Nanoclay Composites as Agrochemical Carriers

Maheshika Perera, L. Jayarathna, D. M. D. Yakandawala, and S. Seneweera

Abstract Agricultural production systems are facing major challenges as a result of rapid urbanization and extreme climate events. There are various accessible gears in current science to circumvent these limitations. Advanced nanotechnology can be used for achieving food security while improving soil fertility, crop productivity, and maintaining the sustainability of our agriculture system. The use of nanocarriers in agriculture sector such as nanofertilizers, nanopesticides, and nanoherbicides is instrumental for improvement in crop productivity. However, there is a significant opportunity to use nanomaterials in agriculture to increase crop performance. In addition, nanocarrier materials, which have been precisely engineered, play a major role in facilitating targeted delivery. There are numerous nanocarriers used in agriculture such as metal nanoparticles, carbon nanotubes, graphene and graphene oxides, polymers, nanoclays, lipids, and. Among those nanocarriers nanoclay plays a very specific role in agrochemical delivery. The fundamental rationale for such specialized delivery qualities is due to the unique properties of the materials, such as low cost, nontoxicity, natural abundance, correct compatibility, and intermolecular forces, which in long-term help to develop continuous release of inactive ingredient. Overall, this chapter will discuss the underlying process of nanomaterials-based active ingredient release mechanisms related to a variety of plant applications.

Keywords Nanoclay · Nanofertilizers · Nanoherbicides · Nanopesticides · Agriculture

M. Perera (✉) · L. Jayarathna
National Institute of Fundamental Studies, Kandy, Sri Lanka
e-mail: maheshikapavithra@gmail.com

D. M. D. Yakandawala
Department of Botany, University of Peradeniya, Peradeniya, Sri Lanka

S. Seneweera
University of Melbourne, Melbourne, Australia

543