

## SIIC055

### Synthesis, Characterization, Toxicity of Silver Nanoparticles Reduced by Ethanol Extract of Beijing Grass

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#### **Abstract:**

Recently, with arising concern in regards with some drawbacks from chemical and physical methods to synthesize silver nanoparticles (AgNPs), plant mediated silver nanoparticles (AgNPs) have garnered such a considerable attention from many researchers due to its beneficial approach that are environmental in nature as well as the attractiveness of its cost-cutting approach in which the established method from chemical and physical are pale in comparison to biological approach. In this present study, the ethanol extract of Beijing Grass will acts as bio-reducing agent for the synthesis of AgNPs where the setting parameter such as concentration and volume ratio in this research to find the optimized parameter for BGE-AgNPs. The optimized parameter are set up from 0.5 mM to 5.0 mM with volume ratio AgNO<sub>3</sub> from 9:1 and 5:5. The as-synthesized AgNPs are then characterized using UV-Vis Spectroscopy in the range of 400 nm - 800 nm. The results showed a successful synthesized via biological approach utilizing the parameter mentioned, where basing on the UV-Vis absorption spectra, a distinguishable peak at 469 nm for optimized concentration of 2 mM silver ion (Ag<sup>+</sup>) and at volume ratio 9:1 are observed. Next, a schematic review highlighting on in-vitro cytotoxicity effect of aquatic species are conducted as the concern of rapid proliferation of AgNPs aligned to exponential growth of increasing demand in many industries could potentially be a risk if release to environment.

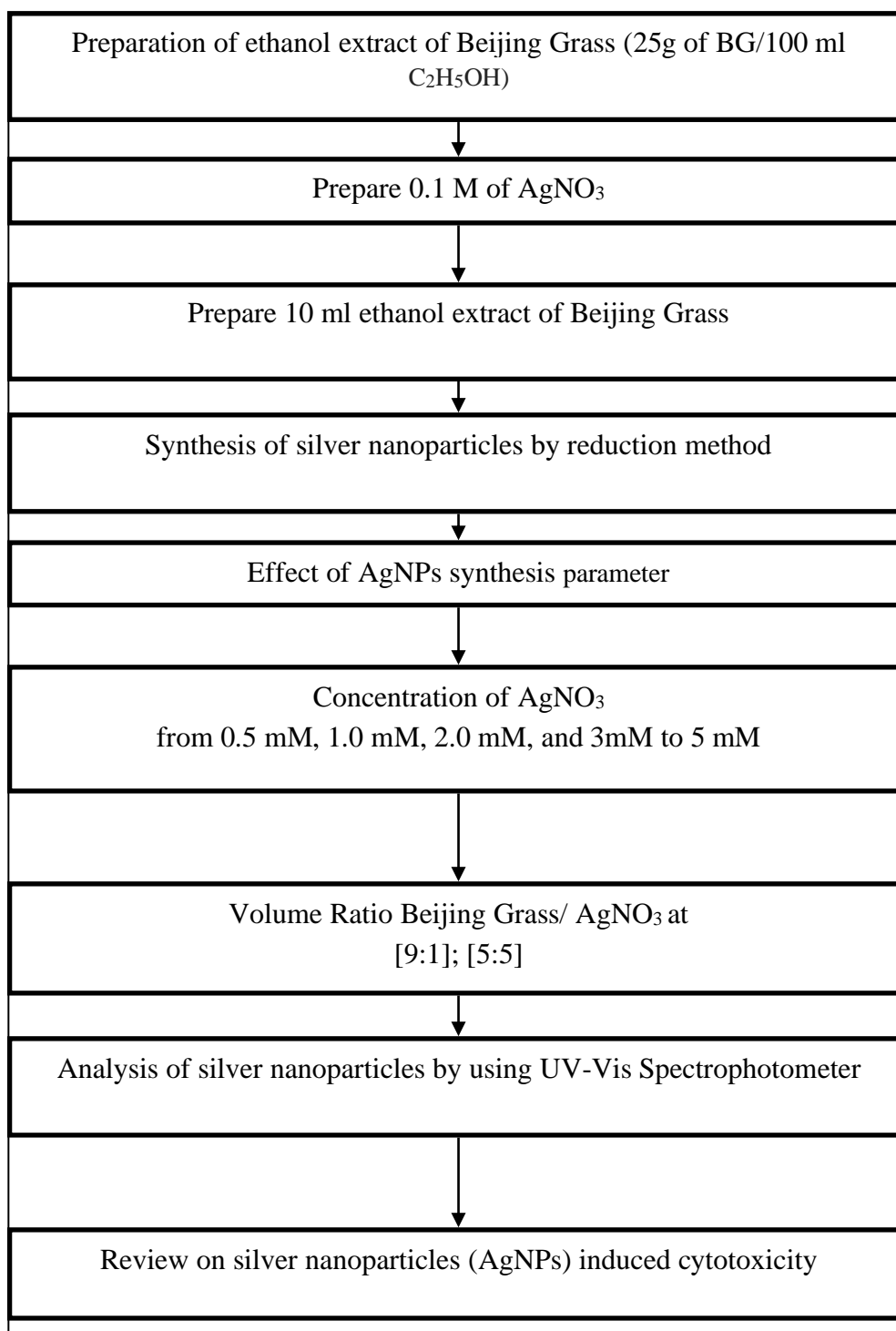
#### **Keywords:**

Silver nanoparticles; in-vitro; Cytotoxicity; Aquatic

#### **Objectives:**

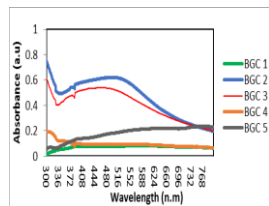
- i. To synthesize the silver nanoparticles (AgNPs) using ethanol leaf extract of Beijing Grass.
- ii. To analyze the synthesized silver nanoparticles by using UV-Vis Spectroscopy.
- iii. To present a systematic review on an in-vitro cytotoxicity induced silver nanoparticles (AgNPs) to aquatic life.

#### **Methodology:**



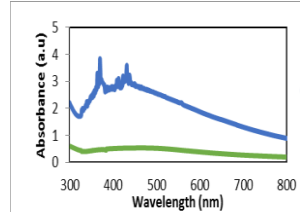
**Results:**

**The UV-Vis spectra at varied concentration**



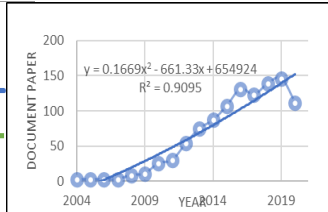
**The UV-Vis spectra at varied concentration**

**The UV-Vis spectra at varied volume ratio**

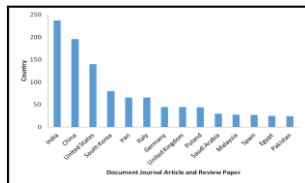
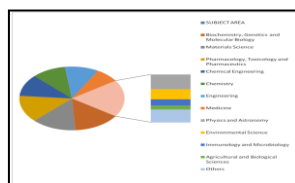
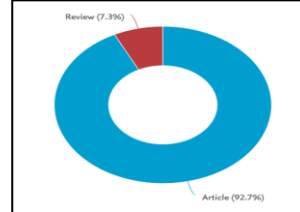


**The UV-Vis spectra at varied volume ratio**

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**In-vitro cytotoxicity of silver nanoparticles on the aquatic life**

Type of aquatic cells/organism	AgNPs size	Time of exposure	Concentration	Cytotoxicity Assessment	Finding	Reference
Mussel hemocytes	5.08±2.03 nm.	24 hours.	0.00001 mgAg/L -100 mgAg/L	MTT assays	AgNPs displayed potent cytotoxicity in Mussel hemocytes exposed <i>in vitro</i> starting from 1 mgAg/L	[40]
<i>R. subcapitata</i> , <i>D. magna</i> and <i>L. variegatus</i>	29.57±4.83 nm.	up to 96 hours	0.001 mgAg/L -5 mgAg/L	OECD guideline for chemical testing (202, 225, And 201)	AgNPs tested in each aquatic organism displayed potent toxicity compared to other NPs	[41]
Mussel hemocytes and gill cells	20 nm, 40 nm, and 100 nm	24 hours	0.001 mgAg/L -100 mgAg/L	Neutral Red (NR), and MTT assays	Maltose-AgNPs induced size-dependent cytotoxicity	[42]
<i>C. catla</i> heart cell line (SICH), Indian <i>C. catla</i> gill cell line (ICG), <i>L. rohita</i> gill cell line (LRG)	40 nm-60 nm	24 hours	2 µg/mL - 64 µg/mL	Neutral Red (NR), and MTT assays	AgNPs displayed a dose-dependent cytotoxicity. ICG cell line is more sensitive to AgNPs followed by SICH and LRG cell line	[36]
Goldfish	10 nm, 4 nm, and 2.8 nm	24 hours	25 µg/mL and 100 µg/mL	XTT Assay	AgNPs induced size-dependent cytotoxicity	[39]

**Conclusion:**

Silver Nanoparticles is a promising technology and green synthesis as an alternative route breath a new fresh air in nanomaterials and nanobiotechnology studies. Providing a less expensive, eco-friendly, efficient, simple, and discouraging of using toxic chemicals make the green synthesis using ethanolic Beijing Grass extract an interesting option to synthesize a benign silver nanoparticle. In the present work, AgNPs are successfully synthesized via biological method using two different parameters: a) AgNO<sub>3</sub> concentration, b) Volume ratio of ethanolic Beijing Grass extract to AgNO<sub>3</sub>. Based on the UV-Visible analysis techniques, the distinguishable peak at about 469 nm at optimum concentration of 2 mM silver ion (Ag<sup>+</sup>) and volume ratio of 9:1 A visual observation in colour change from colourless solution to almost dark brown are related to existences of metallic silver nanoparticles. Next, a comprehensive review highlighting on *in-vitro* cytotoxicity effect on aquatic organisms are done since despite a wide application of AgNPs, little research has been conducted on their impacts. Based on SCOPUS data, six (6) publications available on *in-vitro* silver nanoparticles toxicity. Referring to these studies, there are still not enough documented paper to get a more tangible conclusion on the idea of *in-vitro* cytotoxicity towards aquatic life and the mechanism behind it. Therefore, conclusion can be drawn from these limited studies showed that cytotoxicity of AgNPs, documented *in-vitro* studies in aquatic animal cell lines, are rule by such as dose, size, and cell type.