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Case Studies on Nurseries Raising of Turmeric Var 'Lakadong' in Jaintia Hills Meghalaya India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Short Research Article

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ABSTRACT

Meghalaya is home to a variety of spices, among which turmeric (*Curcuma Longa* L.) is one of the most prominent. The Jaintia hills districts of Meghalaya are a native to one of the finest varieties of turmeric in the world namely 'Lakadong' which is considered one of the world's best varieties due to its curcumin content of around 6.8 to 7.5 per cent. Following single bud rhizome plugtray method developed by Tamil Nadu Agricultural University Coimbatore, for rapid multiplication of seeds, Lakadong rhizome were raised in two types of agro-shade net nurseries in Kyrwen Village. Model 1 is a poly-cum-shade net house covered with translucent 200µ UVS plastic on top and 50% green shade net on the sides, while Model 2 is completely covered with 50% shade net. Studies indicate that while the poly-cum-shade net achieved a higher sprouting rate for Lakadong rhizomes, it led to poor seedling development and lower survival rates when transplanted to the field, especially for seedlings grown in plug trays. Conversely, transferring seedlings from poly-cum-shade net to

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shade net for a week significantly improved their field performance. Shade net nursery demonstrated better and healthier seedling development, with higher survival rates when transplanted. Additionally, Lakadong seedlings grown near the 50% shade net wall in poly-cum-shade net showed similar positive outcomes as those in shade net nurseries.

Keywords: Agro-shade net; cucurmin; kyrwen; lakadong; nurseries; turmeric.

1. INTRODUCTION

The state of Meghalaya in the North-Eastern part of India is home to a variety of spices, with turmeric (Curcuma Longa L.) being one of the most prominent. The Jaintia hills districts of Meghalaya are native to one of the finest varieties of turmeric in the world, known as 'Lakadong', which is considered one of the world's best varieties due to its curcumin content of around 6.8 to 7.5 percent [1,2] compared to regular turmeric which has 2 to 4 percent [3]. The rhizome of turmeric contains significant amounts of phenolic compounds, the most important of which are curcuminoids that gave the turmeric rhizome its yellow color [4]. Lakadong turmeric inherits its name from the small village of Lakadong in the state of Meghalaya, Northeastern part of India. The area under turmeric cultivation in Meghalaya is 2577 ha with a total production of 16324 tonnes {Government of Meghalaya, Department of Agriculture "Lakadong mission" (2018-2023)} and Lakadong is the main variety, covering more than 50% of the total area. It is cultivated in humid and warm climates with very high rainfall about 4000-10000 mm. The Jaintia hill district of Meghalaya which comprises East and West Janita hills, is very congenial to the production of good quality Lakadong turmeric. The practice of planting crops inside agro-shade net nurseries protects them from adverse climatic conditions like high light intensity and temperature [5]. These shade net house require comparatively less land area for agricultural production system, resulting in increased land productivity and facilitate year-round crop production [6]. Agriculture shade nets can regulate temperature and humidity in greenhouses and nurseries, promote better plant growth and development, and extend the growing season. Planting media such as cocopeat enhance sprouting and germination efficiency as cocopeat is considered one of the best growth media components, with acceptable pH, electrical conductivity and other chemical attributes [7].

2. METHODOLOGY

Studies are carried out at Kyrwen Nurseries, located in the Laskein subdivision of West Jaintia hills district in Meghalaya India, situated 5km away from sub-district headquarter in Laskein. Following the single bud rhizome plugtray method for rapid multiplication of turmeric seeds developed by Tamil Nadu Agricultural University Coimbatore, Lakadong rhizomes are cut into small pieces weighing 5-7g each and treated with Trichoderma /pseudomonas fluorescens to avoid infection. Rhizomes are then sown in a cocopeat medium treated with 10ml of humic acid, 15g of Citrus (multi-micronutrient fertilizer), and 10g of VAM (Pseudomonas), all mixed in 30 litres of water, followed by regular watering to maintain

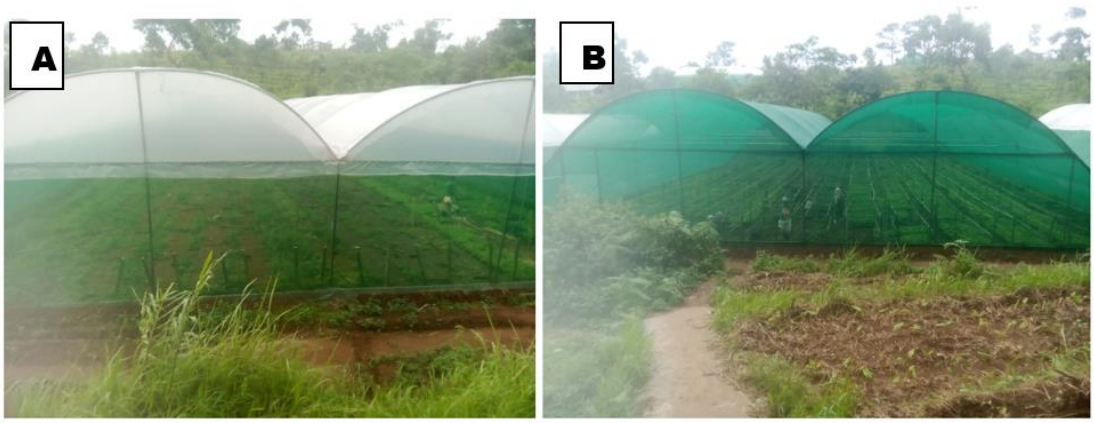

Fig. 1. (A) Model 1 and (B) Model 2. Kyrwen nurseries, Meghalaya India

moisture. The media combination of cocopeat has significantly influence the sprouting percentage and growth parameters of the turmeric transplants in plugtrays [8]. After sprouting, some rhizomes are transplanted into plugtrays filled with the same medium for further development into seedlings, while the remaining are left in the medium itself for further development into seedlings.

This method was adopted in two types of agro-shade net nurseries (Fig. 1), both using a green net with a 50% shade factor. The first type (Model 1) is a poly-cum-shade net house covered with translucent 200µ UVS plastic on top, and sides are covered with 50% green shade net. The second type (Model 2) is completely covered with 50% shade net.

3. RESULTS AND DISCUSSION

3.1 Sprouting and Seedlings Development

Lakadong rhizome under Nursery model 1 showed a higher sprouting rate but poor seedling development, particularly those transplanted into plugtrays, compared to the rhizomes left in the medium (Fig. 2 C). This finding is also report in papaya seed where the germination percentage in poly-cum-shadenet house (93.9 %) was found significantly higher than in a black shade net house (86.8%) [9,10]. Higher temperature in a poly cum shade net might be responsible for germination as most studies show that low germination percentages were recorded in open field due to low temperatures and cold waves at germination stage. Temperature was recorded lower in the black shade net house than in the open field, even though germination percentage of papaya was on par with poly-cum-shade net house. These might be because the black shade net structure reduces the effect of cold wave at germination stage [9]. Seedlings from this model also exhibited a lower survival rate when transplanted directly to the field. However, when seedlings were transferred to Nursery Model 2 for one week, they performed best when subsequently transplanted to the field (Fig. 3). This suggests that light requirements in turmeric vary across the different growing stages, with lower light intensities needed in the initial phases of growth. Therefore, shade levels could be modified during plant growth, starting with a higher shade level and then reducing it, aiming to maximize shoot growth and rhizome development of turmeric crops [11].

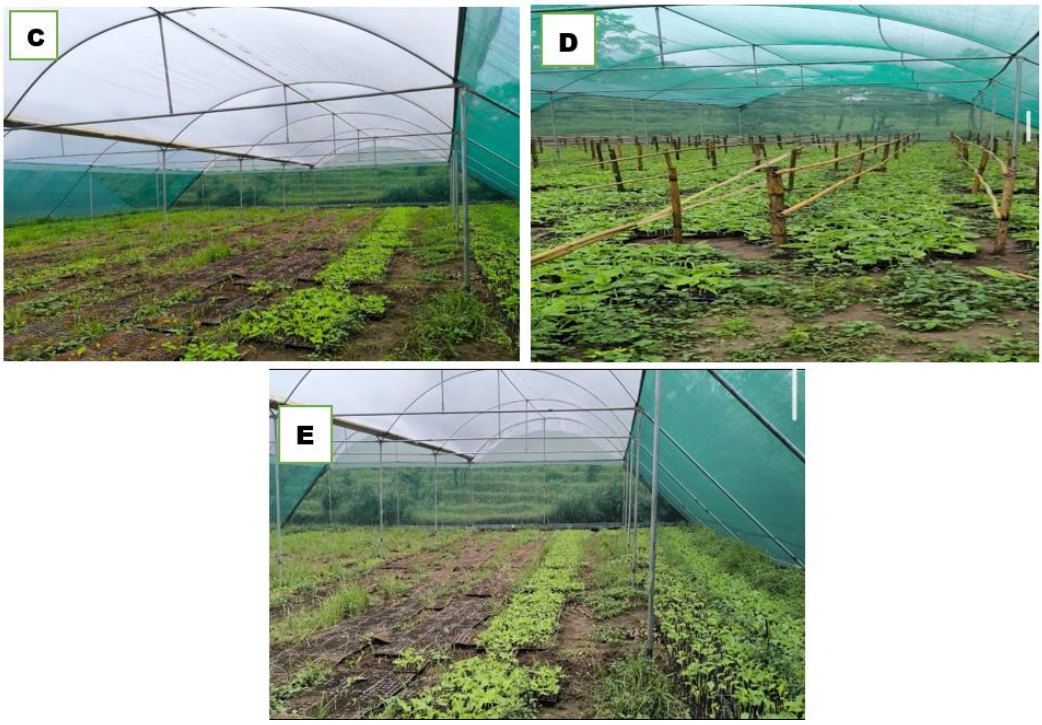

Fig. 2. Sprouting and seedlings development (C) Model 1, (D) Model 2 and (E) healthy seedlings develop near the shade net

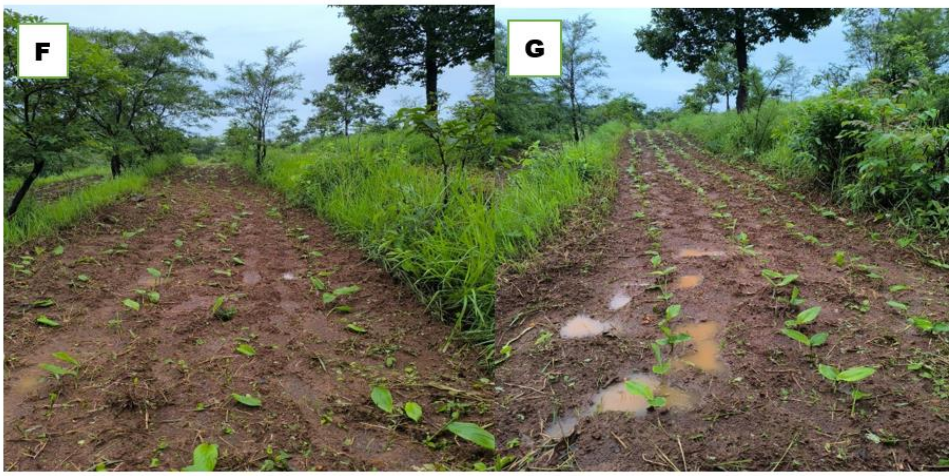

Fig. 3. (F) Seedlings transplanted directly from the media and (G) transplanted from the plugtray

Under model 2, Lakadong rhizome showed comparatively less sprouting than model 1 but exhibit better and healthy seedling development in both the plugtrays and on the medium (Fig. 2 D). This may be the due to the single shade net allowing relatively more sunlight. For instance, wheat seedlings were found to grow more in number with relatively maximum growth rate under single shade net compared to a double shade net and a polyhouse [12]. The partial shade of 50% also increased the yield and could be optimal for maximum photosynthesis and biomass accumulation in the turmeric crop [13,14]. This was also observed in the nursery model 1 where sprouting rhizome placed near the wall of the polyhouse, closer to the 50% shadet, shows similar results to those in nursery under model 2 (Fig. 2E).

3.2 Transplanting

Seedling of Lakadong from the medium shows very low life expectancy when transplanted to the field, whereas seedlings from the plugtrays showed better performance (Fig. 3). Research suggests that the use of plug trays can reduce seedling mortality and can produce a greater number of viable seedlings in the field [15,16]. Turmeric plants recorded highest plant height, number of leaves and number of tillers through single node rhizome raised in plugtray for one month and then transplanted in the field. compare to single node rhizome transplanted directly in the field [17].

4. CONCLUSION

Studies indicate that while Nursery Model 1 achieved a higher sprouting rate for Lakadong rhizomes, it resulted in poor seedling development and lower survival rates when transplanted to the field, especially for seedlings grown in plugtrays. Conversely, transferring seedlings from Model 1 to Model 2 for a week significantly improved their field performance. Nursery Model 2 demonstrated better and healthier seedling development, both in plugtrays and on the ground, with higher survival rates when transplanted. Additionally, Lakadong seedlings grown near the 50% shade net wall in Model 1 showed similar positive outcomes as those in Model 2. Overall, seedlings grown in plugtrays under Nursery Model 2 conditions exhibited the best field performance.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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