



2022 ESA, ESC, and ESBC Joint Annual Meeting  
 Entomology as Inspiration: Insects through art,  
 science, and culture  
 Vancouver, British Columbia, Canada  
 November 13-16



Réunion annuelle conjointe ESA, SEC, et SECB 2022  
 L'entomologie comme source d'inspiration :  
 Les insectes à travers l'art, la science et la culture  
 Vancouver, Colombie-Britannique, Canada  
 13-16 novembre



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Session: **PBT: Insecticides, Toxicology, and Resistance** (1:30 PM – 4:30 PM)

Sunday, November 13, 2022

1:30 PM – 1:42 PM

### Association of zein nanoparticles with botanical compounds for cattle tick control

Luis A. Anholeto – Postdoctoral fellow, Veterinary Parasitology / Department of Chemistry, Embrapa Southeastern Livestock / Acadia Univ...

Amanda Figueiredo – Departamento de Medicina Veterinária Preventiva e Reprodução Animal, Universidade Estadual Paulista Júlio de Me...

Diego Cola – Departamento de Engenharia Ambiental, Universidade Estadual Paulista Júlio de Mesquita Filho

Rafaela Fantatto – Departamento de Fármacos e Medicamentos, Universidade Estadual Paulista Júlio de Mesquita Filho

Yousmel Gainza – Departamento de Medicina Veterinária Preventiva e Reprodução Animal, Universidade Estadual Paulista Júlio de Mesqui...

Isabella Santos – Departamento de Medicina Veterinária Preventiva e Reprodução Animal, Universidade Estadual Paulista Júlio de Mesquit...

Leonardo Fraceto – Departamento de Engenharia Ambiental, Universidade Estadual Paulista Júlio de Mesquita Filho

N. Kirk Hillier – Professor, Department of Biology, Acadia University

Nicoletta Faraone – Assistant Professor, Department of Chemistry, Acadia University

Ana C. Chagas – Embrapa Southeastern Livestock

Cattle tick control has been limited by the resistance to synthetic acaricides. The use of nanotechnology and the association of synthetic acaricides with botanical compounds is important for the development of new products and as an alternative to improve the acaricidal effect of products against acaricide-resistance tick populations. Zein has been used in nanoformulations development due to its high coating capacity, biodegradability, and biocompatibility. Mixtures of botanical compounds citral, menthol, and limonene with cypermethrin (CYPE) and chlorpyrifos (CHLO) were encapsulated in zein nanoparticles (ZN) and tested against *Rhipicephalus microplus* ticks. The formulations were characterized by dynamic light scattering and nanoparticle tracking analysis. The diameter, polydispersion, zeta potential, concentration, and encapsulation efficiency for formulations 1 (ZN+CYPE+CHLO+citral), 2 (ZN+CYPE+CHLO+menthol), and 3 (ZN+CYPE+CHLO+limonene) were monitored for 120 days to check the stability of the formulations. The formulations showed high encapsulation efficiency (>96%), good physicochemical stability, and effective protection of the compounds against degradation. Formulations 1, 2 and 3 caused 100% mortality on tick larvae exposed to 0.233, 0.116 and 0.058 mg/mL, respectively. The commercial product Colosso® (cypermethrin, chlorpyrifos, and citronella oil: Ouro Fino Brazil) caused 100% mortality when tick larvae were exposed to 0.256 mg/mL. Even at lower concentrations, the nanoformulations maintained larvicidal effects. The LC<sub>50</sub> obtained were 0.014, 0.012, 0.012, and 0.032 mg/mL for formulations 1, 2, 3 and Colosso®, respectively. This nanotechnological formulation utilizing a combination of natural and synthetic products can be part of integrated management solutions for cattle tick control.

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