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Snail Infestation in Agricultural Crops: An Emerging Threat and Integrated Management Strategies

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Snail infestation is emerging as a serious concern in agricultural crops, particularly under favourable environmental conditions characterized by high humidity, frequent rainfall and abundant vegetation. In recent years, snail infestation has emerged as a growing concern in agricultural crops, particularly cotton, maize and horticultural crops. Increasing snail activity and associated crop damage have been observed in agricultural fields under favourable environmental conditions. The introduction and spread of invasive land snails may be associated with the movement of infested nursery plants, planting materials, soil and agricultural equipment from one region to another. Once introduced into a suitable environment, these snails can establish themselves, multiply rapidly and spread to neighbouring agricultural areas. If timely management measures are not adopted, their increasing populations may pose a significant threat to crop establishment, productivity and sustainable agricultural production. If timely integrated management practices are not adopted, snail populations may multiply rapidly under favourable environmental conditions, causing substantial crop damage. Furthermore, their spread to neighbouring agricultural fields and villages may create additional challenges for farmers. Therefore, early identification, regular monitoring and community-level implementation of integrated management practices are essential to prevent further multiplication and spread.

Identification and Biology of Snails

Among the terrestrial snails affecting agricultural crops, the Giant African Snail (*Lissachatina fulica*, formerly *Achatina fulica*) is considered one of the important invasive species. It belongs to the phylum Mollusca and class Gastropoda. The Giant African Snail possesses a soft body protected by a large, elongated, conical shell, usually brownish with characteristic darker bands. Mature snails may reach approximately 20 cm in length under favourable conditions. Snails are predominantly nocturnal and remain hidden during the daytime in moist and shaded locations such as soil cracks, beneath stones, crop residues, weeds and other sheltered places. They become more active during the night and following rainfall.

One of the characteristic signs of snail activity is the presence of shiny, slimy trails on the soil surface, leaves and other materials over which they move. As several terrestrial snail species occur in agricultural ecosystems, identification of the species responsible for crop damage is necessary before recommending specific control measures.

Life Cycle and Reproductive Potential

The Giant African Snail possesses a high reproductive capacity, which contributes to its rapid population buildup under favourable conditions. It is a hermaphroditic organism, possessing both male and female reproductive organs. However, reproduction generally involves mating between individuals. A mature snail may lay approximately 200 eggs per clutch and produce about five to six clutches annually, depending on environmental conditions. The eggs are generally cream or pale yellow and are deposited in moist soil or other protected locations. They hatch within approximately 8–21 days, producing young snails that gradually develop into adults. The young snails generally attain adult size within six to eight months. Under natural conditions, their lifespan is approximately three to five years. This high reproductive potential, combined with their ability to survive unfavourable environmental conditions, makes established snail populations difficult to manage.

Environmental Conditions Favouring Snail Infestation

Snail activity and multiplication are strongly influenced by temperature, humidity, soil moisture and the availability of suitable shelter. Warm and humid conditions, particularly during the rainy season, favour snail movement and feeding. Temperatures around 15–25°C are considered favourable for reproduction in the Giant African Snail. The presence of weeds, accumulated crop residues, shaded field bunds and moist soil provides suitable shelter and breeding locations. During prolonged dry or hot conditions, snails may enter a dormant state known as aestivation, which helps them survive unfavourable periods. They become active again when moisture and environmental conditions improve. Consequently, snail infestations may become more noticeable following rainfall, particularly in fields with abundant vegetation and undisturbed moist areas.

Host Crops and Nature of Damage

The Giant African Snail is highly polyphagous and has been reported to feed on more than 500 plant species. Important agricultural and horticultural crops susceptible to feeding include cotton, soybean, beans, cabbage, brinjal, okra, banana, papaya, pumpkin, cucumber and other vegetable crops. In Mancheria District, farmers have also reported snail-associated damage in maize fields, highlighting the need for field-level identification and monitoring. Damage in Cotton: Snails feed on tender leaves and other soft plant parts, producing irregular holes and damaged leaf margins. In young cotton plants, severe feeding may reduce leaf area, retard plant growth and affect crop establishment. Damage in Maize: In recently emerged maize crops, snails may feed on tender leaves and young seedlings. Feeding injuries may appear as irregular holes, ragged leaf margins and damage to soft plant tissues. Severe injury during early crop establishment may result in reduced plant population. Damage in Horticultural Crops: Snails may feed on leaves, stems, flowers and fruits of several vegetable and fruit crops. Heavy infestation can reduce marketable produce and adversely affect crop quality. Snail damage should be differentiated from injuries caused by caterpillars, beetles and other chewing pests. The presence of live snails, slime trails and characteristic feeding symptoms provides useful evidence for field diagnosis.

Integrated Snail Management Practices

Effective management of snails requires the integration of cultural, mechanical, trapping and, where legally permitted and necessary, chemical control methods. Reliance on a single practice is generally insufficient, particularly in areas where snail populations have become established.

1. Field Sanitation and Habitat Management

Field sanitation is one of the most important preventive measures for reducing snail infestation. Farmers should keep crop fields and bunds clean by removing excessive weeds, unnecessary crop residues and materials that provide shelter to snails. Moist and shaded hiding places should be regularly inspected, particularly following rainfall. Proper drainage

should be maintained to avoid prolonged water stagnation. Reducing favourable shelter and breeding locations can help suppress snail populations and facilitate early detection.

2. Use of Rough-Surface Materials as Physical Barriers

Rough-surface materials such as sawdust, groundnut shells and other coarse materials may be placed around vulnerable crop areas to discourage snail movement. These materials may act as temporary physical barriers by making movement across the surface difficult. However, their effectiveness may decrease after rainfall or when the materials become wet and compacted. Therefore, they should be regarded as supplementary measures rather than stand-alone control methods.

3. Attractant Baiting Using Toddy or Beer

Fermented materials such as toddy or beer may be used as attractants for collecting snails. Small containers containing the attractant may be placed at suitable locations where snail movement is observed. Snails attracted to these locations should be collected regularly and safely destroyed. The containers should be positioned carefully to avoid access by children, livestock and other non-target animals. This method may assist in reducing locally active snail populations when combined with other management practices.

4. Wet Gunny Bag Trapping

The wet gunny bag method is a simple and practical approach for attracting and collecting snails. Moistened gunny bags may be placed at selected locations in the field where snail activity is high. Snails tend to gather beneath these bags because they provide moisture, shade and shelter. The bags should be inspected regularly, preferably during the early morning, and the accumulated snails should be collected and destroyed. This method is particularly useful for early detection and mechanical removal of snails without directly applying pesticides to crops.

5. Collection and Safe Destruction of Snails

Manual collection is an important component of snail management, particularly during the initial stages of infestation. Farmers should collect snails from field bunds, moist locations, beneath crop residues and around affected plants. Protective gloves should be worn during handling. A method involving immersion of collected snails in a salt solution prepared using 4 kg of common salt in 10 litres of water has also been suggested for snail destruction. However, concentrated salt solutions should not be applied directly to agricultural soil or crops, as excessive salt accumulation may adversely affect soil properties and plant growth. Any disposal method should prevent contamination of soil and water resources and follow local guidance.

6. Copper Sulphate Application

Copper sulphate has been mentioned among materials used for suppressing snail populations. A concentration of 2 g per litre of water has been suggested in the supplied field advisory. However, this should not be treated as a validated recommendation for spraying cotton, maize or other crops without confirming its legal approval, crop safety and efficacy. Copper sulphate may cause phytotoxicity under certain conditions, and indiscriminate application may adversely affect soil organisms and aquatic ecosystems. Therefore, farmers should not undertake such applications without an approved crop-specific recommendation from the competent agricultural authorities.

7. Chemical Management Using Molluscicides

Chemical control may be considered where snail infestation is severe and other management practices are insufficient. Metaldehyde is one of the synthetic molluscicides reported to be effective against terrestrial snails. It acts by stimulating excessive mucus secretion, resulting in dehydration and eventual death of the snails. An application rate of 4 kg per acre has been mentioned in the supplied field advisory. However, the appropriate quantity depends on the concentration, formulation and registered label of the product. The stated rate should not be used as a general recommendation without verifying these details. Only products legally registered for the intended use should be applied, strictly according to approved label instructions.

Safety Precautions: Metaldehyde is hazardous to children, livestock, pets and non-target organisms. It should be handled carefully, and contamination of drinking water, fodder, irrigation channels and areas accessible to animals must be prevented. Other chemicals reported to have molluscicidal effects under experimental conditions should not automatically be recommended for agricultural field application without regulatory approval and crop-specific evidence.

8. Regular Field Monitoring

Regular monitoring is essential for early detection and timely management. Farmers should inspect field bunds, moist locations, crop surroundings and areas containing weeds or crop residues, particularly after rainfall. Monitoring during evening or early morning hours may help identify active snail populations. Early collection of snails and destruction of egg masses can reduce further multiplication and prevent the development of severe infestations. Farmers may also record the number of snails observed, crop growth stage, percentage of damaged plants and the extent of feeding injury to assess the severity of infestation and the effectiveness of management practices.

Preventing Spread to Neighbouring Villages

The recent reports of snail infestation in Nandulapalle village highlight the importance of preventing the movement of snails to other agricultural areas. Although snails can move naturally over short distances, long-distance spread may occur through the transportation of nursery plants, soil, agricultural machinery and other materials carrying snails or their eggs. Nursery plants obtained from outside areas should therefore be carefully inspected before planting. Soil attached to nursery plants and planting materials should be examined for snails and egg masses. Agricultural machinery and equipment used in infested fields should be inspected and cleaned before being moved to unaffected locations. Community-level coordination is particularly important because isolated management by individual farmers may not prevent reinfestation from neighbouring fields. Collective implementation of sanitation, monitoring, trapping and safe destruction practices can help reduce the risk of spread to surrounding villages.

Important Advisory to Farmers

Farmers are advised to inspect their fields regularly during the rainy season, especially after rainfall when snail activity is generally high. Particular attention should be given to newly established cotton and maize crops, where feeding damage to young plants may affect crop establishment. Snails should not be handled with bare hands because some terrestrial snail species may carry parasites of public-health importance. Hands should be washed thoroughly after field collection activities. Where severe infestation is observed, farmers should seek technical guidance from agricultural officers or scientists of the nearest Krishi Vigyan Kendra before undertaking chemical control.

Conclusion

Snail infestation is an emerging crop protection concern that requires timely attention, particularly in areas where favourable environmental conditions support rapid population multiplication. The occurrence of snail-associated crop damage reported in Nandulapalle village of Nennel Mandal, Mancherial District, emphasizes the need for early identification, preventive measures and coordinated management. If integrated management practices are neglected, snail populations may increase rapidly, resulting in further crop damage and possible spread to neighbouring villages. A combination of field sanitation, physical barriers, attractant traps, wet gunny bag trapping, manual collection, safe destruction, regular monitoring and judicious use of approved molluscicides offers a practical approach to snail management. Early detection, timely intervention and community participation are essential to prevent the establishment and further spread of invasive snails and to safeguard agricultural crop production.