



**Tikrit University
College of Veterinary Medicine.**

Reem.S.Najm 2025/4/22

Subject name: Special Material\Nano

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Lect.9.**Applications of Nanotechnology in plant****Introduction**

Nanotechnology involves manipulating materials on an atomic or molecular scale, and it has significant potential in agriculture and plant science.

This lecture explores various applications of nanotechnology in enhancing plant growth, disease resistance, and overall agricultural productivity.

This field has gained momentum due to its potential to revolutionize various sectors, including agriculture.

1-Nanoparticles for Nutrient Delivery

Enhanced Nutrient Absorption: Nanoparticles can improve the efficiency of nutrient delivery systems, allowing plants to absorb essential elements like nitrogen, phosphorus, and potassium more efficiently.

Controlled Release: Nanotechnology enables the development of slow-release fertilizers that minimize nutrient loss and reduce environmental impacts.

Nanotechnology can improve the efficiency of nutrient delivery to plants.

2. Pest and Disease Management

Nano-pesticides: These are formulated to target pests specifically, reducing the quantity of chemicals needed and minimizing harm to beneficial organisms.

Lect.9.

Disease Detection: Nano sensors can detect pathogens at an early stage, allowing for timely interventions and reducing crop losses.

3-Plant Growth Enhancement .

Stimulating Growth: Certain nanoparticles, such as silicon and zinc oxide, have been shown to enhance plant growth and improve stress tolerance.

Improving Photosynthesis: Nanomaterials can enhance light absorption and increase the efficiency of photosynthesis in plants.

4-Soil Remediation .

Contaminant Removal: Nanotechnology can be used to develop materials that remediate contaminated soils, improving soil health and fertility for better plant growth.

This process contributes to:

Improved soil health

Enhanced agricultural productivity

Sustainable farming practices

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Lect 9.

5- Genetic Engineering

Gene Delivery Systems: Nanocarriers can facilitate the delivery of genetic materials into plant cells, enhancing the development of genetically modified crops with desirable traits.

6-Water Management .

Nanotechnology in Irrigation: Nano-enabled materials can improve water retention in soil and reduce water wastage in agriculture.

Assistant professor Dr. Reem.S.Najm 2023/4/22