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Nanoagrosomes: Future prospects in the management of drug resistance for sustainable agriculture☆

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ABSTRACT

Agriculture plays a crucial role in sustaining the global population with food safety and security. The inadequacy of current agrochemicals in effectively controlling microbial infestations necessitates immediate attention. The over usage of agrochemicals has posed significant threat to agriculture by hampering the crop productivity, increased disease outbreaks and spread resistant microorganisms. This review addresses the pressing issue of drug-resistant microbial pathogens and their detrimental impact on the agricultural system. The use of nanoagrosomes has gained significant attention as a potential solution for combating drug-resistant pathogens due to their unique physicochemical properties, which can be tailored to target specific activities. A diverse of nanoagrosomes is widely practiced to attenuate specific roles which has been outline in the review. It also shed light on their effectiveness in combating drug-resistant pathogens and their role in promoting agricultural sustainability by expanding scientific understanding of nanoagrosomes as a future prospect for management of drug resistance.

1. Introduction

In recent years, advanced scientific domains have emerged, unleashing technological advancements in all aspects of life (Dragan et al., 2018; Singh et al., 2021). The agriculture sector has been revolutionized by numerous scientific research endeavors aimed at improving existing technologies (Rose et al., 2021). In order to contribute to scientific knowledge, nanotechnologies have been developed to design and create scientific tools that are gaining increasing interest in daily life (Grumezescu abd Holban, 2020). In agriculture, the application of nanomaterials at the ultramolecular level has demonstrated numerous potential uses (Tuantranont et al., 2021). The physicochemical properties of these nanomaterials suggest untapped mechanisms that can be tailored and manipulated to attenuate specific activities (Deng et al., 2022; Nadar et al., 2021). This can be achieved efficiently since their exuberant magnetic properties are coupled with plasmonic and optical characteristics, leading to the quantum confinement of atoms (Baig et al., 2021; Deb, 2021). Furthermore, their size-dependent properties provide a larger surface area in comparison to bulk materials of the same composition (Pabari, 2022). These unique properties are well documented, with an increasing number of articles exploring their potential applications. As a result, nanomaterials represent one of the most reliable and excellent platforms for developing advanced scientific tools that are more compatible (Saleh, 2020; Khan et al., 2019). In agriculture, there is a high demand for nano-based technologies to produce food commodities and meet the needs of the growing world population (Zhao et al., 2020). The farming communities face a range of challenges from sowing to harvest and post-harvest processes which must be addressed precisely (Usman et al., 2020; Bratovcic et al., 2021).

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