



Environment-Friendly Management of *Allopeas clavulinum* (spike awl snail) by using Herbal Pesticide from *Cymbopogon jwarancusa*

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Abstract

Allopeas clavulinum, commonly known as the spike awl snail, is an invasive species that poses a significant threat to Ornamental plants, agricultural crops and ecosystems. Traditional chemical pesticides used for snail control have adverse effects on the environment and non-target organisms. Therefore, there is a growing need to explore environment-friendly alternatives for the management of spike awl snails. This research paper focuses on the potential of a herbal pesticide derived from *Cymbopogon jwarancusa*, a natural plant source, for effective and environmentally sustainable control of *Allopeas clavulinum*.

Keywords: *Allopeas clavulinum*, *Cymbopogon jwarancusa*, Herbal Pesticide.

Introduction

Invasive species can have devastating impacts on native ecosystems, and *Allopeas clavulinum* is no exception. *Allopeas clavulinum* syn. *Lamellaxis clavulinus* commonly called as spike awl snail (Bank R 2017) generally lives in garden soils, leaf litters and wetlands. These tiny molluscs generally heavily feed on seedling and saplings in garden nursery and agricultural fields and cause commercial damage. *Allopeas clavulinum* is also

a vector for parasitic helminthes such as the rat lung worm *Angiostrongylus cantonensis*, causal organism of CNS damaging disease 'eosinophilic meningitis (Yii CY 1976). This snail species is known to proliferate rapidly, leading to the displacement of native fauna and the destruction of crops.

Conventional chemical pesticides used to control snail populations have drawbacks, including residual toxicity and harmful effects on non-target

organisms (Ritter L. et. al. 1995). Therefore, alternative approaches using herbal pesticides have gained attention due to their potential effectiveness and environment friendly nature.

Cymbopogon jwarancusa, a grass species has been used for its various therapeutic properties. It is believed to possess antibacterial, antifungal, antispasmodic, and diuretic effects. It has been used to treat digestive disorders, fever, respiratory ailments, and as a general tonic. Pesticidal properties of *Cymbopogon* sp. were reported by the team of MDS Alves (Alves M.d.S. et. al. 2019). The presence of *Allopecurus clavulinum* is observed at its maximum in the summer months in the soil of departmental garden, but they are not observed near the plants of *Cymbopogon jwarancusa* in the garden. That was the reason to choose *Cymbopogon jwarancusa* as a herbal pesticide for the management of *Allopecurus clavulinum*.

Materials and Methods

Place and time of Study- All the experiments were carried out at the department of Zoology, M.L.K.P.G. College, Balrampur during April to June 2023 inside the insect proof chambers to avoid any unwanted insect pest.

Collection and preparation of *Cymbopogon jwarancusa* Extract: One kg of fresh plant material of *Cymbopogon jwarancusa* was collected from the M. L. K. College Garden. The plants were identified and authenticated. It was then cleaned, air-dried, cut into pieces and powdered for further processing using Soxhlet

apparatus. (Fig.-1,2,3 and 4) The powdered *Cymbopogon jwarancusa* was taken inside a thimble made with filter paper properly stapled with stapler pins. Added 100ml of water+ ethanol solvent (70+30 ratio) to the round-bottom flask. Placed the round-bottom flask to the heating mantle and started the heating process at 90°C. The solvent gradually heated up and vaporized, condensing in the condenser and then dripping back into the Soxhlet extractor, extracting the desired active compounds from the *Cymbopogon jwarancusa* plant Material. Allowed the extraction process to continue for 8 hours to ensure efficient extraction. Once the extraction process was completed, removed the round-bottom flask from the heating mantle and disconnected the apparatus. Filtered the extracted solution by passing it through a filter paper to remove any remaining plant material. Finally, stored the extracted *Cymbopogon jwarancusa* extract in a glass container, keeping it in a refrigerator to maintain its stability and potency.

Standardization of most suitable Concentration of herbal pesticide-The Soxhlet extracted *Cymbopogon jwarancusa* extract was now taken as 100percent concentrated solution. It may harm the plants as well as the soil if used in high concentration. Therefore, it was diluted by adding double distilled water to make it diluted in the potencies of 10%, 15 %, 20%, 25%, 30% and so on.

Now the different concentrations of *Cymbopogon jwarancusa* extracts were applied in the uppermost soil of 10 potted tomato plants. (Table-1)

Potted Tomato plant No.	Concentration of <i>C. jwarancusa</i> Extract in Percent (%)	Effect of herbal pesticide spray
1-	10	Snails unaffected, No adverse effect over plants
2-	15	Snails Partially died, No adverse effect over plants
3-	20	Snails died but recurrence after 15 days, No adverse effect over plants
4-	25	Snails died and no recurrence after 15 days, No adverse effect over plants
5-	30	Snails died and no recurrence after 15 days, yellow spots over Tomato plants occurred
6-	Control Plant	No Change



Fig.-1 showing *Cymbopogon jwarancusa* Plants powder

Fig.-2 Soxhlet Extraction of *C. jwarancusa* leaves



Fig.-3 Fresh Cut Leaves of *C. Jwarancusa*

Fig.-4 Cut and Dried Leaves of *C. Jwarancusa*

Results and Discussion

The extract of *Cymbopogon jwarancusa* in the concentration of 20 percent was lethal to the snails but most probably due to the eggs present in the soil, caused the recurrence of the *Allopeas clavulinum* populations after 15 days. The

concentrations below 20 percent were no fully effective to control the snail populations. The most effective concentration of *Cymbopogon jwarancusa* was found as its 25 percent concentration which caused total eradication of snails from the potted plant soil without any adverse effects over the potted tomato plants.

The extract of *Cymbopogon jwarancusa* in its 30 percent potency caused snails death with no recurrence after 15 days, but there were adverse effects in the form of yellow spots over potted Tomato plants occurred (Fig.-5 and 6).

It is now clear that the 25 percent extract of *Cymbopogon jwarancusa* may be used as an effective herbal pesticide against *Allopeas clavulinum*, an invasive spike awl snail. The use

of *Prosopis cineraria* herbal extracts for control of *Allopeas clavulinum* is also reported (Akanksha Tripathi- 2021) but the availability of *Prosopis cineraria* is restricted to only few regions of India and being a tree its vegetative growth is also very slow. The use of *Cymbopogon jwarancusa* extracts as soil treatment for the control of *Allopeas clavulinum* will be cost effective, environment friendly, easily available and sustainable approach.



Fig.-5 –Living *Allopeas clavulinum* in soil (5X) Fig.-6 –Dead *Allopeas clavulinum* after soil Treatment

Conclusion

The management of *Allopeas clavulinum*, an invasive spike awl snail, using environment-friendly approaches is of utmost importance to mitigate the ecological and agricultural impacts caused by this species. The use of a herbal pesticide derived from *Cymbopogon jwarancusa* demonstrated significant potential in controlling *Allopeas clavulinum* populations. The efficacy of the herbal pesticide, combined with its low environmental impact, suggests that it could be a valuable tool in integrated pest management strategies. Further research is warranted to optimize the formulation.

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