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Nano-pesticides, Nano-fertilizers and Nano-sensors

LECTURE NO :14



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14.1 Nano-pesticides

- Nano-pesticides are defined as any formulation that includes elements of nm size range and/or claims novel properties associated with these small size range
- The major aim in the development of nano-pesticides is to lessen the environmental hazards of a pesticide active ingredient through improving the efficacy of a chemical



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14.2 Formulations of Nano-pesticides:

- Nano-pesticides are formulated according to their intended purpose as formulations improving solubility, slow release of active ingredients, prevent degradation etc.
- Some foremost nano-formulations are:
- **Nano-emulsions:** In this formulation active ingredient of the chemical is dispersed as nanosized droplets in water, with surfactant molecules confined at the pesticide-water interface



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14.3 CONTD

- **Nano-suspension:** Nano-suspensions, also termed as nano-dispersions, are formulated by dispersing the pesticide as solid nanosized particles in aqueous media
- **Polymer based nano-particles:** Polymer-based pesticide nanocarriers are majorly deployed in the slow and controlled release of active ingredients to the target site
- **Nano-encapsulation:** This confines the hydrophobic or hydrophilic active ingredient, surrounded by a polymer coating or membrane.



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- **Nano-encapsulation:** This confines the hydrophobic or hydrophilic active ingredient, surrounded by a polymer coating or membrane.
- **Nanospheres:** These are homogeneous vesicular structures, in which the bioactive ingredient is uniformly dispersed throughout the polymer matrix.
- **Nanogels:** These are also known also hydrogel nanoparticles. These are formulated by cross linking of polymeric particles having hydrophilic groups.



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14.5 Advantages of Nano-pesticides:

- Improved solubility of active ingredients
- Better stability of formulation
- Slow release of active ingredient
- Improved mobility
- Higher surface area
- Uniform leaf coverage
- Improve pesticide utilization



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14.6 Nano-fertilizers

- Nano-fertilizers are nutrient carriers of Nano-dimensions capable of holding bountiful of nutrient ions due to their high surface area and release it slowly and steadily that commensurate with crop demand.
- Types of nano devices available are:
- Nano-porous zeolites
- Controlled release nano fertilizers



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14.7 Nano-sensors

- Nano-sensors are any biological, chemical or surgical sensory points used to convey information about nanoparticles to the macroscopic world.



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- Different types include
- Sensors using semi-conductor nanowire detection elements
- Semi-conducting carbon nano tubes
- Carbon nanotubes and nanowires detect bacteria and viruses
- Nanocantilevers



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THANK YOU