



## Polysaccharide Mediated Green Synthesis of Silver Nano Particles from *Agrimonia eupatoria* and its Hepatoprotective activity

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### Abstract

The medicinal product of *A.eupatoria* reduces liver damage by preventing TLR-4 signaling in the liver. Hepatitis surface antigen release was suppressed by aqueous extracts made from the aerial portions of *A.eupatoria*. Due to its lipid-lowering and antioxidant properties, the extract has been demonstrated to protect against liver damage. Plants of the genus *Agrimonia*, including *A.eupatoria*, have potential antiviral action against the hepatitis B virus in their aqueous extract made from their aerial portions. These findings suggest that *A.eupatoria* dry herb extract has a strong hepatoprotective effect, lowers the amount of lipid peroxidation, and stabilizes the outer membrane structure of liver cells.

**Keywords-** Hepatoprotective, liver damage, aerial portions, surface antigen release.

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### Introduction

Numerous definitions exist for nanotechnology as well as nanoscience, that study that underlies nanotechnology. Instead, it really is typically understood to be the capacity to control, evaluate, produce, and forecast first at range of 1-100 nanometer range.<sup>1-3</sup> there at nanoscale scale, composites exhibited special features that are distinct from that of the separated atoms as well as inorganic salt, with the qualities primarily relying upon that dimensions of the particles used to create the substance. Nanotechnology did not develop from a single branch of science. Furthermore, it is multidisciplinary and incorporates physics, biology, engineering, chemistry, and more recently, toxicology.<sup>4</sup>

Nanotechnologies, the plural form, are frequently used. Nanometer-sized substances are still not brand-new. Nanoparticles are frequently found in nature; as instance, DNA, proteins, and other nanoscale substances are vital to life, and atmospheric nanoparticles are a normal occurrence. Ever since 10th century AD<sup>4</sup>, and perhaps even before, both Ag and gold nanoparticle have already been employed to tint pottery varnishes and decorative arts.<sup>5</sup> Flames and volcanic activities are two examples of naturally occurring resources for nanoparticles.

Samples from biology includes viruses, ferritin, and magnetite, which would be present in both organisms and cells (a protein which stores excess iron in the body). However, due to the production of nanoparticles through simple burning as well as other industrialization activities, individuals exposed to nanoparticles has rapidly grown during the past century. For instance, the emissions from smelting, electric utilities, especially internal-combustion engines all produce nanomaterials into the atmosphere. Even cooking or searing meals releases nanoparticles into the air.<sup>6</sup>

The potential uses of nanotechnology and how they may enhance people's standard of living have become the subject of a lot of speculation. Air pollution remediation, effective drug delivery methods with fewer adverse reactions (for instance, quite accurate anti - cancer treatments), advancements in digital technologies, "shrewd" textiles that modify to the heat flux, conscience glass panels, and much more widely used chemical procedures in construction sector are mostly just and a handful of the long- to medium-term advantages of nanotechnology.<sup>7</sup>

The liver is an essential organ that regulates a number of bodily functions, including digestion, immunity, metabolism, vitamin storage, and detoxification. A healthy adult's body weight consists of around 2% of it. Due to its dual blood supply from the hepatic artery (about 25%) and the portal vein, which account for around 75% of the liver's blood flow, it is a special organ.<sup>8</sup>

## **Clinical Values**

There are several viruses that may harm the liver. Hepatitis E also A commonly found in travellers and in animals that have eaten infected seafood or water. They often have jaundice and vomiting as first symptoms, and they are self-limiting disorders.<sup>35</sup> Viruses called hepatitis B, C, and D may lead to acute hepatitis and chronic hepatitis. Hepatitis B is necessary for the generation of hepatitis D. It may either co-occur with hepatitis B, known as coinfection, or co-occur with hepatitis B, known as superinfection. The difference is crucial because superinfection may cause sickness that is more harmful. Both Hepatitis b as well as C may be transmitted by infected needles used for tattooing, injecting drugs, or iatrogenically.<sup>9</sup>

Sexual contact may potentially spread hepatitis B. Hepatitis C therapy has advanced to the point that drugs like sofosbuvir/velpatasvir, a combination of antiviral drugs, may cure the disease.<sup>35</sup> Most often, it affects women in their middle years. Similar to other liver illnesses, PBC may cause pain in the right upper quadrant.

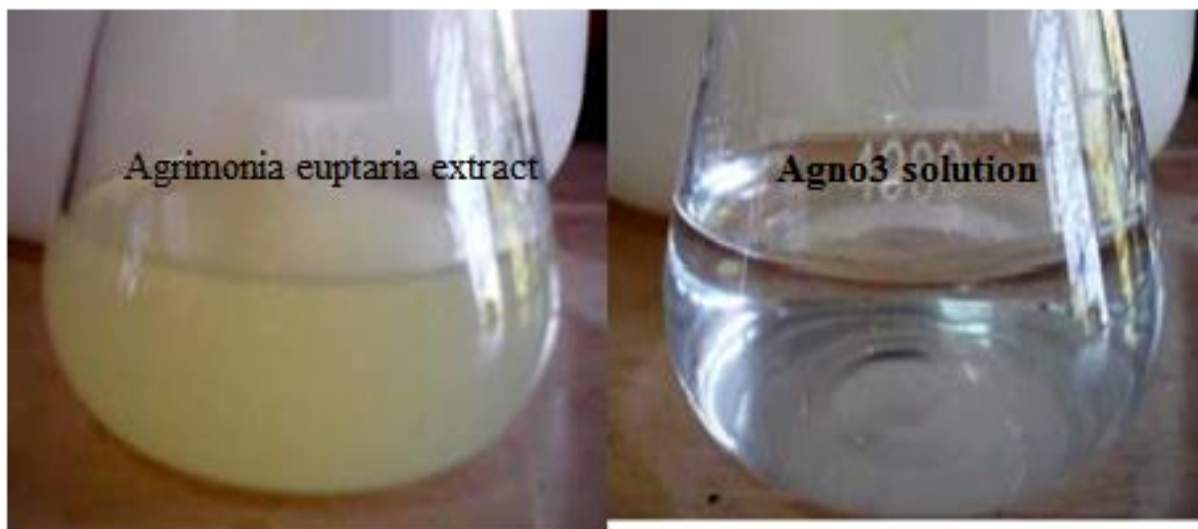
Ursodeoxycholic acid, which slows the disease's development, as well as other immune-suppressing drugs such as methotrexate, steroids, and sometimes calcineurin 2 inhibitors are used to treat PBC. The only curative method is a liver transplant.<sup>9</sup>

The liver suffers long-term harm from alcoholism. The liver is in charge of breaking down alcohol, and over time, regular alcohol use causes cell damage owing to the accumulation of harmful metabolites, mostly to acetaldehyde. In this process, the liver develops cirrhosis and all the previously mentioned symptoms. Clinical history, physical exam findings, test results.

**Autoimmune Hepatitis** is characterized by ongoing inflammation of the liver, tissue necrosis, including an increased risk of developing fibrosis. In a 4:1 ratio, young women experience it more frequently compared to young males. Typically, an individual arrives with elevated LFTs for no obvious reason.<sup>[37]</sup> Those with these conditions might have significant self-antibodies such as those against the hepatocyte antigenic substance, smooth muscle tissue, hepatic/kidney microsomal, and anti-nuclear antibodies. Estionnaires may all be used to make a diagnosis. Agrimony is a European natural plant that thrives in damp places like marshes, wastelands, and wet meadows. Indeed, it is the arid grassland species most typical in the former agricultural regions of the Southeastern Czech Republic and the Slovak Republic. As a result, the Hindu Kush Mountains in Pakistan, the Western Himalaya, and India are all locations where it has been documented. Harvesting occurs in the summer, when the plant is in full bloom. This shrub is a herbaceous perennial with thin, upright leaves. Its stalk is 60 to 90 cm in length and has few branches. These plants are greenish color, coated by delicate, velvety bristles, as well as when they're severely wounded, they exhale a strange, but delicious perfume.

### **Ag nanoparticles synthesized through Eco-friendly Route**

Surface agitation Ag nanoparticles look yellowish brown in water due to Plasmon resonance. The extract's color will change as transparent to yellowish brown when mixed with both the aqueous phase of a Ag ion complex. This resulted from the creation of an Ag<sup>+</sup> ions seen in Figure.



(I)

(II)



(III)

Fig no 1. After 10 hours of incubation, photographic images of (I) *A. eupatoria* extract (II) 1 mM AgNO<sub>3</sub> without extract (III) 1 mM AgNO<sub>3</sub> with *A. eupatoria* extract are shown.

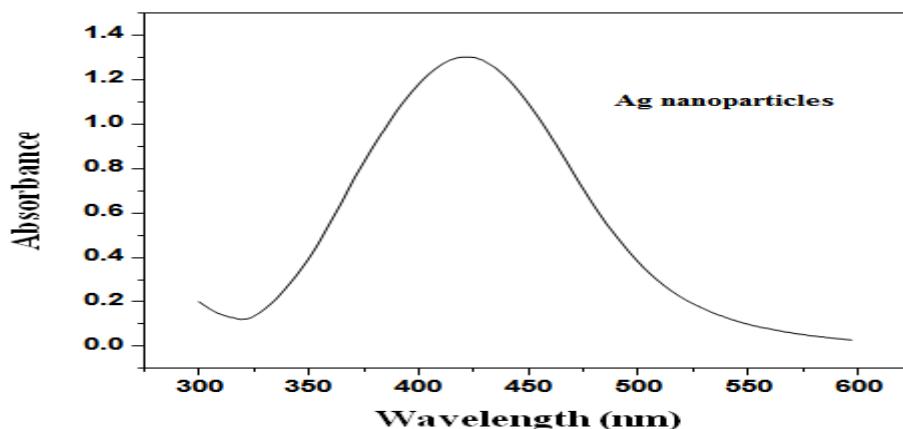
Table no 1-. The concentration of amino acids per 100 mg present in the extract of *Agrimonia eupatoria*

Sr No	Name of Amino Acid	Concentration per 100 mg
1	Serine	610 ± 20
2	Glutamic acid	110 ± 30

3	Proline	<b>420 ± 11</b>
4	Cystine	<b>70 ± 2</b>
5	Glycine	<b>78 ± 27</b>
6	Alanine	<b>570 ± 22</b>
7	Leucine	<b>361 ± 9</b>
8	Glutamic acid	<b>100 ± 3</b>
9	Proline	<b>420 ± 11</b>
10	Cystine	<b>80 ± 2</b>
11	Glycine	<b>860 ± 27</b>
12	Alanine	<b>580 ± 22</b>
13	Valin	<b>610 ± 7</b>

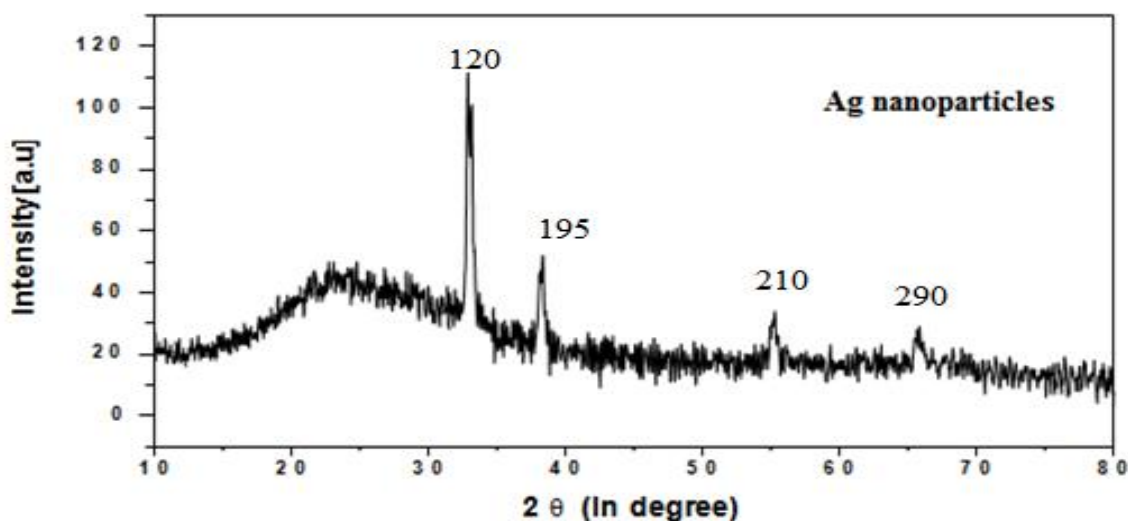
### **Characterization of Ag nanoparticles-**

Silver nanoparticles obtained in the reaction medium have an absorbance maximum at 420 nm in their spectra. The peak's extraordinary expansion from 350 to 480 nm reveals the particles' polydispersed state. At longer response times, the peak in the absorption spectra was shown to move blue from 350 to 480 nm.



**Graph-1. Ag nanoparticles made from 0.5% soluble starch and a 10% *Agrimonia eupatoria* extract in a 1 mM aqueous AgNO<sub>3</sub> solution.**

The distinctive peaks seen in the XRD picture, displayed in Figure 6, which was used to create the Ag nanostructure, proved that *Citrus sinensis* extract was responsible (b). The recognisable face centred cubic (FCC) silver lines are present in all diffraction peaks. These diffraction lines have been given the indices (105), (190), (200), and (300) for the corresponding  $2\theta$  angles of 32.80, 38.20, 55.10, and 65.70. Characteristic peak, position, & breadth are determined by analysing Xrd analysis using comprehensive as  $1/2$  (Full width) measurements as well as the Scherer equation described in the subsection on substances as well as methodology. As indicated by the typical Xrd spectra, this study sampled silver nanoparticles inside a combined stage with a cubic and hexagonal configuration. The approximated median size of particles of this samples were 50 nm in size depending upon that Wave number of the peaks associated also with 105 planes and having cubic and hexagonal forms.

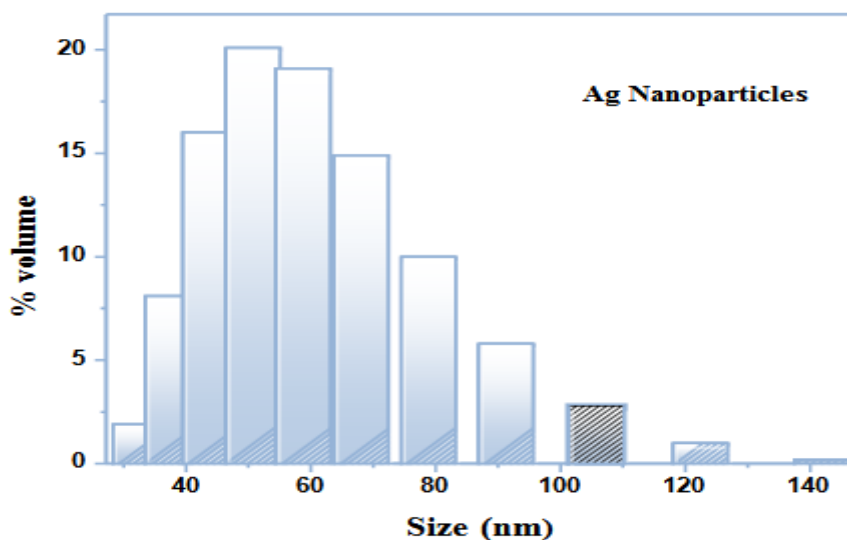


In mixing 10 percent solution of *Agrimonia eupatoria* with the 1 mM water Silver nitrate solution, Nanoparticles were created.

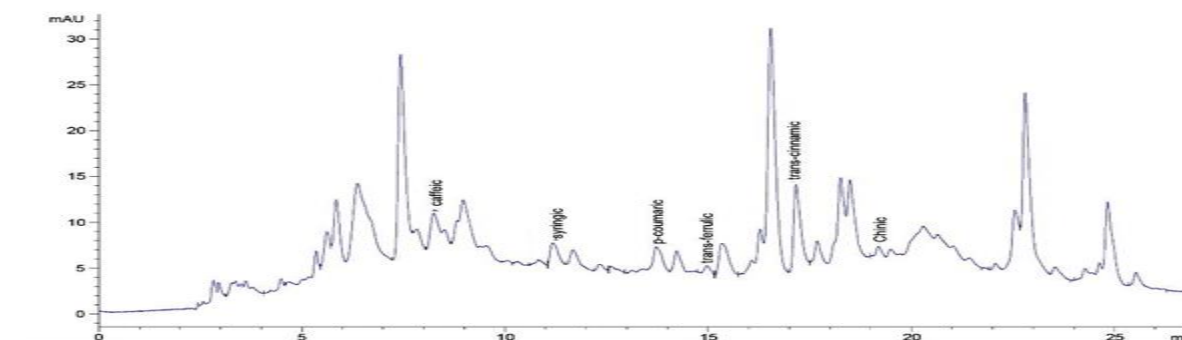
### Dynamic light scattering particle size analyzer

They were between 30 and 150 nm. Nonetheless, the fraction of nanoparticles is quite low above the 100 nm range. Ag NP made up 50 nm of the maximum proportion of the solution.

The plot made it clear that the solution contains nanoparticles of different size which were determined by the SEM analysis.



Graph 2- Particle size data of silver nanoparticles by chemical reduction method

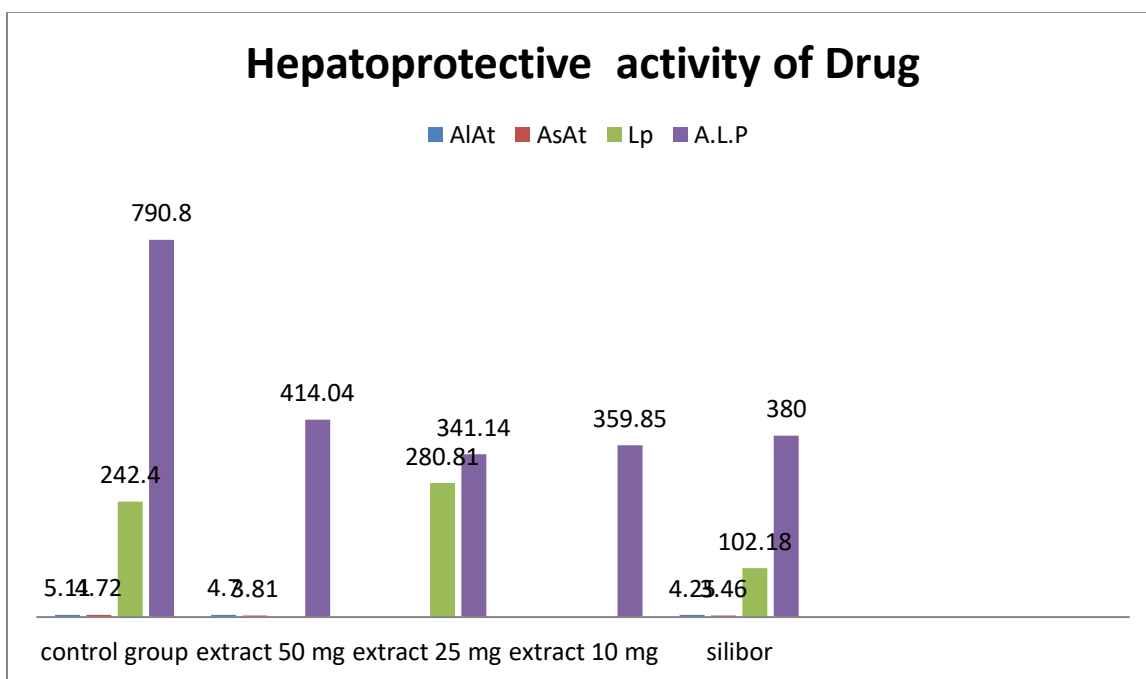


Graph 3- shows the HPLC data of acids present in the solution of plant.

### Hepatoprotective Activity-

Groups	Study objective	AlAt mmol/Litre	AsAt mmol/Litre	L p, mmol/h*ml	A.L.P mmol/h*ml
1	Control Group	5.11 ± 0.08*	4.72 ± 0.10*	242.40 ± 29.95*	790.80 ± 30.50 *

2	Extract, 50 mg/kg	4.70 ± 0.39*	3.81 ± 0.80*		414.04 ± 24.16 **/*
3	Extract, 25 mg/kg			280.81 ± 13.70*	341.14 ± 8.46 *
4	Extract, 10 mg/kg				359.85 ± 5.94 **/*
5	Silibor	4.25±0.12*	3.46 ± 0.13*	102.18 ± 17.30*	380 ± 74.52*
6	Intact animals				130.60 ± 10.35*



**Graph 4- Shows the Hepatoprotective activity of Drug**

### Conclusion-

When injected intragastrically, an extraction of *A. eupatoria* is among generally non-toxic drugs (LD50 > 5000 mg/kg), according to a research on acute toxicity. The results of the research showed that intragastric infusion about a herbal extract of *A. eupatoria* within amounts of 800-1000 mg/kg does not result in animal death. Additionally, alterations to the morphological structure of the experimental animals' internal organs do not occur, indicating the lack of toxic effects of the extract, characterising these individuals essentially non-toxic (toxicity class V) in accordance with the classification of substances. Findings from a research on the



hepatoprotective effects of a herb extract from *A.eupatoria* in an example of acute tetrachloromethane hepatitis.

The medicinal product of *A.eupatoria* reduces liver damage by preventing TLR-4 signalling in the liver. Hepatitis surface antigen release was suppressed by aqueous extracts made from the aerial portions of *A. eupatoria*. Due to its lipid-lowering and antioxidant properties, the extract has been demonstrated to protect against liver damage. plants of the genus *Agrimonia*, including *A.eupatoria*, have potential antiviral action against the hepatitis B virus in their aqueous extract made from their aerial portions.

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