

Nanoformulations for Sustainable Agriculture and Environmental Risk Mitigation

Edited by Zeba Khan
and Nicoleta Anca Şuţan

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7 Role and Application of Nanosensors in Crop Protection for Disease Identification

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Abstract

Crop diseases can lead to economic loss, at the same time raising health concerns for the final consumers. In this area, the development of materials and, in recent decades, nanomaterials, can provide important contributions to avoid both economic losses and health-related problems. In this chapter, the main types of diseases affecting some major crops (including food, horticultural, and floriculture crops), as well as the modern nanosensors developed for their identification are discussed. Some of the latest developments and future development perspectives are also presented.

Keywords: crop diseases, fruit crops, floriculture crops, nanomaterials, nanosensors

7.1 Introduction

In recent years, the impact of climate change has grown rapidly. It is an important factor in all stages of crop development and forces farmers to change and adapt their actions. Farmers need to look for new management strategies to make their agricultural work both ecologically and economically viable, with an emphasis on a return on investment. Given the complex interactions between the plant, soil, and environment, the prediction of diseases that can affect plants and also the optimal time for the application of

fungicides is essential. With a well-thought-out approach, farmers can increase crop yields with a lower impact on the environment, while maintaining a high quality of the final agricultural products (Ungureanu *et al.*, 2019).

The presence of three factors is decisive in the occurrence of a disease: (i) an unprotected host; (ii) a favourable environment; and (iii) the presence of the pathogen. Thus, the pathogen must come into contact with an unprotected host plant under favourable environmental conditions all at the same time for the disease to occur (Scholthof, 2007). The severity with

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