

Antidiabetic and Cytotoxic Effect of Hexane Extract in *Mucuna Pruriens*

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Abstract

Introduction: *Mucuna pruriens* Linn. is a common Indian medicinal plant that has long been used in traditional Ayurvedic Indian medicine for diseases like parkinsonism. This herb is pharmacologically investigated for various activities such as antidiabetic, antineoplastic, antiepileptic, antimicrobial, etc. A wide variety of phytochemical components have been isolated from this herb. **Aim:** The study was to determine the anti-diabetic and cytotoxic effects of hexane extract on *Mucuna Pruriens*. **Materials and methods:** *Mucuna pruriens* powder was weighed in a conical flask with distilled water and hexane solution added. Both of the flasks were covered with foil and kept in a shaker for 2 days and solution was added to both separate test tubes. The antidiabetic agent was added to each of the test tubes and heated. Using the spectrophotometer, a reading of both aqueous and hexane solutions was observed. Brine shrimp eggs are kept for two days to mature. In a 6 well ELISA plate artificial seawater was added to each of the 6 wells, 10 shrimps were added to the wells. The estimated volume of hexane extract is added to the brine shrimps with the help of micro-drippers. The setup is kept undisturbed for 24 hours, the number of shrimps that are alive on the first and second day is

counted and tabulated. Correlation analysis is done in SPSS. Results: *Mucuna Pruriens* has higher inhibition and a positive correlation which produces antidiabetic efficacy. The viability of Nauplii, analyzed for different concentrations after 24hr was found, all of them were alive and after 48hr 20,40,80micro microliter, all the nauplii were alive. Conclusion: The study establishes the in vitro antidiabetic activity of *Mucuna Pruriens* as evidenced from the hexane extract, showing a potential source for newer antidiabetic treatment.

Keywords: *Mucuna Pruriens*, Anti-diabetic, Diabetes Mellitus, Cytotoxicity, Brine shrimp lethality assay, green synthesis, ecofriendly.

Introduction

Nanotechnology can be characterized as the science and engineering involved in the design, synthesis, characterization, and application of materials and devices whose smallest functional organization, in at least one dimension, is on a nanometer or one billionth of a meter scale [1]. Nanotechnology has found numerous uses in medicine and this article outlines some of these applications. [2] Over the last 20-30 years, there has been an abundance of scientific information on plants, raw plant extracts, and other plant compounds as medicinal agents. [3] Although herbal medicine has been around since the beginning of time, our understanding of how plants influence human physiology remains largely unexplored. One such plant, which claims different medicinal properties, is *Mucuna pruriens* Linn., one of India's most common and essential medicinal plants [4]. It is a component of more than 200 indigenous drug formulations.

Mucuna pruriens is a native and widely naturalized and cultivated tropical legume native to Africa and tropical Asia [5]. Its common English names include monkey tamarind, velvet bean, Bengal velvet bean, Florida velvet bean, and Mauritius velvet bean [6]. The plant is an annual climbing shrub with long vines that can reach more than 15 meters. It fixes nitrogen and fertilizes the soil. The plant is a legume. The beans are eaten in Indonesia, particularly Java, and are widely known as 'Benguk' [7]. The seeds of *Mucuna pruriens* were used in Ayurvedic medicine to treat many dysfunctions [8,9]. For the prevention of illnesses, including Parkinson's. The plant's seeds contain about 3.1-6.1 percent L-DOPA, with serotonin, nicotine, and bufotenine trace amounts. [10,11]

In modern years, diabetes mellitus and its complications prove to be one of the main causes of morbidity and mortality. Among the plants used in the treatment of diabetes in the tropics is *Mucuna Pruriens* [12]. Diabetes mellitus is considered to be one of the most serious threats to humans in the 21st century [13]. It is a systemic disease characterized by continuous damage to the liver and pancreas. [14,15]. *Mucuna*'s phytic acid has antioxidant, anticarcinogenic, and hypoglycemic activities. Type II is more common than the Type I form of the two forms of diabetes mellitus. [16] The free radical formation also plays a key role. The underlying pathology is a defect in the mechanism of insulin secretion and resistance of insulin due to damage in pancreatic beta cells and liver disorders, which hinders the metabolism of carbohydrates, proteins,

and lipids. [17] Thus, this research is necessary to determine whether hexane extract of *Mucuna Pruriens* has a potential source of the antidiabetic drug.

Cytotoxicity is a nature that is toxic to cells. Brine shrimp lethality assay using crustacean eggs, *Artemia salina* is a more standard approach used to analyze the cytotoxicity of bioactive compounds [18][19]. Our team has extensive knowledge and research experience that has translate into high quality publications [20] [21–34] [35–39]

This study aims to determine the antidiabetic and cytotoxic effects of hexane extract on *Mucuna Pruriens*.

Materials And Methods

Test For Antidiabetic Activity

Mucuna pruriens dried seeds in powder form were collected where 5 g of powder was weighed and taken in a conical flask [A]. An additional 5 g of *Mucuna pruriens* were weighed and poured into a separate conical flask [B] to which 50 ml of distilled water and 50 ml of hexane solution were added. Further, both of the flasks were covered with foil and kept in a shaker for 2 days. Later, a separate test tube was taken and 10,20,30,40,50 microliter of the solution was added to both separate test tubes of hexane extract and aqueous solution. Further, an anti-diabetic agent was added to each of the test tubes, standard pre obtained values were used. All the test tubes are kept in a beaker with a small amount of water and heat the beaker for 15min at 50 degrees. Leave it to cool, further using the spectrophotometer to observe the reading of both aqueous and hexane solution.

Cytotoxic Effect

Brine shrimp eggs were obtained from the new aqua laboratory. Further, filtered artificial seawater was prepared, the shrimp eggs were added into the chamber while the lamp above the other side was to attract the hatched shrimp. The shrimps were kept for two days to mature. After which the shrimp is used for the assay. Later, a 6 well ELISA plate was taken and 5mL of artificial seawater was added to each of the 6 wells and 10 shrimps were added to the wells. Now, the estimated volume of hexane extract is added to the brine shrimps with the help of micro-drippers. This has to be done with care to avoid the extra count of Nauplii. The setup is kept undisturbed for 24 hours. Finally, the number of shrimps that are alive on the first and second day are counted and tabulated.

Correlation analysis was done using SPSS software,

followed by validations by the nano experts. *Mucuna Pruriens* Antidiabetic Activity and Cytotoxicity were analyzed.

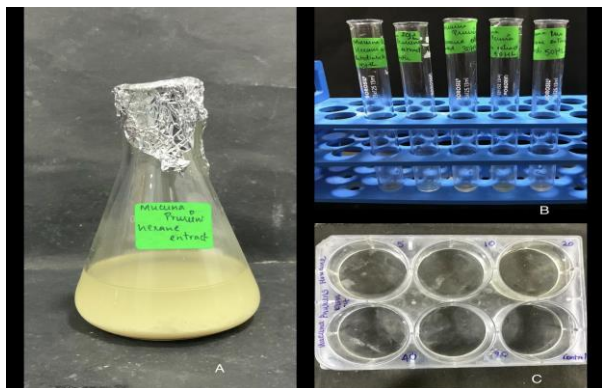


Figure 1: The image represents [A] Hexane extract of *Mucuna Pruriens*, [B] Hexane extract of *Mucuna pruriens* at different concentrations [C] Brine Shrimp Lethality Assay of hexane extract in *Mucuna pruriens*.

Results

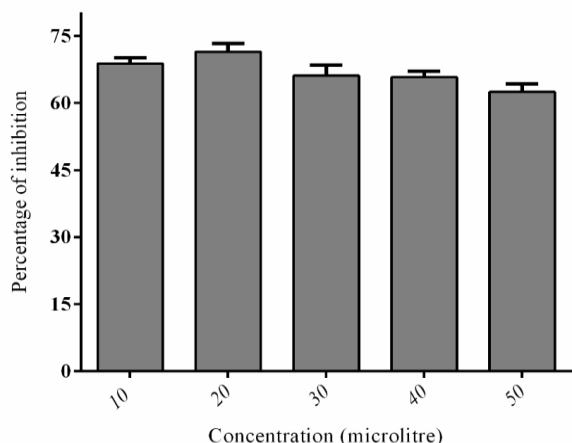


Figure 2: The spectrophotometric absorbance value and percentage of inhibition of the hexane extract at five different concentrations are represented. The X-axis represents concentration, Y-axis represents absorbance value and percentage of inhibition. Here, yellow color represents absorbance and green color represents percentage of inhibition.

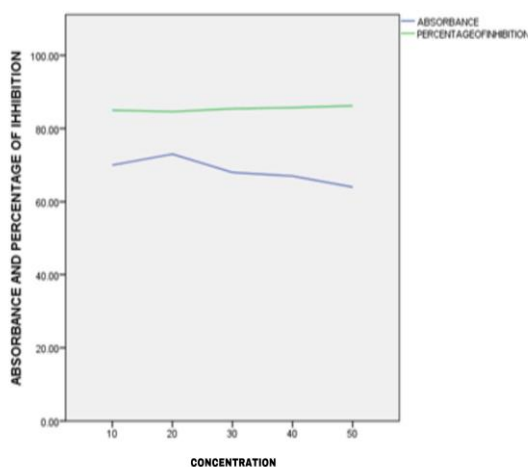


Figure 3: The given line diagram represents the antidiabetic effect of hexane extract in *Mucuna Pruriens*. X extract represents five different concentrations in microlitre and the Y-axis represents the absorbance and percentage of inhibition.

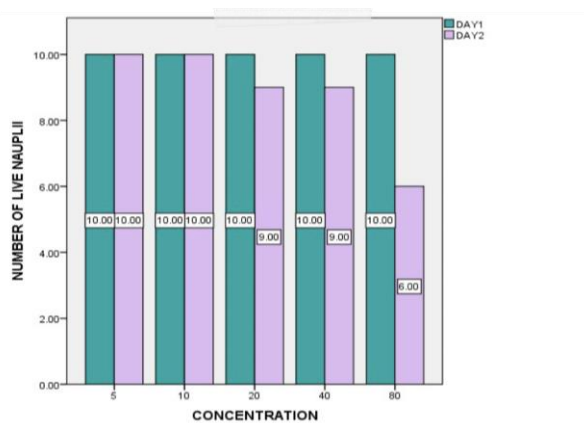


Figure 4: The graph represents the decrease in Nauplii count with an increase in concentration. The green color represents Day 1 and purple represents Day 2 respectively.

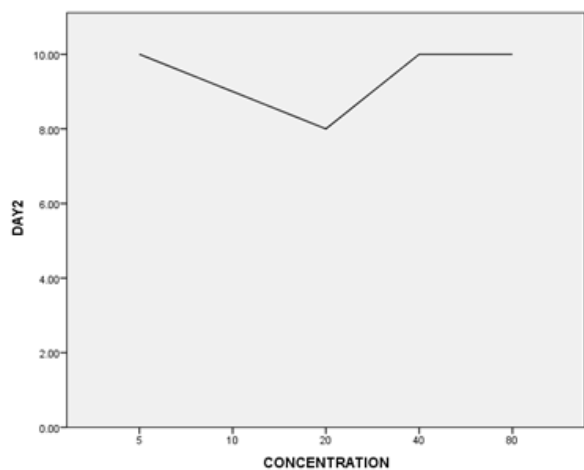


Figure 5: The given line diagram represents the cytotoxic effect of hexane extract in *Mucuna Pruriens*. The X-axis represents four different concentrations in microlitre and the Y-axis represents the number of nauplii present on day 2.

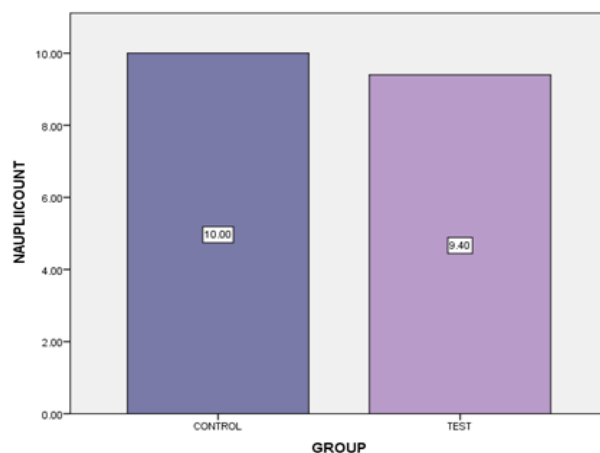


Figure 6: The graph represents the cytotoxic effect of hexane extract in *Mucuna pruriens*. The X-axis represents the group with control and test, the Y-axis represents the nauplii count.

From the results of our study, it is clear that *Mucuna Pruriens* has higher inhibition on rising concentration levels which shows a positive correlation with standard and produces antidiabetic efficacy seen in Figure 2,3. Brine shrimp lethality assay is an important test in the study of toxicity. The viability of

Nauplii was analyzed for different concentrations, after 24hr it was found all of them were alive and after 48hr it showed a negative correlation with the increase in concentration but with positive cytotoxicity seen in Figure 4,5.

Discussion

Diabetes mellitus has been a major cause worldwide, a lot of studies have had multiple approaches to overhead diabetes mellitus[40]. The drugs at the market inhibit the activity of enzymes like miglitol, voglibose, and acarbose. The long-term usage of these will lead to a lot of side-effects with abdominal bloating. [41] Using the extract of natural compounds extracted from medicinal plants may eradicate these effects. Many researchers have identified the antidiabetic efficacy of *Mucuna pruriens* Linn [42] Grover et al [43]documented this property in their hunt for antidiabetic plants in alloxan-induced diabetic rats. Rathi et al [44] tested the alcoholic extract of *Mucuna pruriens* [100, 200, and 400 mg/kg/day] in alloxan-induced rats and streptozotocin [STZ] mice. A study done by Donati et al [45] added an antidiabetic agent but it failed to maintain the renal hypertrophy but in our present study the antidiabetic agent is maltose.

The *Mucuna Pruriens* ethanolic seed extract chose to have potential efficacy and thereby improving the antidiabetic effects concluded from the study done by Sekar Suresh et al[46], Where is the work done by Prithviraj Prakash et al [47]Revealed that the potential of *Mucuna Pruriens* improves the anti-inflammatory activity in comparison to antidiabetic effect. The study was done by Lim Et al [48] supports the traditional use of milk you know proteins for the treatment of diabetes, indicating the plant good source of potent antidiabetic drug which stand similar to the study of L.Lank et al [49]Which revealed that the alcoholic extract of leaf and fruit of *Mucuna Pruriens* showed antibacterial activity.

Further, the study done by Fuji et al[50] Concluded that the fatality of the alive nauplii after 24 hours showed the lowest concentration at 5 and 10 microliter

Concentrations that contradict our result But stand similar to Kosteletzky et al [51]Study with lower concentration at 80 µL. Also in comparison to the study done by Manyam et al [52]Established that the herbal drug used for nervous disorders proves to have anti-Parkinson's and neuroprotective effects which contradict our study of interest. Lyophilized aqueous extract of *Mucuna Pruriens* lowered the occurrence rate of cataracts in treated populations [53]. David et al [54] demonstrated the existence of D-chiro-inositol and its two galactose-derivatives in *Mucuna pruriens* seeds and explained their anti-hyperglycemic effect.

The limitations of the present study are that there is a lack of assays of anti-inflammatory, anti-microbial activity whereas the antidiabetic and cytotoxicity was only measured activity which likely seems to be consistent with the earlier reports. Further, the

studies carried out to identify specific constituencies to drive this mechanism of the following activities.

Conclusion

The study establishes the in vitro antidiabetic activity of *Mucuna Pruriens* and evidence from hexane extract, showing high potential sources. *Mucuna Pruriens* may block many other complications of diabetes by reducing oxidative stress and hence protects from oxidative damage. It is recommended to conduct a long-term study for a close evaluation of the anti-diabetic properties of *Mucuna pruriens* seeds.

Highlights

Mucuna pruriens supports a healthy central & peripheral nervous system.

This activity has a better potential of anti-diabetic and cytotoxic effect than an individual plant extract. Hence this can be used for finding new drugs with higher potency and less toxicity.

Acknowledgement

The authors are thankful to Saveetha Institute of Medical and Technical Sciences, Saveetha Dental College and Hospitals, Saveetha University for giving a platform to conduct the study.

Conflict Of Interest

The authors would like to declare no conflict of interest in the present study.

Funding

- The present project is supported by:
- SARKAV Health Services, Chennai
- Saveetha Dental College and Hospitals,
- Saveetha Institute of Medical and Technical Sciences,
- Saveetha University, Chennai.

Authors' Contributions

A.ShivapriyaRaje' designed the study, performed the methods and wrote the first draft of the manuscript and Dr. Priyadarshini R' performed the statistical analysis and wrote the protocol, 'Dr. Rajeshkumar S' managed the analyses of the study and managed the literature searches and "Dr. Palati Sinduja" managed the final drafting and editing of the manuscript. All authors read and approved the final manuscript."

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