



# TO EVALUATE THE EFFICACY OF GREEN SYNTHESIZED NANOTIZED *KRIMIGHNA GANA* PLANT EXTRACTS USING SILVER NANOPARTICLES BY CHECKING ITS ANTIMICROBIAL POTENCY FOR TOPICAL APPLICATION.

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## Abstract:

In Ayurveda, there are two primary methods of medicine administration *Antah-Parimarjan* (~internal cleansing) & *Bahi- Parimarjana* (~internal cleansing). *Lepa* (A paste of herbs application over affected part) is one of the *Bahi-Parimarjan Chikitsa*. We possess precise knowledge of the effects of *Krimighna Gana* (10 drugs used against macrobes and microbes) plants, as described in classical Ayurvedic texts. In this experimental study, the efficacy of *Krimighna Gana Mahakashaya Lepa* (a topical application) is assessed by turning it into nanoparticles and examining its antibacterial strength. over the last decade, we have witnessed transformative changes in the field of nanotechnology. Integration of Ayurveda and nanotechnology may provide the best medicines to treat various life-threatening diseases<sup>i</sup>. The amalgamation of Ayurveda and nanotechnology has the potential to yield optimal pharmaceutical solutions for a wide range of life-threatening ailments. Utilizing nanocarriers to administer Ayurvedic medications and formulations will enhance their efficacy in treating various chronic illnesses. Nanotechnology is an emerging technology that is poised to revolutionize the production process of many items. It is a pioneering scientific field that has recently emerged. Additionally, it can contribute to heightened efficacy and safety concerns linked to medications. These formulations can increase bioavailability and stability, as well as minimize the dose of various potent drugs<sup>ii</sup> In the past ten years, researchers have displayed increased interest in this topic. There is a pressing want for a methodical examination of Herbal Nano Medicines for Ayurvedic formulations. Silver nanoparticles (AgNPs) have been proven to possess good antimicrobial activity. Green synthesis of AgNPs has been reported as safe, low cost and ecofriendly<sup>iii</sup> Research has demonstrated that silver nanoparticles (AgNPs) exhibit effective antibacterial properties. The process of synthesizing AgNPs using green methods has been documented as being safe, cost-effective, and environmentally beneficial. Considering this backdrop, we chose the issue of researching the conversion of *Krimighna gana* plant extracts into nanoparticles. This study showcases the effectiveness of silver nanoparticles manufactured by green methods, employing nanotized *Krimighna gana* plant extracts. The study evaluates the antibacterial strength of these nanoparticles for potential usage in topical applications. This work has the potential to contribute to future progress in the field of Ayurvedic medicines.

**Keywords:** Ayurveda, Antimicrobial Potency, *Krimighna Gana*, Experimental Study, Nanotechnology.

## OBJECTIVES

1. Synthesis of nanoparticles from *Krimighana gana* plant extracts.
2. Characterization of synthesized nanoparticles by UV- Visible spectroscopy, FTIR.
3. Analysis of antimicrobial potential of *Krimighna gana* plant extracts and synthesized nanoparticles.

## METHODOLOGY

**Type of Study:** Experimental

**Study Centre:** RK University Ayurvedic College & Microbiology Department of School of Science, RK University

### Collection of Drugs: Procurement of Raw Drugs:

*Shigru Phala* (Fruit of *Moringa oleifera* Linn.) and *Nirgundi Patra* (Iraves of *Vitex negundo* Linn.) were collected from Herbal garden of (RK University Ayurvedic College and Hospital).

*Vidanga* (*Embelia ribes* Burn.F.), *Gokshura* (*Tribulus terrestris* Linn.) and *Marich* (*Piper nigrum* Linn.) purchased from market.



*Shigru (Moringa oleifera* Linn.)



*Nirgundi (Vitex negundo* Linn.)



*Vidanga (Embelia ribes* Burn F.)    *Gokshura (Tribulus terrestris* Linn.)    *Marich (Piper nigrum* Linn.)



**Identification of Plants: Done from Saurashtra University**

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Date: 25/05/2023

To  
The Principal,  
RK University Ayurvedic College and Hospital  
Rajkot  
Gujarat.

Kindly refer to your letter ACH/23/05/28 dated 12-05-2023 for identification of given Specimens by Mr. Ghadiya Jaivik have been confirmed and identified as given below.

Sl No	Sample received as	Part	Sample identified as	Remarks
1.	<i>Embelia ribes</i> Burn.F.	Seed	<i>Embelia ribes</i> F	All samples are O.K.
2.	<i>Moringa oleifera</i> Linn.	Seed	<i>Moringa oleifera</i> Linn.	
3.	<i>Vitex negundo</i> Linn.	Leaf	<i>Vitex negundo</i> Linn.	
4.	<i>Piper nigrum</i> Linn.	Seed	<i>Piper nigrum</i> Linn.	
5.	<i>Tribulus terrestris</i> Linn.	Fruit	<i>Tribulus terrestris</i> Linn.	

With regards

Dr. V. S. Thaker  
Prof & Programme Coordinator  
Plant Biotechnology & Genetic Engineering Lab  
Department of Biosciences  
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**Preparation of plant extracts:**

Standardized *Krimighna gana* plants; *Shigru* (*Moringa oleifera* Linn.), *Maricha* (*Piper nigrum* Linn.), *Vidang* (*Embelia ribes* Burn.F.), *Nirgundi* (*Vitex negundo* Linn.), *Gokshura* (*Tribulus terrestris* Linn.), *choornas* were taken.

Each choornas were taken in 2gm quantity and 100 ml distilled water was taken. The aqueous plant extract was made by boiling it for 30 minutes at 100° C. Then it was filtered using Whatman Filter paper no. 1 and the filtrate was stored for further use.

**Green synthesis of Nanoparticles:**

The silver nanoparticles were synthesized by sol-gel method.

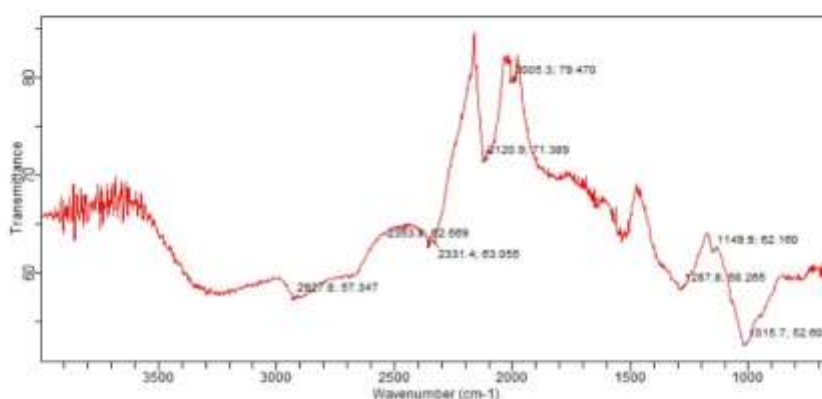
300 ml distilled water was taken and 5.07 gm Silver Nitrate (AgNO<sub>3</sub>) was dissolved into it to make 0.1 M solution of Silver Nitrate (AgNO<sub>3</sub>). Then it was placed on magnetic stirrer and little by little 15 ml Plant extract was added into Silver Nitrate (AgNO<sub>3</sub>) solution. It was kept on stirrer for 4 hours at 70° Celsius. Then the synthesized nanoparticles were cooled down and stored for further use.

The colourless solution was turned out to brown colour. It indicates the formation of nanoparticles<sup>iv</sup>



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 Sample Scans:8  
 Background Scans:8  
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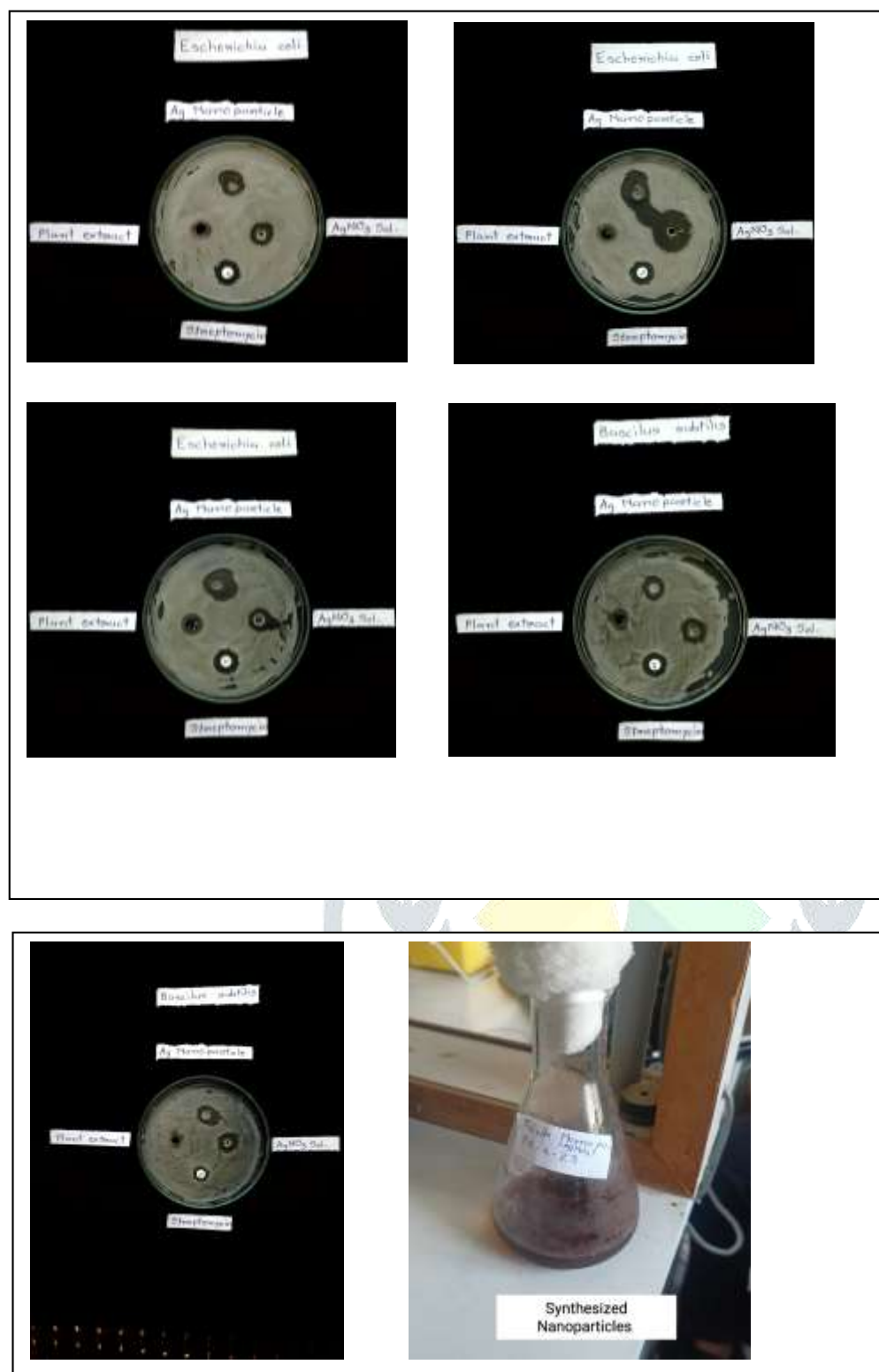
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## ANTIMICROBIAL ACTIVITY

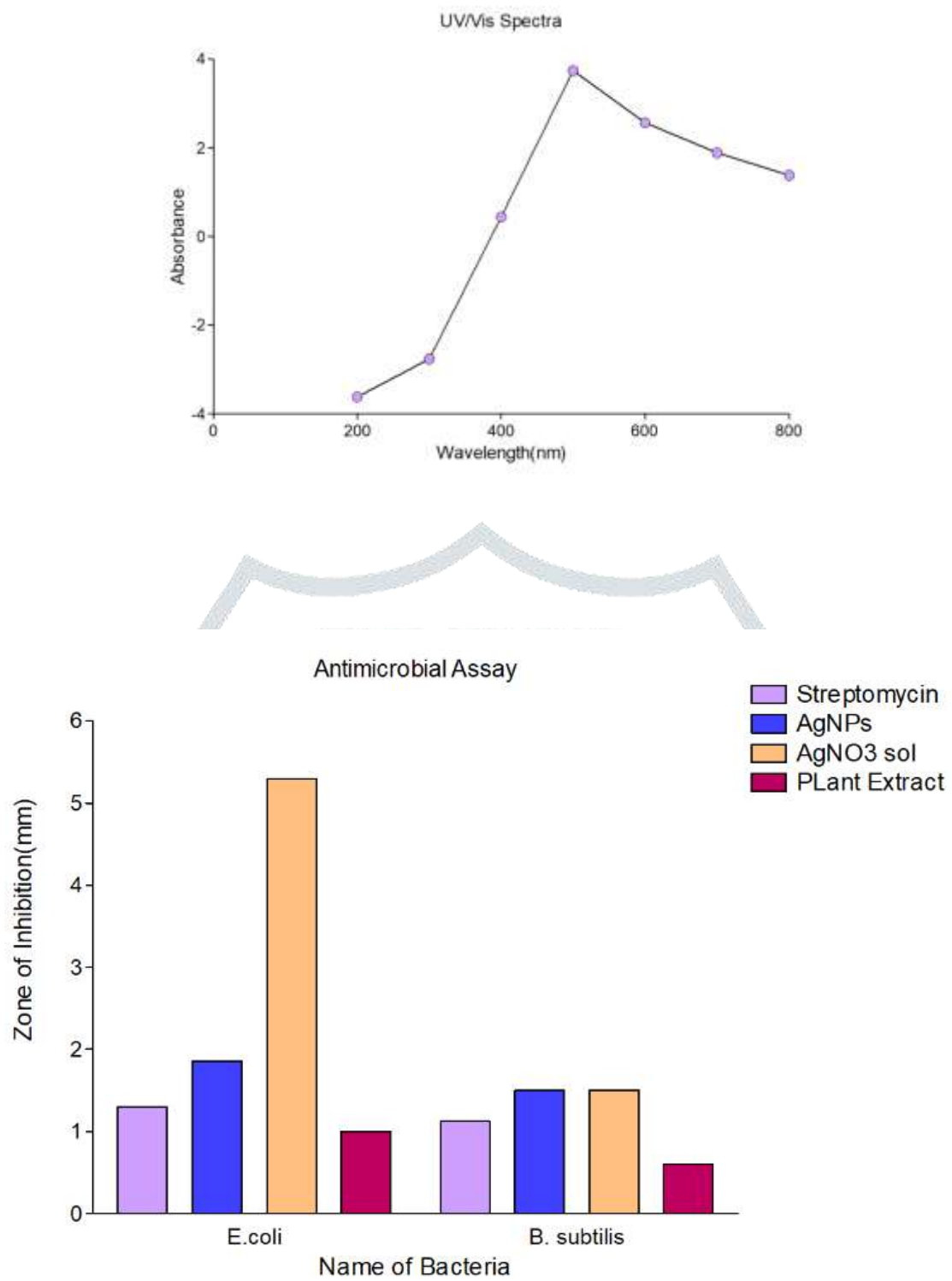
The petri dish was prepared by using Luria Birtani and Agar as media then the prepared petri dish was kept undisturbed to set it properly. Then the nutrient broth was prepared for growing the *Escherichia coli* and *Bacillus subtilis* bacteria. Then Spreading of it was done on the petri dish and Silver nitrate, Plant extract and an antibiotic was used as control to assess potential of the synthesized nanoparticles

## OBSERVATIONS



## RESULTS:

UV-Visible spectra showed a sharp peak at around 500nm that means nanoparticles are synthesised and the color change of solution is an indicator of nanoparticle formation as per literature. Thus these synthesised nanoparticles can be further used. FTIR was done to check which functional groups are present in the nanoparticles. Antimicrobial assay was performed by well diffusion method, in which AgNPs showed good antimicrobial activity against Gram negative bacteria (E.coli).



Graph 1.1

	Streptomycin	AgNO <sub>3</sub> NP	AgNO <sub>3</sub> sol.	Plant Extract
EC 1	1.3 cm	2.2 cm	2.4 cm	1.1 cm
EC 2	1.3 cm	1.4 cm	1.2 cm	0.9 cm
EC 3	1.3 cm	2.0 cm	1.7 cm	1.0 cm
BS				
	Streptomycin	AgNO <sub>3</sub> NP	AgNO <sub>3</sub> sol.	Plant Extract
BS 1	1.3 cm	1.3 cm	1.3 cm	1 cm
BS 2	1.1 cm	1.6 cm	1.4 cm	0
BS 3	1 cm	1.6 cm	1.8 cm	1 cm

Table 1.1

**DISCUSSION:**

In this study antimicrobial Activity has been compared -

1. Using Plant Extract only
2. Using Antibiotic (Streptomycin) control
3. Using AgNO<sub>3</sub>
4. Using AgNO<sub>3</sub> Nanoparticles synthesized with *Krimighna Plants* Extracts

AgNO<sub>3</sub> Nanoparticles synthesized with *Krimighna Plants* Extracts exhibited a larger zone of inhibition in antibacterial activity compared to the plant extracts, and Antibiotic (Streptomycin) control as indicated in table 1.1 and graph 1.1 above. There is significant evidence that there is potential for creating topical medications utilizing plant extracts produced with AgNO<sub>3</sub>.

**CONCLUSION:**

The effectiveness of the Green Synthesized Nanotized *Krimighna Gana Plant* Extracts Using Silver Nanoparticles has been demonstrated, making it a promising drug delivery method for various topical applications. Nanotizing Ayurvedic plants using silver nanoparticles allows for the preparation of numerous Ayurvedic topical formulations. However, additional pre-clinical and clinical trials are required to assess the toxicity and clinical efficacy of this approach.

**FURTHER SCOPE OF RESEARCH:** Pre-Clinical and Clinical Trials can be conducted to assess its Clinical Efficacy due to the positive outcomes observed in this experimental study.

**CONFLCTS OF INTERESTS:** The identical research project was chosen for the SPARK (Studentship Program for Ayurveda Research Ken) Project. This research was conducted by the student Ghadiya Jaivik under the supervision of the first author, as part of the SPARK Project by CCRAS (The Central Council for Research in Ayurvedic Sciences), Ministry of Ayush, Govt. of India. The student was awarded a studentship of Rs. 50000/- with a 'good' grade for this work. All authors have been actively engaged in this research from its inception to the completion of the final report. We express our gratitude to the CCRAS, R K University Ayurvedic College and

Hospital and School of Science, R K University, Rajkot, Gujarat, India for their provision of study facilities, laboratory resources, and instrumentation assistance.

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