

To resolve the farmers' problem, ICAR-NBAIR, Bengaluru has developed a slow-release nanogel pheromone formulation. This technology was validated in white grub endemic areas of Rajasthan.



Trap for attraction of beetles towards slow release pheromone formulations installed in the field

Aggregation pheromone of *H. consanguinea* has been immobilized in the matrix, forming a viscoelastic semi-solid mass. Whereas attractants are volatile in nature, they can be partially sequestered in nanogels. The nanogels have a matrix with remarkable mechanical strength and they can be handled and transported without refrigeration. The entangled fibrous network in the nanoscale range gives the gels sustained release properties that allows them to be used in agricultural lands for prolonged periods of time. The nanogels display high residual activity, as well as better efficiency, even during heavy rain. Their thermal stability allows their deployment in hot climate temperature. The nanofibrous gel samples are eco-friendly and the aggregation pheromone

immobilized in the matrix acts as an attractant for both the male and female adult beetles. The nanofibrous gels are reusable and recyclable. These products form non contact with food articles. This novel product is effective in causing the aggregation of beetles for upto one month, thereby saving the cost of daily loading septa. The cost of per sample is Rs 10 and is available at ICAR-NBAIR, Bengaluru and RARI, Jaipur. The catches of adult of white grubs per trap per day was upto 17.50.



Slow release pheromone formulations

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Slow release pheromone formulations for the management of *Holotrichia consanguinea* (Blanchard) - Laboratory to Market



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Groundnut (*Arachis hypogaea* L.), an important oilseed and supplementary food crop across the world is infested by more than 100 insect pests from planting to storage. The annual yield loss in groundnut due to insect pests is approximately 15 per cent i.e., 1.6 million tons of produce worth Rs 25,165 million. White grubs or root grubs are the soil inhabiting and root feeding immature stages of scarab beetles which are highly destructive in nature and belong to three sub-families; Melolonthinae, Rutelinae and Dynastinae of Scarabaeidae.



Larval population in groundnut field

Larval stages are more destructive as they feed mainly on the roots, and rootlets while adults are reported to feed on foliage of host trees like neem, *Acacia*, etc. White grubs are polyphagous in nature and feed on different cultivated crops such as groundnut, cereals, millets, pulses, vegetables and plantation crops besides some trees. The yield loss due to white grubs was reported to be as high as 100 per cent in certain crops and locations. They are also named as May-June beetles as they occur in these months, the diversity of these beetles

is high with 30,000 species worldwide. *Holotrichia serrata* and *Holotrichia consanguinea* are especially predominant and ubiquitous examples. The *Holotrichia* species has a single generation and the grubs thrive better in light soil, fibrous rooted plants and high particulate soil organic matter content.



Adult beetle of white grubs on host trees

Their population is at low in waterlogged, compacted, stony soils or lands lacking vegetation. In a majority of the farming situations, control of white grub has become difficult because of the lack of suitable management strategies. Pest management depends primarily on the use of highly poisonous chemical pesticides.



Damage by white grubs in groundnut field

Improper method is adopted during the use of chemical pesticide which is uneconomical and associated with environmental pollution and pesticide residues. Hence, there is a need for development of an alternate ecofriendly and economically feasible strategy for the management of white grubs. Among the several alternatives, use of pheromone for adult beetle management is found to be highly effective.



Larva of *Holotrichia consanguinea*

The aggregation pheromone of *H. consanguinea* was identified as methoxy benzene. The lure has been employed in the endemic areas of groundnut growing regions and proven to be effective in attracting the adult beetles. But the highly volatile nature of the chemical necessitates frequent application of the pheromone lures, which becomes laborious and cumbersome and practically not feasible for the farmers. There is a need for suitable dispensers, which are still not available, to alleviate frequent replacement of dispensers at nights, which is practically not feasible for the farmers.