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Biodegradable nanoparticles as carrier in smart delivery of pesticides

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The efficacy of conventional pesticide application methods is limited due to loss by leaching, evaporation, and degradation. As much as 90% of the applied pesticide is estimated to be lost, which not only increases the cost of pest management but also leads to environmental pollution. Smart delivery systems using bio-degradable polymers offer several advantages viz., improved specificity, ease and safety in handling, and minimum ecological side effects. Nanoscale delivery system offer additional benefits like lower application rates and enhanced bioavailability owing to their huge surface area/volume ratio. In this perspective, a study has been undertaken to produce nanoparticles incorporated with pesticides as a smart delivery system. Imidacloprid, an insecticide and tebuconazole, a fungicide has been incorporated into poly (lactic-co-glycolic acid) [PLGA] biopolymer (Mw= 50.000 - 75.000 g mol⁻¹) and nanoparticles were produced by electro spraying process. The parameters of the electro spraying were optimised for getting uniform nanoparticles. PLGA @ 6.4 wt % in the acetonitrile incorporated with imidacloprid (10 mg mL⁻¹) and tebuconazole (0.4 mg mL⁻¹) produced uniform nanoparticles with the following parameters of electro spraying viz., needle size 25 G; feed rate of infusion pump @ 30 µl/min; voltage 15 kV and distance between electrodes 10 cm. The morphology of the biodegradable nanoparticles produced through electro spraying was observed by field emission scanning electron microscopy (FESEM). The size of particles ranged from 80nm to 120nm in diameter. The resultant smart delivery system of biodegradable nanoparticles was utilised as a successful seed treatment formulation in cotton and wheat.

Biography

K Rameash is a Senior Scientist (Entomology) at the National Bureau of Plant Genetic Resources - Regional Station, Hyderabad. His contributions are in the area of plant quarantine, biotic stress screening of plant germplasm, para-pheromones, biorational pest management and smart delivery of pesticides. He has authored over 30 research papers in reputed journals. He has been conferred with "Young Scientist Award" of International Consortium of Contemporary Biologists during 2013. He was a Visiting Scientist at Cornell University, USA during 2011. He is an editorial board member of the India Journal of Plant Protection.

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