.*[10] reported that turmeric seed rhizome treatment with Ridomil MZ @ 0.4 per cent gave the lowest rotting (0.05%) compared to control (5.13%).

Chandrappa[11] reported that the ginger rhizome treated with Emisan-6 at 0.2 per cent

recorded significantly higher recovery of healthy rhizome (92.56%) and maximum germination of rhizome (84.87%) whereas the lowest recovery of healthy rhizome (78.89 %) and minimum germination (50.98%) was found with rhizome in control.

Venkatesha *et al*.[12] reported that pre-storage treatment of turmeric rhizomes with 0.2 per cent emisan was effective in managing the rhizome rot during storage and also maximum recovery of healthy seedlings and maximum sprouting after planting in the field.

Kirankumar *et al*.[13] reported that the pre-treatment of rhizomes with captan 0.3 per cent or Mancozeb 0.1 per cent was found effective in minimizing the storage diseases (3.20 – 3.65 %) and insect pests (5.30- 7.15 %) as compared to untreated control (14.75% and 34.60%, respectively) and combination of these two gave the highest recovery of healthy seed rhizome and pre-storage seed treatment did not have any effect on physiological loss in weight after 90 days of storage.

The highest percentage of germination (93.33) was recorded when the chilli seeds of BARI Morich 1 were treated with BAU Bio-fungicide, whereas the lowest percentage of germination was recorded in case of untreated seeds (61.33). The highest percentage of healthy seedling was recorded when the seeds were treated with BAU Bio-fungicide and allamonda leaf extracts (95.33), whereas the lowest percentage of healthy seedling was recorded in case of untreated seeds (59.00). The highest vigour index (681.69) was recorded when the seeds were treated with neem leaf extracts, whereas the lowest (214.66) was recorded in case of untreated seeds[14].

Chowdhury *et al*.[15] reported in ginger that among 10 fungicide seed treatments, Dursban plus Ridomil recorded maximum plant height (65.35 cm) followed by Mataril (64.21 cm) and the minimum was recorded in control (45.23 cm). Highest rhizome weight per plant and rhizome yield per ha was recorded in Dursban plus Ridomil (402.70 g and 32.20 t/ha) respectively, while the lowest was recorded in control (185.00 g and 14.79 t/ha).

Jegathambigai *et al*.[16] reported in *Chrysalidocarpus lutescens* that seed treatment with a spore suspension of *Trichoderma* completely eliminated the disease while *Trichoderma spp* and *Pseudomonas fluorescens* reduced the disease incidence significantly. The seed treatments also significantly increased seed germination, seedling growth and seedling vigor.

Pal *et al*.[17] observed 97 per cent seed germination in maize seeds treated with *Trichoderma harzianum* with 1 g kaolin and 98 per cent seed germination in soybean seeds treated with *T. harzianum*. 0.2 per cent extracts of garlic and 0.5 per cent extracts of turmeric showed 93 per cent germination and 68 per cent field emergence of seedling in soybean respectively. Further it was opined that combination of *T. harzianum* with kaolin can be used for the enhancement of seed germination of various crops.

Under field condition, seed treatment in ginger with *Trichoderma viride* at 4g per kilogram of seed resulted in maximum reduction in plant mortality (4.2.%) with consequent increase in disease control (84.9%), plant stand over control (32.8.%), plant height (48.9 cm), number of tillers (18.0) and yield (22.43 t/ha), respectively[18].

Lalfakawma *et al*.[19] reported in ginger that among the growth parameters, the maximum plant height was recorded in plots with *Trichoderma spp.* + neem extract rhizome seed treatment (46.46 cm) followed by copper oxychloride rhizome seed treatment (45.28 cm). The lowest was recorded in plots with neem extract rhizome seed treatment (40.22 cm). The maximum number of tillers per hill (11.49) was recorded from rhizome treatment with copper oxychloride + neem extract followed by rhizome treatment with copper oxychloride (10.54) while the minimum were recorded from control plots where pathogen (*Pythium myriotylum*) was inoculated (6.56). Highest yield was recorded in plots with copper oxychloride rhizome seed treatment (59.14 q/ha) followed by copper oxychloride + neem extract (49.30 q/ha). The lowest projected yield was recorded in control plots

(9.98 q/ha), where rhizomes were inoculated with the pathogen (*Pythium myriotylum*).

Shadap *et al.*[20] reported that the highest sprouting percentage (98.89) was recorded in rhizome stored in ZECC treated with *Trichoderma harzianum* whereas, the rhizome stored in sand layer with no seed treatment recorded the lowest germination (75.56%).

Effect of seed rhizome treatments on field establishment and yield performance

Mohanty and Sharma[21] suggested that planting of rhizome treated with ceresan wet (0.25%) in raised bed and application of fertilizers, farm yard manure combined with mulching, recorded the highest rhizome yield (234.7 Q/ha) with reduced incidence of soft rot in ginger.

Sharma *et al.*[22] reported that *Trichoderma viride* in combination with Ridomil MZ gave a greater protection against rhizome rot and also gave higher yield, when given as a seed treatment.

Hore *et al.*[23] reported that rhizomes treated with $KHPO_2$ 0.5 per cent produced significantly higher clump weight (346.28 g), yield per plot (14. 97 kg/ 3 sq. m) and projected yield (34. 37 t ha^{-1}) as compared to control (258.34g, 10.62 kg/$3m^2$ and 26.55 t ha^{-1}, respectively). The other promising treatments with respect to yield were GA 200 ppm (14.35 kg/ 3 sq. m) and KNO_3 0.25 per cent (13.75 kg/ 3 sq. m).

Naresh *et al.*[24] observed that technological interventions like rhizome treatment, soil application of Trichoderma (bio-control agent) in well rotten cow dung, wood ash, crop rotation, mulching, plant protection measures increased rhizomes yield by a tune of 20- 30% at farmers field.

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