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Effect of different botanical extracts and growth hormones on mycelial growth of milky mushroom

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Milky mushroom is the first mushroom from India to be commercialized. It is known for its attractive white fruiting body and meaty texture, preferred for cultivation due to its ability to grow in higher tropical temperatures. It is also a very profitable mushroom as its biological efficiency ranges from 50-100%. Its cultivation is also relatively simpler as compost preparation is not necessary. This specialty mushroom is also the fourth most cultivated mushroom in India (Kumar *et al.,* 2017).

The antimicrobial activity of plant extract is traditional knowledge in all parts of the world for thousands of years. Antimicrobial activity of plant extracts has been especially used for preservation of food material and also as pharmaceuticals, and alternative medicine (Đernaitë, 2017). With the increase in demand for natural sources of different antimicrobial compounds due to their effectiveness and safety, the usage of plant extract is an option that is more desirable than the usage of chemicals which is toxic to humans.

Plant growth regulators show their effect not only on plants but also on other organisms such as mushrooms. Plant growth regulators show their effect not only on plants but also on other organisms such as mushrooms. The usage of plant growth hormone in mushroom cultivation technology needs more research as it is a helpful tool to produce desirable characteristics and also to increase yield in mushroom cultivation.

To prepare the phytoextract, leaves of Parijat, Betel, and Tulsi were collected from the B.H.U. campus, washed, and ground with distilled water (50g leaves in 50 ml water). The paste was filtered through muslin cloth, centrifuged at 10,000g for 10 minutes, and filtered with Whatman No. 1 paper (Chhetri *et al.,* 2017). The extract was autoclaved at 121°C for 15 minutes at 15 psi and stored at 5°C. Extracts were added to PDA media at a 20% concentration. Three growth hormones—Indole-3-butyric acid (IBA), Indole-3-Acetic acid (IAA), and Gibberellic acid (GA)—were tested at concentrations of 5, 10, and 20 ppm to assess mycelial growth. Sterile IBA and IAA solutions were prepared at 1 mg/ml. For GA, 10 mg of powder was dissolved in ethyl alcohol and diluted to 10 ml for a 1 mg/ml stock solution. These stock solutions were added to PDA media at the specified concentrations. Fourteen-day-old culture bits of milky mushroom (Strain CI-09) mycelia were transferred to pre-solidified culture plates containing plant extracts and growth hormones. The inoculated Petri plates were incubated at 27±2°C in a BOD incubator, with radial growth assessed at 3-day intervals.

Effect of different plant extracts on mycelial growth of milky mushroom

All three extracts; Parijat, Betel, and Tulsi showed a faster growth rate than the control. The fastest growth was observed with Parijat extract, reaching

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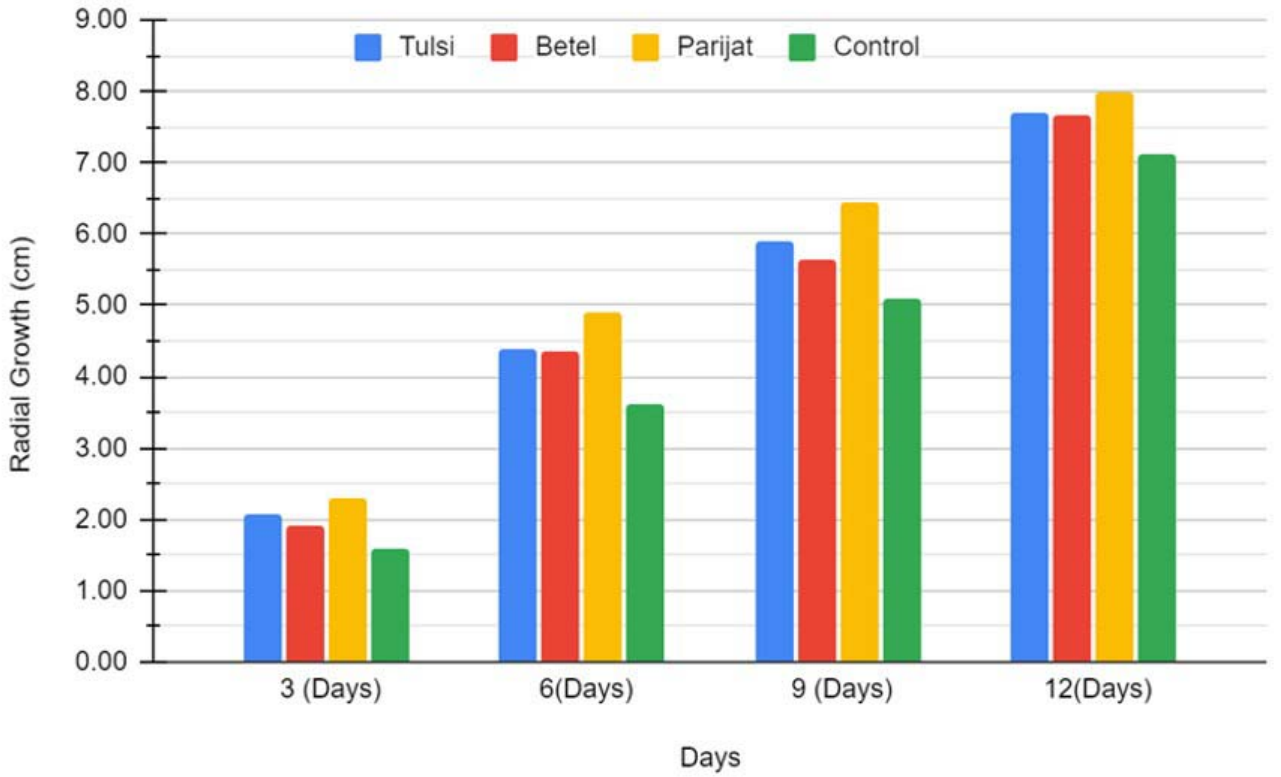

Fig. 1. Effect of plant extract on radial growth of milky mushroom

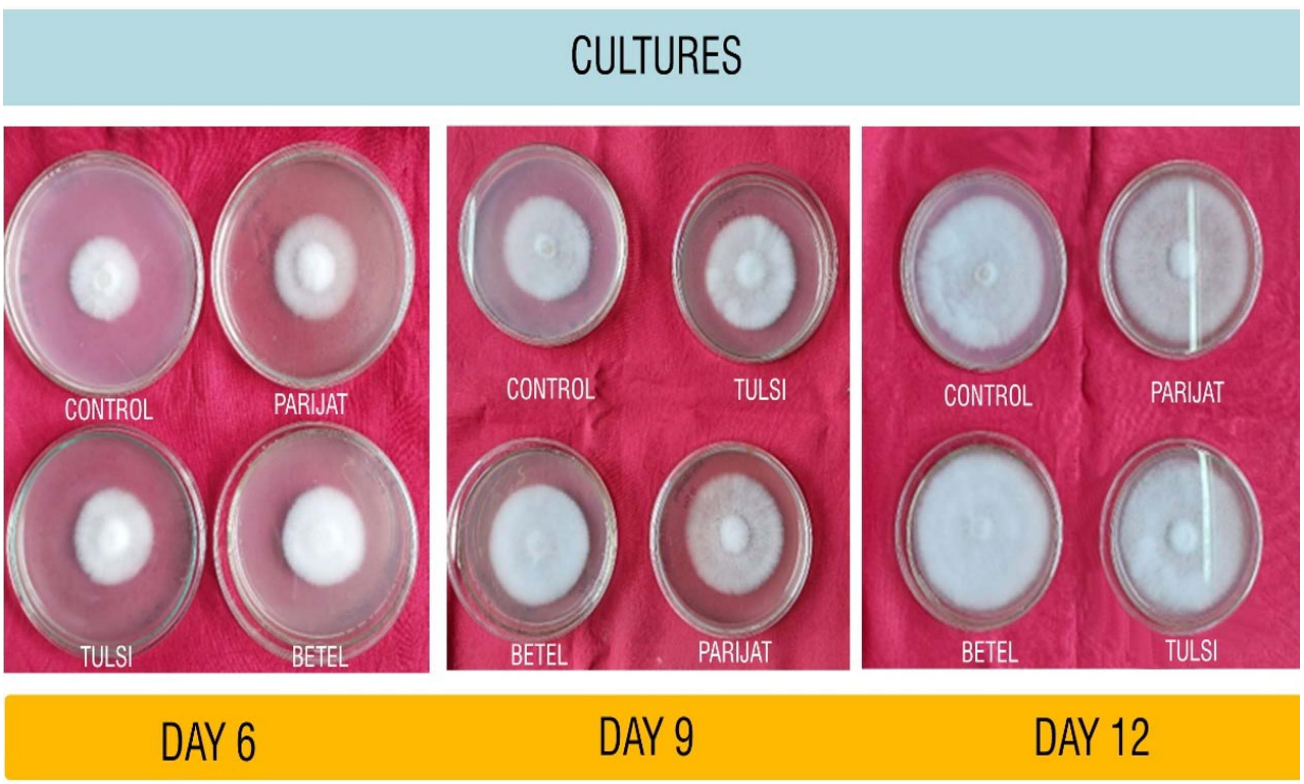

Fig. 2. Mycelial growth on different days

8.05 cm on day 12, followed by Tulsi (7.7 cm) and Betel (7.84 cm). Additionally, all three leaf extracts produced denser colonies compared to the control, with Betel showing the densest colony.

Effect of different plant growth hormones on mycelial growth of milky mushroom

Three growth hormones, namely Indole-3-butyric acid (IBA), Indole-3-acetic acid (IAA), and Gibberellic acid (GA), were used to support the mycelial growth of milky mushroom. Observations were taken 12 days after inoculation. The fastest growth was observed with 5 ppm of GA (8.4 cm), while the slowest growth was with 20 ppm of IAA (6.9 cm). For IAA, the fastest growth was at 10 ppm (7.8 cm), and the slowest at 20 ppm (6.9 cm), indicating that concentrations higher than 20 ppm inhibit mycelial growth. In IBA, the fastest growth was at 5 ppm (8.3 cm), followed by 10 ppm (8.2 cm), both higher than the control. However, at 20 ppm (7.77 cm), there was no significant difference compared to the control. For GA, the highest growth was at 5 ppm (8.4 cm), followed by 10 ppm (8.3 cm), while at 20 ppm (7.5 cm), growth was comparable to the control. It was observed that concentrations above 20 ppm for all three growth hormones either inhibited growth or had no effect. These results align with the findings of Pandey *et al*. (2021), who evaluated the effect of neem and eucalyptus plant extracts on *Pleurotus florida* at 2% and 4% concentrations. Maximum growth was observed with 2% neem extract (88 mm), followed by the control (80 mm), while eucalyptus inhibited growth at both concentrations. Other researchers have also reported on the effects of plant extracts and growth hormones on the mycelial growth of mushrooms (Biswas *et al*., 2018; Pervez *et al*., 2012).

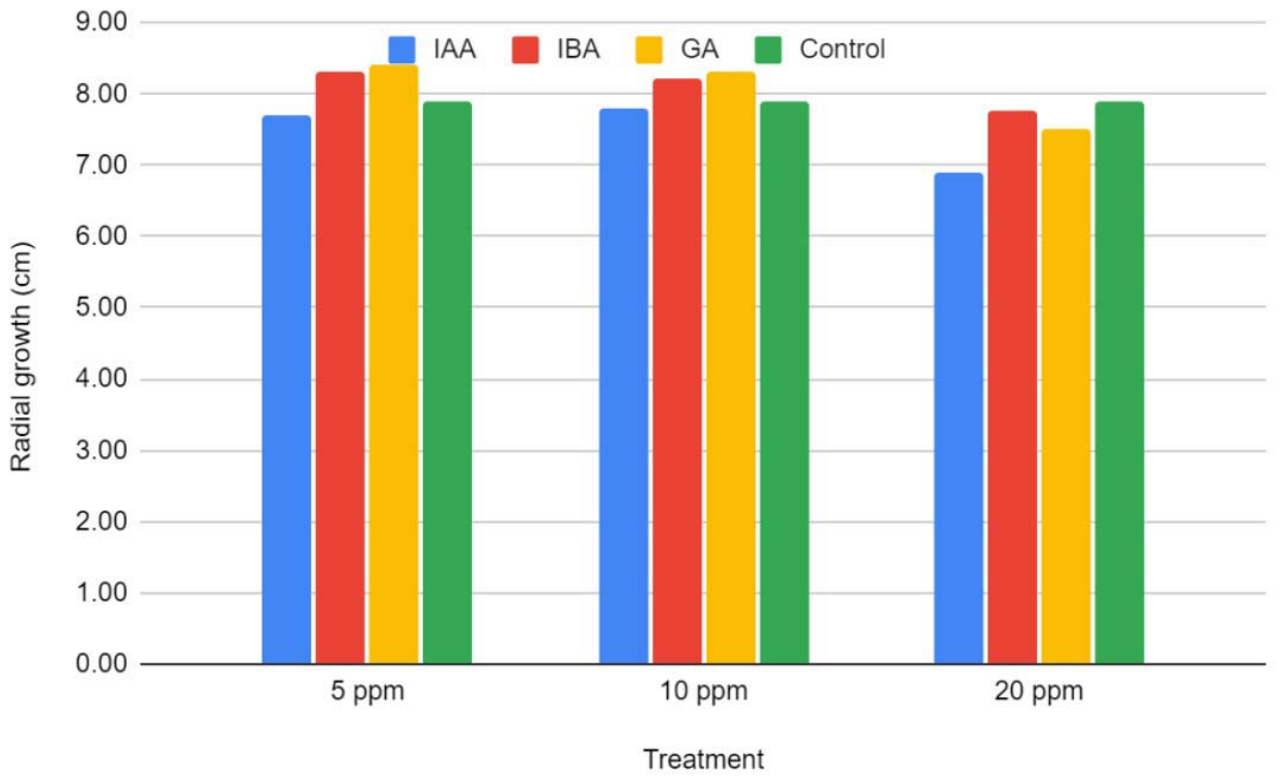

Fig. 3. Effect of growth hormones on radial growth of milky mushroom

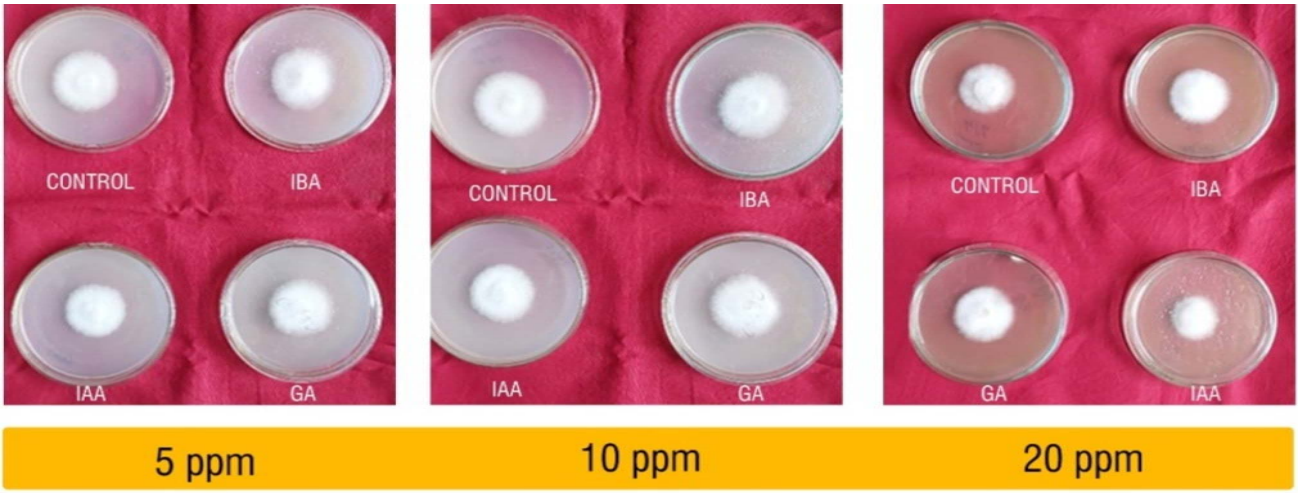

Fig. 4. Mycelial growth at different concentrations of growth hormones

In view of the summarized experimental findings, it can be concluded that the highest mycelial growth of milky mushroom was achieved with Parijat extract. Maximum mycelial growth was recorded with the growth hormone GA at a 5 ppm concentration (8.4 cm), while the lowest growth was observed with IAA at 20 ppm (6.9 cm). Therefore, spraying GA at different stages of mushroom cultivation may increase yield, which warrants further study. This investigation will help mushroom growers select suitable botanical extracts and growth hormones for the production of mycelial inoculum.

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