

7. Sand and Ash Mixture on Nursery Pathways

A mixture of coarse sand and ash applied on nursery pathways and bed borders acts as a physical barrier that restricts movement. The rough texture and drying effect discourage snails and slugs from crossing into nursery beds. This method is particularly useful around high-value seedling blocks.

Molluscicides for Management of Snails and Slugs in Forest Nurseries

S. No.	Common Name (Active Ingredient)	Trade Name (Examples)	Recommended Dose	Method of Application	Recommendation / Remarks
1	Metaldehyde 2.5-5% GB	Meta, Deadline, Slugfest (or equivalent)	10-15 kg/ha OR 2-3 g/m ²	Broadcasting as bait in nursery beds and along borders	Apply in evening hours; avoid application before irrigation or rain; keep away from children, birds, and pets
2	Metaldehyde 5% + Carbaryl 5% (bait)	Slug Out, Meta-Carb (or equivalent)	10 kg/ha	Spot application near infested areas	Effective under high infestation; use only where ITK methods fail
3	Iron Phosphate 1% bait	Ferramol, Sluggo (eco-friendly brands)	10-15 kg/ha	Broadcasting as bait	Safer to non-target organisms; suitable for eco-sensitive nursery areas
4	Calcium Cyanamide (lime-based granules)	Perlkalk (or equivalent)	200-300 kg/ha (nursery paths only)	Line application on nursery paths and borders	Acts as deterrent and fertilizer; avoid direct contact with seedlings
5	Copper Sulphate solution	— (technical grade)	1-2% solution	Sprayed only on borders / non-plant areas	Acts as repellent; do not spray directly on seedlings



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Indigenous Technical Knowledge (ITKs) for Snail and Slug Management in Forest Nurseries



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About snail and slugs

Snails and slugs are soft-bodied, non-insect organisms belonging to the class Gastropoda under the phylum Mollusca. They are commonly found in moist, shaded, and cool habitats, which makes forest nurseries, polyhouses, and irrigated planting areas highly suitable for their survival and multiplication. Snails are characterized by the presence of a coiled external shell, whereas slugs lack a shell or have a highly reduced internal one. Both are slow-moving organisms that rely on a muscular foot for locomotion and secrete mucus to facilitate movement and prevent desiccation. Their life cycle includes egg, juvenile, and adult stages, with reproduction occurring rapidly under favorable environmental conditions. Snails and slugs play an ecological role in natural ecosystems by contributing to organic matter decomposition and nutrient cycling, but in managed nursery systems their population often increases beyond ecological balance, necessitating appropriate management interventions.

Marks of Identification of Snails and Slugs

Snails and slugs can be identified by their soft, unsegmented bodies and slow creeping movement. Snails are distinguished by the presence of a hard, spirally coiled shell on the dorsal side, into which the body can be partially or completely withdrawn, whereas slugs lack an



external shell or possess only a small, reduced internal shell. Both have a muscular, flattened foot used for movement and secrete a slimy mucus that leaves visible trails on surfaces. The head bears two pairs of tentacles, with the longer upper pair carrying the eyes and the shorter lower pair functioning as sensory organs. Their bodies are usually moist, elongated, and tapering, with coloration ranging from light brown and grey to dark black depending on the species and habitat. These features together help in the easy field identification of snails and slugs in forest nursery environments.

Damage Symptoms of Snails and Slugs in Forest Nurseries

In forest nurseries, damage caused by snails and slugs is commonly observed on young and tender



seedlings, particularly under moist and shaded conditions. These pests feed by scraping plant tissues, resulting in irregular, large holes on leaves, often starting from the leaf margins. In severe cases, complete defoliation of seedlings may occur. Newly germinated seedlings may be cut at the collar region, leading to patchy gaps in nursery beds.



A typical and easily recognizable sign of their activity is the presence of silvery, slimy mucus trails on leaves, nursery trays, pots, and soil surfaces. Damage is usually more prominent after irrigation or rainfall and is often noticed during early morning hours. Continuous

feeding weakens seedlings, slows their growth, and may ultimately cause wilting or death, thereby reducing the overall quality and survival rate of nursery stock.

Life Cycle of Snails and Slugs

Snails and slugs undergo a simple life cycle consisting of egg, juvenile, and adult stages, without any larval or pupal stage. Under favourable conditions of high moisture, moderate temperature, and shaded habitats, they reproduce rapidly, especially in nursery environments. Adult snails and slugs are hermaphrodites (each individual possesses both male and female reproductive organs), but they usually mate and exchange sperm before laying eggs. Eggs are laid in clusters in moist soil, cracks, leaf litter, or under pots and debris, typically a few centimeters below the soil surface. The eggs are small, round, translucent to milky white in colour and hatch within 7–21 days, depending on temperature and humidity. After hatching, juveniles resemble miniature adults and begin feeding immediately. They grow gradually through increased feeding and body size, reaching maturity within 2–6 months. Adults can live for several months to more than a year and are capable of laying eggs multiple times during their lifespan. Continuous availability of moisture and food allows overlapping generations, which leads to persistent infestations in forest nurseries if not properly managed.



ITK-Based Management of Snails and Slugs in Forest Nurseries

1. Ash Barrier Method

Dry wood ash or cow-dung ash is traditionally used as a physical and desiccating barrier against snails and slugs. A continuous ring of ash is applied around nursery beds, seed trays, polybags, or individual pots. When snails and slugs attempt to cross the ash layer, it absorbs body moisture and causes irritation, discouraging further movement. This method is highly effective under dry conditions and should be reapplied after irrigation or rainfall to maintain its effectiveness.

2. Lime (Chuna) Line Method

Lime powder is applied as thin lines along nursery bed borders, pathways, and around seedling containers. The alkaline nature of lime acts as a deterrent and prevents snails and slugs from crossing treated areas. Care should be taken to avoid direct contact with plant stems or roots, as excessive lime may cause phytotoxicity. Regular maintenance of the lime lines is required, particularly during the rainy season.

3. Trap Method Using Organic Materials

Traditional trap materials such as banana peels, papaya peels, cabbage leaves, or wet gunny bags are placed on nursery beds in the evening. Snails and slugs seek shelter under these materials during night hours. The following morning, the traps are lifted and the collected pests are removed and destroyed. This method is simple, inexpensive, and highly suitable for small to medium-sized forest nurseries.

4. Fermented Attractant Trap (Traditional Practice)

Shallow containers filled with fermented jaggery solution or stale beer are placed at ground level within nursery beds. The strong odor attracts snails and slugs, which fall into the liquid and drown. Containers should be checked daily, and the contents replaced periodically to maintain attractiveness.

5. Hand Collection (Manual Control)

Hand picking is one of the oldest and most reliable ITK practices. Collection is best done early in the morning or at night, particularly after irrigation or rainfall when snails and slugs are active. Collected individuals are destroyed by deep burial with ash or salt. Regular hand collection significantly reduces the breeding population and prevents rapid multiplication.

6. Nursery Sanitation and Habitat Management

Maintaining clean nursery conditions is a crucial ITK component. Removal of weeds, fallen leaves, decaying organic matter, broken pots, and unused materials reduces hiding and egg-laying sites. Proper spacing between beds, improved drainage, and avoidance of excess irrigation help create unfavorable conditions for snail and slug survival.