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Nanomaterials on Growth and Development of Horticultural Crops

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SUMMARY

Nanotechnology is a revolution in modern agriculture for facilitating sustainable agricultural production. It also has tremendous potential in agriculture, where several types of nanomaterials are employed to boost produce production and quality while reducing post-harvest spoiling of fruits and vegetables. Nanotechnology uses the potential of nanoparticles and their distribution techniques to boost horticulture crop yield. They limit the usage of chemical fertilisers and pesticides. Nanomaterials are simple, cost-effective, and environmentally benign, allowing them to be manufactured in a short period of time with minimal effort and without harming the environment. Nanotechnology increases the shelf life of horticulture fruits, vegetables, and cut flowers. Nanosensors are used to detect pesticide residue, monitor soil moisture, assess nutritional requirements, and diagnose crop pests.

INTRODUCTION

Nanotechnology has great promise for increasing agricultural output and so assisting future food security. Maintaining quality and preventing rotting of harvested fruits and vegetables is a difficult issue in horticulture. Various nanomaterials have demonstrated significant promise for increasing production, extending shelf life, minimising post-harvest damage, and improving crop quality. Antimicrobial nanomaterials, such as nanofilms on harvested items and/or packaging materials, are appropriate for storing and transporting vegetables and fruits. Nanomaterials extend the life of cut flowers as well. Nanofertilizers are very efficient in increasing vegetative growth, pollination, and fertility in flowers, resulting in higher yield and product quality for fruit trees and vegetables. Nanopesticides are very efficient, target-specific. Nanosensors provide real-time monitoring of crop plant development, plant disease, and insect assault in the field. These innovative sensors are utilised to precisely determine soil moisture, humidity, agricultural pest populations, pesticide residues, and nutritional needs. This study intended to offer an update on current advancements in nanomaterials and their prospective applications for increasing productivity, product quality, control of insect and reducing postharvest losses in horticulture crops.

Nanomaterials Application:

Nanoparticles are macromolecular colloidal particles that are solid colloidal particles. Nanoparticles entrap, dissolve, encapsulate, or absorb active components such as bioactive compounds or therapeutic molecules. Nano fertilisers are low-cost, environmentally friendly inputs that enable extremely efficient plant feeding and, as a result, boost crop output. Nano fertilisers provide nutrients to agricultural plants in three ways. (i) the nutrient can be coated by nanoparticles in the form of nanoporous materials or nanotubes; (ii) wrapped in a thin polymer defence layer; and (iii) given as an emulsion or nanoscale particles. Nanofertilizers are slowly, precisely, and effectively distributed to plants (Singh et al., 2017). ZnO nanoparticles, for example, increase peanut production (Arachishypogaea). Similarly, the use of SiO2 nanoparticles increases plant biomass as well as the concentration of biomolecules such as chlorophyll, proteins, and phenols in maize grains. Carbon nanotubes at low concentrations improve hexaploidy wheat root growth, mustard (Brassica juncea) seed germination and seedling growth, black gramme (Phaseolusmungo), rice (Oryza sativa), and tobacco (Nicotianatabacum) cell growth (16 percent increase). The application of TiO2 and SiO2 nanomaterials increases nitrate reductase activity and appears to accelerate soybean seed germination and seedling growth. The use of nanomaterials, like that of field crops, encourages the growth and development of horticulture crops. Nanofertilizers are employed in horticulture to boost vegetative growth, pollination, and floral fertility, resulting in greater yield and improved product quality for fruit trees. Exogenous nano-Ca supplementation on blueberries under salt stress conditions increases vegetative development and chlorophyll content in the leaf. Similarly, nano-boron spray on mango tree leaves increases overall yield and chemical properties of fruits, which is likely to be linked to the enhancement of chlorophyll and essential nutrient elements in the leaves, such as nitrogen (N), phosphorus (P), potassium (K), manganese (Mn), magnesium (Mg), boron (B), zinc (Zn), and iron (Fe).Spraying mango trees with nano-zinc increases fruit weight, fruit quantity and yield, leaf chlorophyll and carotene content, and concentrations of numerous nutritional components such as N, P, K, and Zn. Similarly, the use of nano-boron and nano-zinc fertilisers enhances fruit quality, increases fruit quantity, the ratio of total soluble sugars (TSS) and maturity index, total sugars, and total phenols in pomegranates.

Disadvantages:

However, incorrect usage of nanomaterials will be detrimental to crop plants and the environment. As a result, research-based correct usage of nanomaterials is required for reducing post-harvest spoiling of horticulture crops and improving food quality production.

CONCLUSION

Finally, it is proved that extensive use of nanotechnology will considerably improve growth, increase yields, lower production costs and post-harvest losses by preserving good quality and also by increasing storage duration of fresh and processed fruits and vegetables. The availability of usable nanoparticles and field application safety evaluations are required to provide food and nutritional security for the world's ever-increasing population in a changing climatic scenario. Increased use of nanotechnology will result in climate-smart horticulture, reduced post-harvest losses, and improved overall crop quality.

REFERENCES

Singh, MD (2017). Nano-fertilizers is a new way to increase nutrients use efficiency in crop production. *International Journal of Agriculture Sciences*, ISSN:0975-3710.