

# Polymeric Nanoformulation of Thiamethoxam for Improved Bioefficacy and Reduced Dose

**Dhruba Jyoti Sarkar<sup>1</sup>, Jitendra Kumar<sup>2</sup>**

*Division of Agricultural Chemicals, Indian Agricultural Research Institute, New Delhi-12*

---

## ABSTRACT

Thiamethoxam is a systemic insecticide used as seed treatment and foliar application for controlling several pests in different crops. Commercial formulations of thiamethoxam promote instantaneous release of *a.i.* after application and one of the major metabolite of thiamethoxam in soil is clothianidin which is moderately toxic to small mammals and highly toxic to honey bees. Thus to minimize repeated application and harmful effects on the environment, controlled release nanoformulations of thiamethoxam are developed using amphiphilic copolymers, synthesized from poly(ethylene glycols) and organic diacids, which self assemble into nano micellar aggregates in aqueous media. Release kinetics study of developed nanoformulation in soil showed controlled release behaviour with both non-Fickian diffusion and super case II transport mechanism ( $0.43 < n < 0.85$ ,  $n > 0.85$ ). The developed nanoformulations were coated on soybean seed and evaluated in field condition for bioefficacy against white fly (*Bemisia tabaci* G.). The developed nanoformulations of thiamethoxam gave significantly better control of white fly, which transmit Yellow Mosaic Virus (YMV) and improved yield as compare to commercial formulation and control. The residues of thiamethoxam in seed and soil after harvest were analysed and found below the detection limit ( $0.25 \mu\text{g mL}^{-1}$ ).