

SYNTHESIS AND CHARACTERIZATION OF GOLD AS NANOPARTICLE BY GREEN METHODS

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ABSTRACT

In this paper, we synthesized the spherical gold nanoparticles (AuNPs) of 70 nm size, using HAUCL solution and the aqueous extract of Fenugreek plant seeds, which can act as a reducing, stabilizing and capping agent, at ambient condition. The formation of gold nanoparticles was confirmed by the first exciton peak of UV Vis. Spectra that was supported by the change in color of the solution. As synthesized Au, nanoparticles were characterized with the help of UV-Vis absorption spectroscopy analysis, Fourier Transform Infrared (FTIR) analysis, and Scanning Electron Microscopy (SEM) analysis.

KEYWORDS: Gold, nanoparticles, Fenugreek, plant, seeds.

INTRODUCTION

Synthesis of gold nanoparticles using plant extract is useful not only because of its reduced environmental, but also because it can be used to produce large quantities of nanoparticles. Plant extracts may act both as reducing agents and as stabilizing agents in the synthesis of nanoparticles. In view of its simplicity, the use of plant extract for reducing metal salts to nanoparticles has attracted considerable attention within the last few decades.^[1] The properties of gold nanoparticles are very different from that of bulk, as the gold nanoparticles

are wine red solution while the bulk gold is yellow solid. The gold nanoparticles can be manufactured into a variety of shapes including nano-rods, nano-spheres, nano-cages, nano-stars, nano-belts and nano-prisms.^[2] The size and shape of gold nanoparticles strongly influence their chemical and other properties. The triangular shaped nanoparticles show attractive optical properties in comparison to spherical one.^[3] Due to their wide spread applications in targeted drug delivery, imaging, diagnosis and therapeutics due to their extremely small size, high surface area, stability, non-cytotoxicity and tunable optical, physical and chemical properties, gold nanoparticles have revolutionized the field of medicine.^[2,4]

In the present research work *Trigonella foenum* seed extract have been used as a reducing agent. The same extract also acts as a capping agent. *T. foenum* is widely available plant in tropical country like India. The aqueous extract contains protein, which may act as a bio-ligand. This method gives nanoparticles well separated from each other and no aggregation was observed. Similarly, the anti-microbial activity was also studied. A thorough study on literature of *T. foenum* reveals that the major components of the plant are protein in which globulin and histidine are major components and contains albumin and Phosphorus. The seed contains Trigonelline (C₇H₇O₂N), Choline, fatty acids, phosphates, lecithin, and nucleo-albumin. Therefore, it is as nutritive as cod-liver oil. It is also used as a Ayurveda medicine against indigestion, bleeding piles, galactagogic, diarrhea, griping pain, anemia, diabetes, goitre, leucorrhoea, and as appetizer and purgative and in treating eye diseases.^[5,6]

METHODOLOGY

Material

Fenugreek seed, HAUC₄.3H₂O.

Equipment

Weighting sensitive balance, Ultra-violet UV, Nano plus common version 5.22 / 3.00 (zeta potential), SEM, FT-IR.

Preparation methods

A. Fenugreek Extract Method

8g of fenugreek seed was taken, and added 60ml distil water on Beaker, then but in the heater until boiling, the extract was formed, 5ml of extract was taken.

B. Green Method

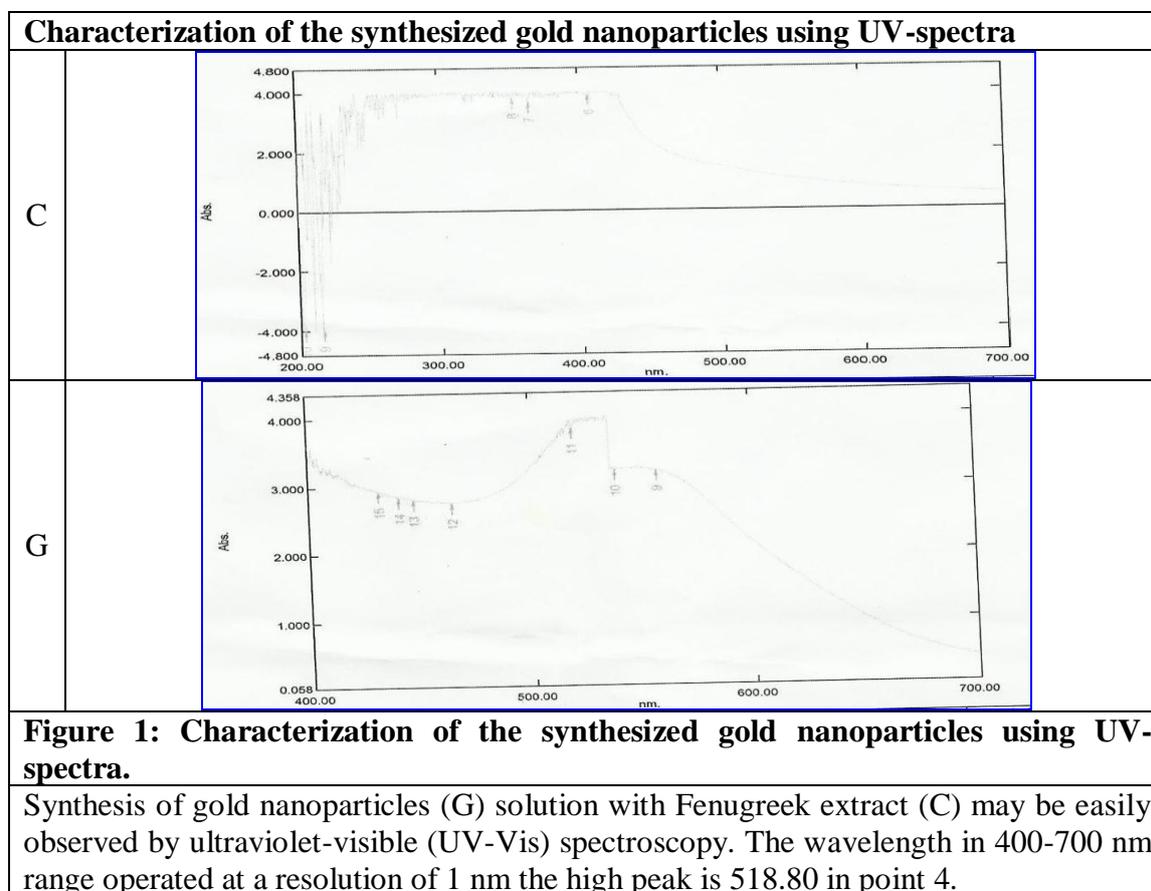
5ml of HAUCL was taken and completed volume to 50ml of distil water, the beaker of solution was put on heater.

Then the 5ml of extract was added as drop wise to the solution and boiled until the color was changed (endpoint), the reaction was take one minted.

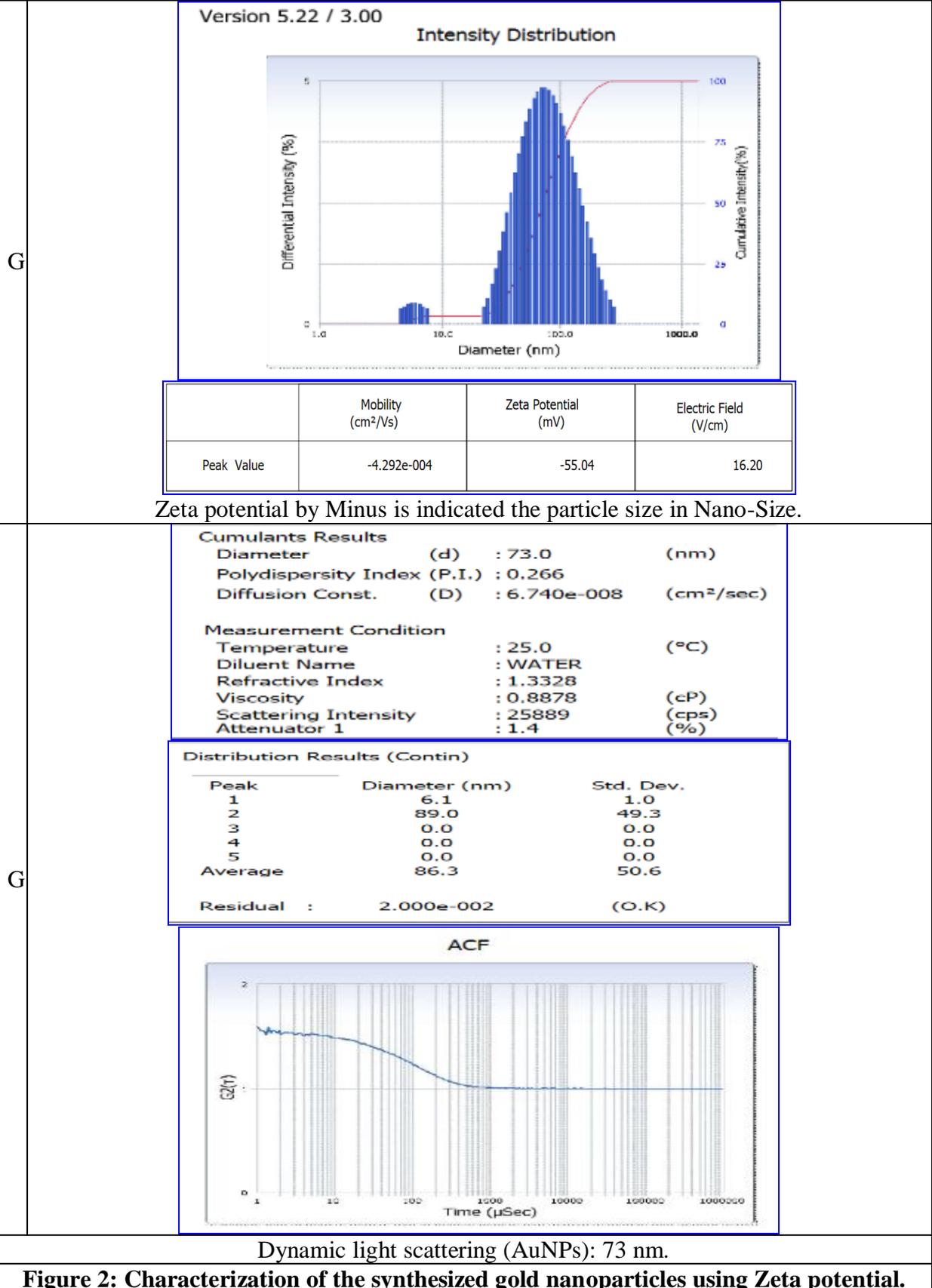
RESULTS AND DISCUSSION

Gold nanoparticles were synthesized from Hydrogen tetra chloraurate solution containing Au⁺ ions by treating with the Fenugreek Extract (C).

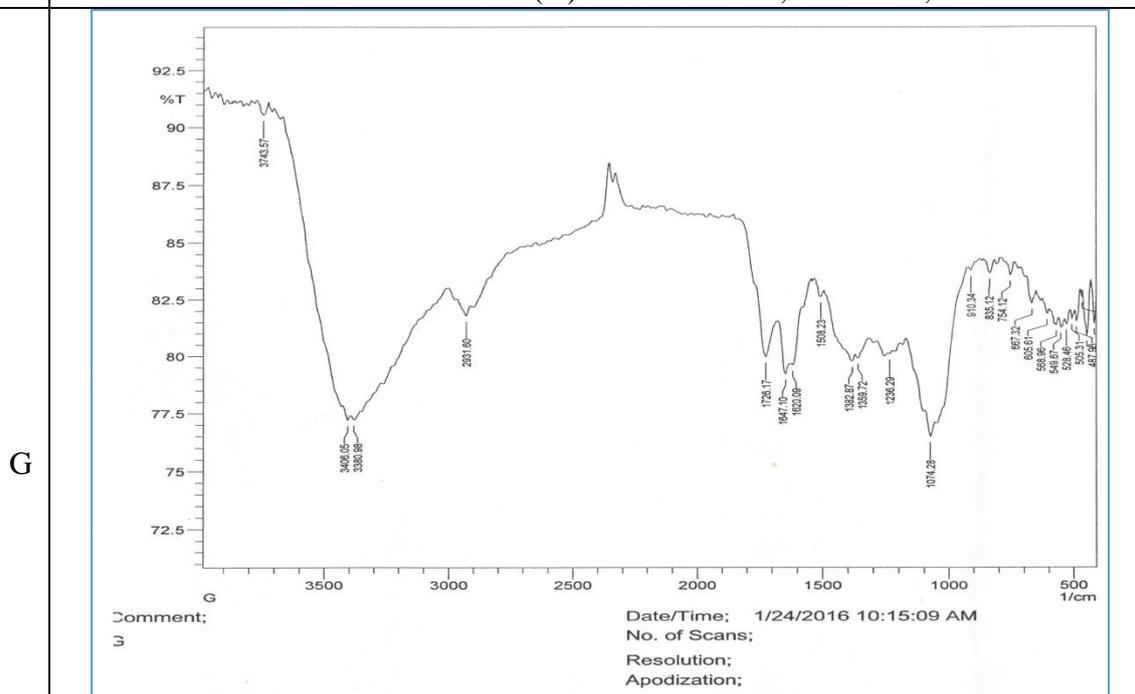
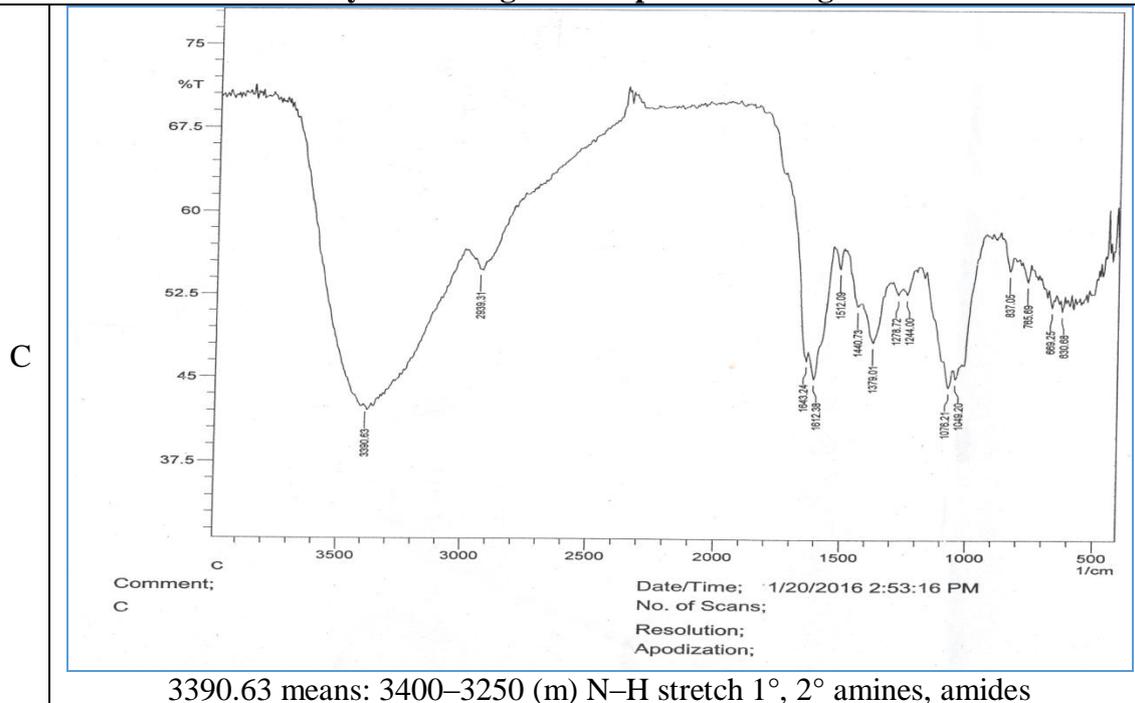
The color of the solution changed to purple color within 1 min of reaction with the Au⁺ ions. The appearance of the purple color indicated formation of gold nanoparticles.



Characterization of the synthesized gold nanoparticles using Zeta potential



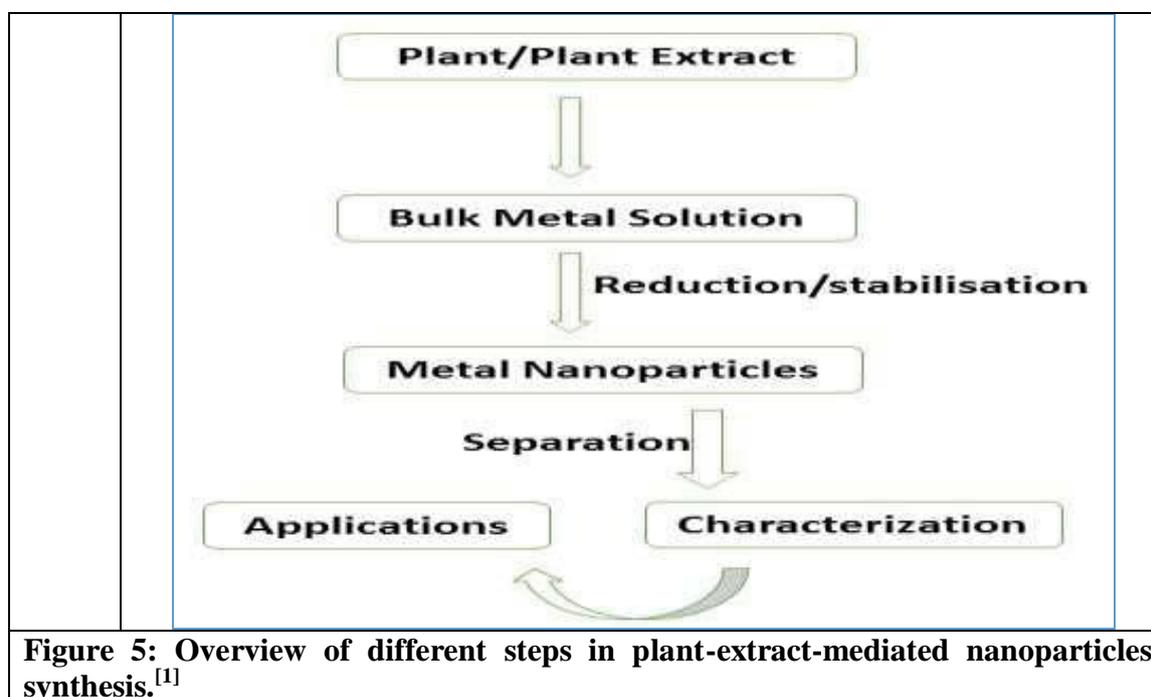
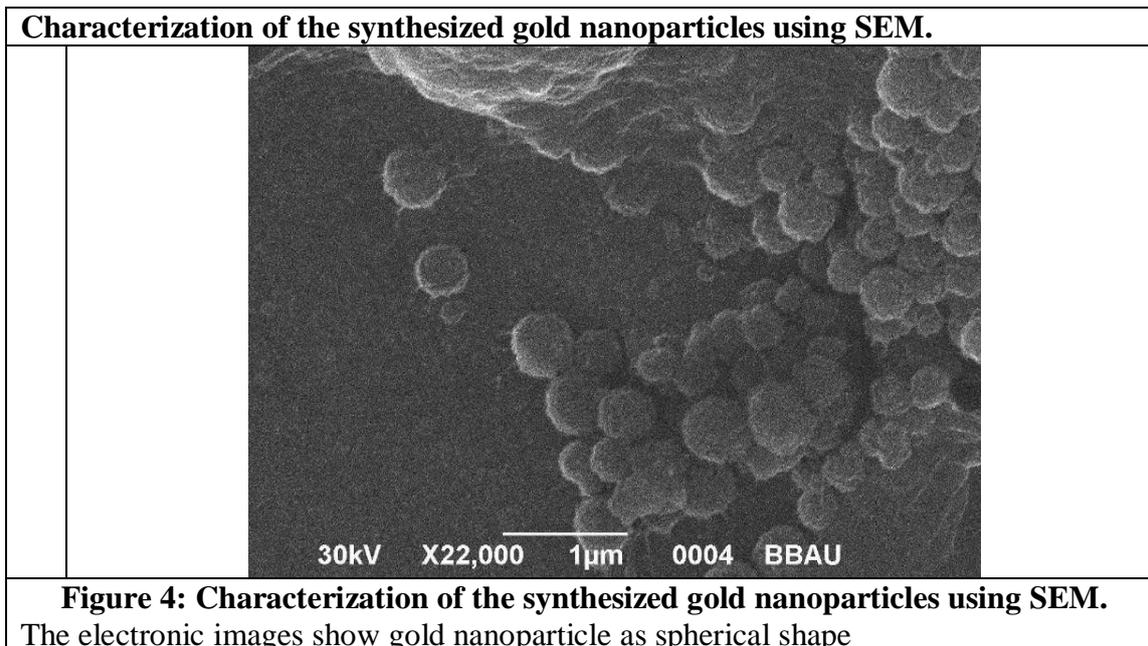
Characterization of the synthesized gold nanoparticles using FT-IR



3406.05 and 3380.98 means: (3500–3200) (s,b) O–H stretch, H-bonded alcohols, phenols

FTIR analysis also gives a set of peak values unique for the sample along with information of the plant peptides that are present in the sample as the plant extract acts as a reducing agent figure-5. FTIR analysis is used to confirm the presence of plant peptides visible due to the bending produced by amide bonds.

Figure 3: Characterization of the synthesized gold nanoparticles using FTIR.



CONCLUSION

In this present study, the synthesis of gold nanoparticles was synthesized by green method using Fenugreek seed extract, which acts as a reducing agent to reduce gold metal to nano-size particles. The synthesized gold nanoparticles were subjected to analysis such as SEM, UV Vis Spectroscopy, and FTIR in order to characterize them. To the best of our knowledge, this is the best information of the observations of the unique structures of fenugreek seeds extract mediated Au nanoparticles. This opens a way to understand the synthesis mechanism of Au nanoparticles formed from other plant seeds extracts.

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