

## **Microencapsulation of clove oil to improve its usability as a pesticide**

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Clove oil (CO) displays many important bioactivities such as antimicrobial and antioxidant activity. It is also reported to possess significant insect repellent and insecticidal activity against several insect types and acts as a herbicide as well, by disrupting cell membrane integrity and inhibiting seedling growth of weeds. However, direct usage of CO as a pesticide in day-to-day life is restricted due to its strong odor, cytotoxicity and irritability. Microencapsulation can be used to overcome the above undesirable characteristics and obtain prolonged activity of CO. Therefore, CO microcapsules were synthesized using chitosan and gum arabic as wall materials.

The optical and scanning electron microscopic images indicated the formation of irregular shaped microcapsules in the 150-200  $\mu\text{M}$  range. The UV-visible analysis confirmed the successful encapsulation of CO with a 8  $\mu\text{L/g}$  loading. The synthesized microcapsules indicated a significant antibacterial activity against *Bacillus cereus* and *Escherichia coli*. Additionally, the CO microcapsules displayed significant mosquito repellent activity (MRA) against *Aedes aegypti* mosquitoes in an assay carried out using a static air repellent apparatus. The MRA was maintained from  $64\pm 4\%$  to  $28\pm 4\%$  during a 3 hour time period. CO microcapsules indicated a DPPH radical scavenging activity of  $30\pm 1\%$ . The synthesized CO microcapsules did not display any pungent odor as did the unencapsulated oil.

It can be concluded that CO can be successfully encapsulated with its original bioactivities being preserved while allowing the controlled release of CO, minimizing its toxic effects and pungent smell during direct usage.

**Keywords:** *microencapsulation, clove oil, chitosan, gum arabic, mosquito repellent*

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