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## **Knowledge about the Bio fabrication of *Lavandula angustifolia* and *Clitoria ternatea* formation mediated silver nanoparticles and its anti diabetic activity**

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### **ABSTRACT**

**Aim:** The aim of the present study is to investigate biofabrication of Lavandula angustifolia and Clitoria ternatea formation mediated nanoparticles and its anti diabetic activity.

**Introduction:** Lavender (Lavandula angustifolia) is an oil-yielding plant in the mint family (Lamiaceae) that is cultivated as a medicinal and garden plant, as well as for essential oil production, all over the world. Butterfly pea (Clitoria ternatea) is a perennial plant, indigenous to Malaysia that has spread around the world, including Sri Lanka, Caribbean, Central America, and Mexico, but it has since spread throughout India's tropical regions. It is a member of the Fabaceae family and grows on neutral as well as on moist soils.

**Materials and methods:** The inhibition of  $\alpha$ -amylase was carried out by the method described by Malik and Singh. The percentage inhibition of  $\alpha$ -amylase was calculated as  $[(A_o - A_i)/A_o] \times 100$ , where  $A_o$  was the absorbance of the standard and  $A_i$  was the absorbance of the test sample.

**Results:** There is a dose-dependent increase in alpha amylase inhibitory activity of blue pea and lavender formulation mediated silver nanoparticles. Maximum inhibitory activity was observed at maximum concentration.

**Discussion:** The therapeutic potential of environmentally friendly synthetic AgNPs in the treatment of cancer and viral infections is covered in this review conducted by Nancy et al

**Conclusion:** The synthesized Lavandula angustifolia and Clitoria ternatea mediated silver nanoparticles showed potent anti diabetic activity

**Keywords:** Lavandula angustifolia, Clitoria ternatea, Silver nanoparticles, antidiabetic activity, Biofabrication

### **INTRODUCTION**

Butterfly pea (Clitoria ternatea L.) is a perennial plant, indigenous to Malaysia that has spread around the world, including Sri Lanka, Caribbean, Central America, and Mexico, but it has since spread throughout India's tropical regions. It is a member of the Fabaceae family and grows on neutral as well as on moist soils. Butterfly pea, Conch flower, or 'Aparajita' are all common names for this plant. (1) It is used to make herbal teas, herbal juices, and has the potential to be utilized in cooking. It produces five-petaled solitary, axillary, and papilionaceous flowers with a standard petal, two wing petals, and two keel petals. The primary plant portion is a dark blue or white bloom with great therapeutic effects due to the presence of important phytochemicals. (2) These phytochemicals can also be found in varying amounts in other sections of the creeper, including as the leaves, roots, bark, and seeds. (3) Clitoria ternatea Linn produced a diverse range of secondary metabolites, including triterpenoids, flavonol glycosides, anthocyanins, and steroids. (4) Diabetes mellitus (DM) is a serious endocrine disease that affects about 5% of the world's population. One of the key variables linked to the development of glucose toxicity in diabetes is oxidative stress. (5) Most of the oral anti-diabetic medications just give symptomatic relief and do not completely treat diabetes. (6,7) The use of various plant extracts and herbal compounds as a therapy for diabetes is an innovative technique. (8) Its extracts have antibacterial, antipyretic,

anti-inflammatory, analgesic, renal, local anesthetic, antidiabetic, insecticidal, blood platelet aggregation-inhibiting, and vascular smooth muscle relaxing characteristics, among other things.(9)(6)(10)

Lavender is an oil-yielding plant in the mint family (Lamiaceae) that is cultivated as a medicinal and garden plant, as well as for essential oil production, all over the world.(11) *Lavandula angustifolia* are native to the Mediterranean region, but they are now widely grown and marketed around the world.(10,12) Although there are few studies on agronomic procedures, lavender species thrive in a wide range of climatic conditions, preferring full sunlight and humus-rich soils with little organic substances.(13) Several investigations have been conducted on the chemical components and pharmacological assessment of *Lavandula angustifolia* over the years. The majority of these investigations concentrated on the extracts, components, and essential oils of the plant's aerial parts and flowers. Extracts, fractions, and essential oil of *Lavandula angustifolia* have been shown to have CNS-depressant, anti-convulsive, sedative, spasmolytic, local anesthetic, antioxidant, anti-bacterial, and mast cell degranulation inhibitory properties in pharmacological and biological experiments.(14) Nanotechnology is a magic formula that has the power to alter every aspect of science and everyday life. It contains the design, production, and manipulation of nanosized materials for a variety of applications in biology and medicine.(15) Hence the aim of the present study is to investigate biofabrication of *Lavandula angustifolia* and *Clitoria ternatea* formation mediated nanoparticles and its anti diabetic activity.

## MATERIALS AND METHODS

The inhibition of  $\alpha$ -amylase was carried out by the method described by Malik and Singh. Briefly, the reaction was initiated by the addition of 490, 470, and 450  $\mu$ L buffer to different volumes (10, 30, and 50 ML) of 30 mg/mL of garlic extract, synthesized silver nanoparticles, stored (at room temperature, at 37°C and 4°C), and calcined (300°C, 500°C and 700°C) GAgNPs samples, respectively, to make the total volume of 500  $\mu$ L reaction solution. In the next step, 500 ML  $\alpha$ -amylase was added, followed by the addition of 1,000 ML of starch to the reaction vessels. Then, the reaction vessels were incubated in a water bath for 5 min at 100°C. Next to this step, 500  $\mu$ L of NaOH is added. The reaction was completed by the addition of 500 ML of DNS, and then, the reaction vessels were again incubated for 5 min by putting them in a beaker with hot water. The color change from yellow to orange indicated  $\alpha$ -amylase inhibition activity. For the preparation of blank, 30 ML of garlic extract was added into 1,500 ML buffer, and all the steps were conducted in the same sequence as mentioned earlier except the addition of amylase and starch. The tubes were left to cool, and the absorbance was measured at 540 nm. The percentage inhibition of  $\alpha$ -amylase was calculated as  $[(A_o - A_i)/A_o] \times 100$ , where  $A_o$  was the absorbance of the standard and  $A_i$  was the absorbance of the test sample

## RESULTS

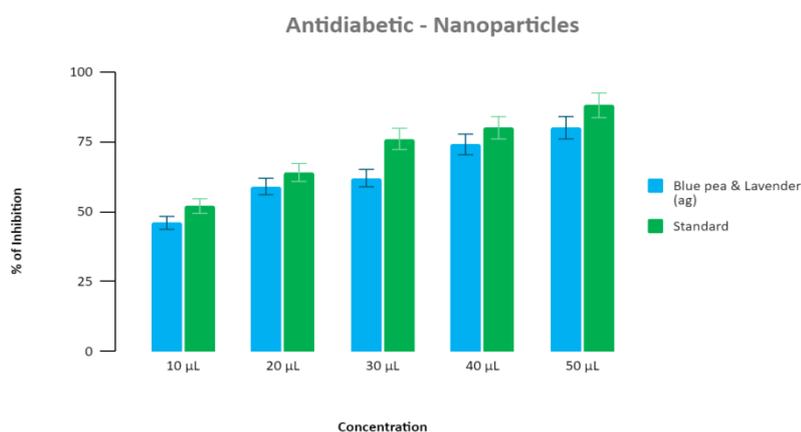
Diabetes mellitus is a condition characterized by persistent hyperglycemia and difficulties with carbohydrate, lipid and protein metabolism connected with a total or relative lack of insulin action of insulin secretion. almost 800 species of plants showing antidiabetic activity and *Clitoria ternatea* is one of them. *Clitoria ternatea* leaf extracts have recently shown promise as an anti-diabetic. There is a dose-dependent increase in alpha amylase inhibitory activity of blue pea and lavender formulation mediated silver nanoparticles. Maximum inhibitory activity was observed at maximum concentration.



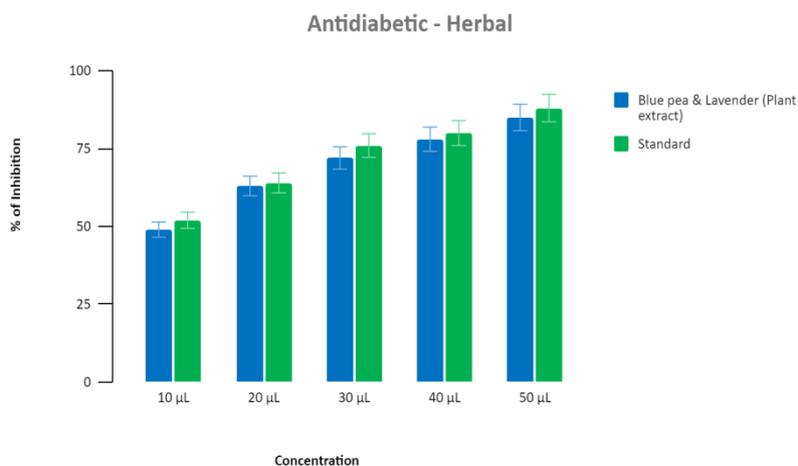
**Figure 1: Shows 1gm of *Lavandula angustifolia* and *Clitoria ternatea* flower was procured as powder was mixed with 100 ml of distilled water and boiled for 20 mins**



Figure 2: Shows 20mM of Ag nanoparticles was dissolved in 50 ml distilled water and added to 50ml of extract and filtered



Graph 1: Shows *Lavandula angustifolia* and *Clitoria ternatea* formation mediated silver nanoparticles and its anti diabetic activity(☒ amylase activity)



Graph 2 : Shows *Lavandula angustifolia* and *Clitoria ternatea* plant extract and its anti diabetic activity(☒ amylase activity)

## DISCUSSION

The therapeutic potential of environmentally friendly synthetic AgNPs in the treatment of cancer and viral infections is covered in this review conducted by Nancy et al. Here, we first provided a general overview of the environmentally friendly synthesis of AgNPs before reviewing the uses of AgNPs in the management of cancer and their potential mechanisms for cytotoxic effects. (16) Additionally, the probable mechanisms of phyto-based AgNPs with antiviral activity were addressed. The final section outlined various therapeutic and upcoming difficulties. Excellent biological activity has been achieved by plant-based AgNPs, which are extremely toxic to malignant cells but less hazardous to normal cells. (17) The AgNPs are now a promising possibility for cancer treatment in the future because of this. Additionally, AgNPs have demonstrated dominant activity against a number of fatal viruses, making them appropriate for the treatment of viral infections. (18) Hypertriglyceridemia and hypercholesterolemia are the two lipid disorders that are most frequently seen in diabetic patients. (19) In diabetic control rats, there has been a clear increase in total cholesterol and a decrease in HDL cholesterol. Hypertriglyceridemia is brought on by insulin insufficiency because lipoprotein lipase is not activated. While HDL takes cholesterol from peripheral tissues to the liver and helps with its elimination, LDL and VLDL transfer cholesterol to the peripheral tissues of diabetics where it is accumulated. The rise in LDL and VLDL is hence atherogenic. (20) Aqueous plant and callus extracts of the narrow-leaved lavender were used in a "green" synthesis to create colloidal stable silver nanoparticles. The features of the created NPs impact the potential of their application in the creation of multifunctional agents that combine therapeutic and diagnostic functions. (21) As a low-cost and environmentally safe synthesis approach for new and inventive nanomaterials, the utilization of biological materials for the manufacture of nanoparticles has a lot of potential. Green synthesis procedures for the production of nanoparticles also heavily depend on non-hazardous biological wastes. (22) Due to a limited period of time only limited samples can be taken. In future more uses of lavender and blue pea like anti oxidant, anti inflammatory activity will be evaluated

## CONCLUSION

A sensible method was investigated to create a green, environmentally acceptable way to synthesize silver nanoparticles using the extract of Lavender *augustifolia* and *Clitoria ternatea*. The synthesized Lavender *augustifolia* and *Clitoria ternatea* formulation mediated silver nanoparticles shows potent antidiabetic activity. The results of this work suggest that Lavender *augustifolia* and *Clitoria ternatea* formulation mediated silver nanoparticles may eventually be used in biomedical applications.

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## Conflict of Interest

The authors reported no conflict of interest while performing this study.

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