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Formation Of Silver Nanoparticle Using Fenugreek Seeds And Its Antimicrobial Activity

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1.Introduction :-

Fenugreek (Trigonella foecum-graecum) is an annual herb that belongs to the family fabaceae. Application of Nano scale material and structures are usually ranging from 1-100nm and is emerging area of nano science and nanotechnology. Metal nanoparticles have a high specific surface area and a high fraction of surface atoms; have been studied extensively because of their unique physicochemical characteristics including catalytic activity, optical properties, electronic properties, antibacterial properties and magnetic properties [1]-[4]. Synthesis of noble nanoparticles for the applications such as catalysis, electronics, environmental and biotechnology is an area of constant interest [5], [6]. Generally, metal nanoparticles are synthesized and stabilized by using chemical methods such as chemical reduction [7], [8], electrochemical techniques [9], photochemical reactions in reverse micelles [10] and now days via green chemistry route [11] Use of plants in synthesis of nanoparticles is quite novel leading to truly green chemistry which provide advancement over chemical and physical method as it is cost effective and environment friendly easily scaled up for large scale synthesis and in this method there is no need to use high pressure, energy, temperature and toxic chemicals. Now days we are using bacteria, fungi for the synthesis of nanoparticles [12]-[18] but use of seed extract [19], [20] reduce the cost as well as we do not require any special culture preparation and isolation techniques.

In the ancient Indian traditional system of medicine,Ayurveda, fenugreek has been suggested as an importantmedicine to treat a variety of digestive and mucosal condi-tions [21] The fenugreek seed hastraditionally been used as a carminative, demulcent, expec-torant, laxative and stomachic agent. The mature fenugreekseed has many other active components such as amino acids,fatty acids, vitamins and saponins such as disogenin,gitogenin, neogitogenin, homorientin saponaretin, neogigo-genin and trigogenin, fibers, flavonoids, polysaccharides,fixed oils and some identified alkaloids, that is, trigon elline and choline [22]

The hypoglycemic effect of fenugreek is well known indiabetic subjects including experimental animals as well ashumans. However, a study by [23] suggests that the aqueous extract of Trigonella leaves giveneither orally or intraperitoneally possesses a hypoglycemiceffect in normoglycemic rats. Further, in another study,when extracts of Trigonella foenum-graecumseeds were fedto normal mice orally, it produced a hypoglycemic effect and reduced the blood glucose levels

Accordingly, when taken post meal, dietary fibers present in the fenugreek seed could regulate the production of cholesterol in the liver. The authors suggest that fenugreekseeds contain 45.4% dietary fiber of which 32% are insoluble fibers and 13.3% are soluble fibers (Roberts, 2011). Further,polysaccharides such as galactose and mannose are also found in seeds, which are associated with antiglycemic and anticholesterolemic properties. Galactomannan, a solublefiber from fenugreek seed, has been reported to reduce postprandial blood glucose response.[24] Fenugreek flower produces brownish to yellowish brown ~15 cm long 2–8 pods. Each pod contains 10–20 seeds per pod; seeds are small (~5 mm long), hard, smooth, dull yellow to brownish yellow in color [25]. Plants are used medicinally in different countries and are a source of many potent and powerful drugs . This plant decrease body fats and effective on obesity. The yields can be significant increase in quantity and quality through the suitable management of cultivation, irrigation and harvesting. In this context, fenugreek (Trigonella foenum graecum L.), an annual legume, is extensively cultivated in most regions of the world for its medicinal value . In order to meet the ever increasing demand for medicinal plants, for the indigenous systems of medicine as well as for the pharmaceutical industry, many medicinal plants need to be cultivated commercially, but soil salinity and other forms of pollutions represent serious threats to plant production [26]

Aim :- Formation of silver nanoparticle using fenugreek seeds and its antimicrobial activity

Objective :- To synthesise silver nanoparticle from foenum seed

To evaluate antimicrobial activity of Foenum Graceum seed

Fig 1 :- Trigonella Foenum Graecum seed

- **Plant materials and Preparation of seed extract**

- Seeds were collected from koradi village, Nagpur district, Maharashtra.
- The seeds were initially washed thrice in distilled water and dries on paper toweling and sample (10g) ground in to powder form. It was then boiled with 100ml of distilled water for 30 minutes. The extract was passed through Whatmann No.1 filter paper and the filtrates were kept 4 degree C for further use

- **Trigonella Foenum Graecum Prepration of seed extract**

Fig :- 3 Trigonella Foenum Graecum Prepration of seed extract

- **Formation of Nanosilver**

The periodic colour change of the Trigonella Foenum Graecum seed extract when treated with 1mM Silver nitrate solution was from pale yellow to dark brown within 72 hours of incubation which is an indication of the formation of silver nanoparticles.

Fig 3 :- shows the periodic colour change of reaction mixture at different time intervals. (fenugreek seed extract+ 1mM AgNO3)

+ (light yellow), ++ (dark yellow), +++ (brown), ++++ (dark brown)

Time/Concentration	1mM AgNO3
0 Hr	+
1 Hr	++
2 Hr	+++
24 Hr	++++
48 Hr	+++++
72 Hr	++++++

Formation of culture media :-

The required amount of nutrient agar [2 gm] and simple agar [1 gm] medium or individual ingredients are dissolved in distilled water. Media containing agar should be dispensed into appropriate containers for sterilization by moist heat in an autoclave.transferred in to the petri dish, After that for 2 hr kept it in to the room temperature then kept 24 hr in refrigerator .

After 24 Hr. the culture media is ready to bacterial growth. [E. coli & Staphalococcus aureus] , these bacteria placed in to the incubator for 24 hr for bacterial growth.

Fig 4:- Culture media

Fig 5 :- Bacterial growth

Antimicrobial Assay

Antimicrobial activities of the synthesized silver nanoparticles were determined using the agar pour method . Approximately 5ml of molten and cooled media (Nutrient agar) was poured in sterilized Petri dishes. The plates were left overnight at incubator to check for any contamination to appear. The test organism should be added on the nutrient agar before the solutions added. The plates were examined for evidence of zones of inhibition,

which appear. The test organisms used in the s tudies E.coli, Staphylococcus Aureus

Fig no. 6

Trigonella foenum-graecum extraxt sample are spray on bacteria & sample show antimicobial actvites as show in Antimicrobial activity of Trigonella Foenum Graecum

Magnatic stirrer :- A stir bar magnet is placed inside a container, immersed in the fluid. A separate magnet is placed underneath the container so that it attracts to the stir bar magnet. The lower magnet is usually attached to a motor that spins it. If the magnets are close enough, the stir bar magnet spins inside the container. Depending on the application, you can configure your magnetic stirrer with hot plates to heat your samples as they are stirred. With the use of a hot plate stirrer, you can mix a wide variety of samples for different applications.A liquid sample placed in magnatic stir for 24 hr .

Fig no. 7 :- Magnatic stirrer

Nanoparticle Formed (crystal form) :- After the processes magnatic stirrer the sample transfered into the hot air oven for 2 – 3 days. Crystal formed as shown in Fig 8.

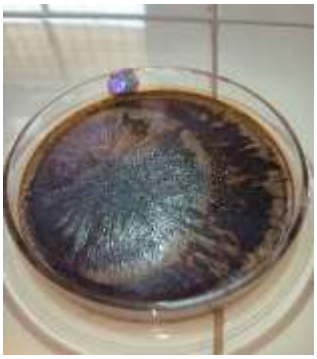

Fig 8 :- Nanoparticle formed

Result :- The synthesized silver nanoparticles were determined using the Trigonella Foenum Graecum seed extract .it show the antimicrobial activity

Discussion:- We have seen in the above project that synthesized silver nanoparticles shows antimicrobial activity

Conclusion:-

The bio reduction of aqueous Ag+ ions by the seed extract of the Trigonella Foenum Graecum plant has been demonstrated. In the present study I found that seeds can be a good source for the synthesis of silver nanoparticles . makes this method potentially exciting for the large- scale synthesis of other inorganic materials (nanoparticles)

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