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## Nanoparticles mediate dsRNA delivery to control the crop insect pest cotton boll weevil, *Anthonomus grandis*

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**Statement of the Problem:** In past decades chemical pesticides are gradually losing effectiveness against crop insect pests, as well as Bt crops. RNA interference (RNAi) came as an alternative to overcome this problem. This control method works well in some insects through dsRNA oral administration but is not very effective against others. Despite great efforts, however, some insects, such as cotton boll weevil (CBW), *Anthonomus grandis*, have gut nucleases that degrade dsRNAs, hampering dsRNA cell internalization and RNAi response. This study offers a strategy to increase dsRNA stability and enhance dsRNA cellular uptake using chitosan nanoparticles coated with a surfactant.

**Methodology & Theoretical Orientation:** The optimal proportion of dsRNA:chitosan:surfactant to form a self-assembling nanoparticle was established by dynamic light scattering (DLS), which also provides the nanoparticle size and cargo. It was verified the nanoparticle resistance to CBW's gut nucleases and then it was administered through oral delivery to CBW. The gene silencing was assessed by RT-qPCR. Nanoparticles were also dispersed on cotton leaves in order to analyze its wettability.

**Findings:** The dsRNA:chitosan:surfactant nanoparticle size is approximately 300nm with a positive charge of 25mV. The dsRNA coated with chitosan and surfactant is resistant to CBW's gut nuclease degradation, which improves gene silencing through dsRNA oral delivery. Also, the nanoparticle coated with surfactant spreads in a uniform way in cotton leaves, when compared to non-surfactant-coated nanoparticles.

**Conclusion & Significance:** There is a necessity for an environmentally friendly strategy to control crop insect pests and the use of dsRNA coupled with chitosan in order to form self-assembling nanoparticles came as a green approach. This method of control is very effective against CBW and can be exploited to greenhouses and possibly cotton fields, making the control of this insect sustainable and less expensive. This strategy can also be applied to other crop insect pests.

### Biography

Rayssa Garcia is a PhD student at the University of Brasilia, Brazil, in the program of Molecular Biology. She is under the orientation of Dr Maria Fátima Grossi-de-Sá at the Plant-Plague Molecular Interaction at Embrapa Genetic Resources and Biotechnology. Her master was focused on characterization and gene silencing of nucleases present in the gut of cotton boll weevil, *Anthonomus grandis*, an important crop insect pest. She also works with viroid-like dsRNAs that are known to improve gene silencing in different organisms. Now her studies focus on improving dsRNA stability and cellular uptake through the development of self-assembling nanoparticles, which are an environmentally friendly strategy to control crop insect pests and overcome dsRNA degradation by gut nucleases.

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