

**THE EFFECTS OF SILVER NANOPARTICLES ON SEED GERMINATION  
AND SEEDLING GROWTH**

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## **ABSTRACT**

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Silver nanoparticles have various applications in various fields. Silver nanoparticles positive role in the environment, especially in plant ecosystem, is extensively studied nowadays. Among the metal nanoparticles, the silver nanoparticles (AgNP) are receiving special attention because of their ability to increase the growth and yield in many crops. During this overview, there are many methods of synthesizing silver nanoparticles discussed, including chemical, bacterial-induced, fungal-derived and plant-mediated synthesis. Silver nanoparticles possess unique properties which find myriad applications such as antimicrobial and anticancer activities. It was concluded that cautious and sensible use of nanotechnology can warrant food security through boosting agricultural production. Although many studies are found containing toxic effects of AgNPs the perspective of the present review is to collect the information about their positive role in growth and yield enhancement of crops. This review is aimed at providing an insight into the syntheses of silver nanoparticles, its significant applications in various fields, and characterization techniques involved.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Study

Agriculture is considered as the foundation of human civilization. Without the help of agriculture sector, basic needs of human such as food, medicine, shelter and clothing cannot be provided. There is an increasing demand of basic needs due to rapidly expanding population. Therefore, it is one of our top priority to invest in exploring the knowledge that can expand the agricultural technology to produce crops efficiently.

A technology-based farming or 'smart farming' has been adopted in the agriculture sector which was developed to enhance crop production as to supply sufficient nutritional diets of growing population, under uncertain climatic extreme condition, water supply scarcity, in limited and degraded land area, as well as changes in natural biodiversity. Nanotechnology is one of the frontier technologies that is needed to be explored in order to address the aforementioned problems by fabricating smart ways in promoting crop productivity is developed while securing the safety of the environment and higher usage efficiency.