



## **Comparative Anti Inflammatory Activity of Hexane and Aqueous Extract of *Mucuna pruriens***

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author SD designed the study, performed the methods and wrote the first draft of the manuscript and author RP performed the statistical analysis and wrote the protocol. Author SR managed the analyses of the study and managed the literature searches and author PS managed the final drafting and editing of the manuscript. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Introduction:** *Mucuna pruriens* is a tropical legume native to Africa and tropical Asia. The plant is an annual climbing shrub with long vines that can reach a height of 15 meters in length. *Mucuna pruriens* belong to the family legume. It is a herbal drug that is used as a medicine for the treatment of male infertility, nervous disorder, and also as an aphrodisiac. It has been shown that it potentially has more medical importance. It causes orange hair that causes a severe itch when in contact with the skin. It releases a protein called mucanain.

**Aim:** To determine the anti-inflammatory activity of aqueous and hexane extract of *Mucuna pruriens*.

**Materials and Methodology:** The extract was prepared and the anti-inflammatory effect was done using a UV-Beckmann spectrometer. The anti-inflammatory activity of nanoparticles prepared using plant extract was investigated by albumin denaturation assay. The results of the test were described as the standard deviation and analyzed using UV-Vis spectroscopy. Correlation and analysis were done in SPSS.

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**Results:** The hexane solution and aqueous solution of *Mucuna pruriens* have a high percentage of inhibition at the 30 µl, 40 µl and 50 µl concentration when compared with a standard solution. And hexane has a high percentage of inhibition at 50µl when compared with a standard solution. The obtained data were analyzed using spearman correlation analysis and the non-parametric correlation was statistically significant at p value< 0.05.

**Conclusion:** The aqueous and hexane extract of *Mucuna pruriens* show good anti- inflammatory activity. In that hexane extract has good anti-inflammatory activity when compared with aqueous extract. And it is used for disease. And further research should be done with the action and mechanism of *Mucuna pruriens*.

**Keywords:** Anti-inflammation; innovative technology; *Mucuna pruriens*; nerve disorder; Parkinson's disease.

## HIGHLIGHTS

- *Mucuna pruriens* belong to the legume family.
- It is used for anti-inflammatory activity and diabetic disorders.
- It is an ornamental plant and used for many medicinal values.
- In that hexane extract has good anti-inflammatory activity when compared with aqueous extract.
- This plant is pharmacologically studied for varied activities like medication, aphrodisiac, antineoplastic, anticonvulsant, antimicrobial activities, etc.

## 1. INTRODUCTION

*Mucuna pruriens* may be a common Indian medicative plant that has been employed in ancient Ayurvedic Indian medication for diseases like brain disorder [1]. *Mucuna pruriens* belong to the legume family and it is a flavourer drug used for the treatment of male sterility, nervous disorders, and as an aphrodisiac. Its seed area unit is probably of considerable medicative importance. The plant *M. pruriens* named as "velvet bean," could also be a lively annual climb legume originally from Southern China, Japan, and Asian countries, wherever it's only one occasion widely cultivated as a vegetable crop. The plant has long, slender branches, alternate, lance-like leaves, and white flowers with a bluish-purple, butterfly-shaped whorl. The pods or legumes are bushy, thick, and leatherlike, average it's four inches long, and has formed like string sound holes, and contains seeds. They are brown with thick coats and stiff hairs [2]. Emulsifiers are proteins found in living things that are capable of interacting with carbohydrates [3,4].

This plant is pharmacologically studied for varied activities like medication, aphrodisiac, antineoplastic, anticonvulsant, antimicrobial activities, etc [5]. Its medicinal drug agents, the nice effort has been spent on the event of medicine for the treatment of inflammation and has many medicinal values [6]. Clinical effects and levodopa pharmacokinetics following two different doses of *Mucuna* preparations and comparing them with standard L dopa /carbidopa. It has onset action and has a long time effect without a concomitant increase in dyskinesias [7]. *M.pruriens* have an intrinsic DOPA -decarboxylase inhibitor or act by the mechanism which is independent of levodopa [8]. Velvet beans are used like coffee in America. It is a crop and provides fodder and green manure and is also used as an ornamental plant. And treatment reduced the anti- nutritional value of the seed by autoclaving. [9,10].

Inflammation can be defined as the response of the body against various nanoparticles like exogenous and endogenous inciting agents like pathogens, damaged cells, or toxic compounds [11].

Inflammation is related to conditions like trauma, heat, chemical, and microorganism, arthritis, gout, and cancer. Inflammation signs are heat, redness, swelling, pain, and loss of performance. Medicine employed in the inflammation area unit is effective and has facet effects.

[12] Medicine like NSAIDs, corticosteroids area units want to manage the pain and inflammation Anti-inflammatory activity was tested in carrageenan evoked rat paw edema model and cotton pellet technique in rat [13,14]. Anti-inflammatory assays were analyzed by a hot plate, formalin, and used probably as a centrally mediated opioid antagonist against analgesia [15]. The study involves evaluating the impact of

the methanolic extract of *M. pruriens* seed in mice with relevancy delayed hypersensitivity wherever in vitro inflammatory leukocytes mobilize [16].

This study is needed to reduce the inflammation by the plant extract because plant extract has no toxicity and has fewer side effects which are good for health. This will fulfill various health issue problems and treatment of various nerve disorders. It can be used as an alternative drug in the future. Our team has extensive knowledge and research experience that has translated into high quality publications [17–36]. The study aims to determine the anti-inflammatory activity of aqueous extract and hexane extract of *Mucuna pruriens*.

## 2. MATERIALS AND METHODS

### 2.1 Preparation of the Extract

*Mucuna pruriens* dried seeds in powder form were collected in readymade form. Using a weighing machine, 5 gms of mucuna pruriens were weighed and taken in a conical flask [A]. And another 5gms of *Mucuna pruriens* were weighed and poured into the separate conical flask [B]. In [A] conical flask they add 50ml of distilled water and in another [B] conical flask they add 50ml of hexane solution. And cover the mouth of both conical flasks with foil paper. And kept the conical flask inside the shaker for 2 days. After 2 days observations were noted and

transferred to a separate test tube and added 10 $\mu$ l, 20 $\mu$ l, 30 $\mu$ l, 40 $\mu$ l, 50 $\mu$ l of the solution in the separate test tube for both hexane and aqueous solution. Then add an anti-inflammatory agent to each of the test tubes. And keep all the test tubes in a beaker with a small amount of water. And heat the beaker for 15 min at 50 degrees. And cool the beaker. And using a spectrophotometer observe the reading of both aqueous and hexane solutions. The error should be avoided while the collection of samples. It belongs to a randomized control study. This study is only on anti-inflammatory effects. Correlation and analysis were done in spss and Non parametric correlation was significant at p value less than 0.05. Validations were done by nano experts.

### 2.2 Reagent and Chemicals

#### 2.2.1 Anti inflammatory:

0.45 mL of Bovine serum albumin (1% aqueous solution)

0.05 mL of *Pterocarpus santalinus* of various fixation (10 $\mu$ L, 20 $\mu$ L, 30 $\mu$ L, 40 $\mu$ L, 50 $\mu$ L)

1N hydrochloric acid

Positive control: Diclofenac Sodium

Negative control: DMSO: Dimethyl sulfoxide.

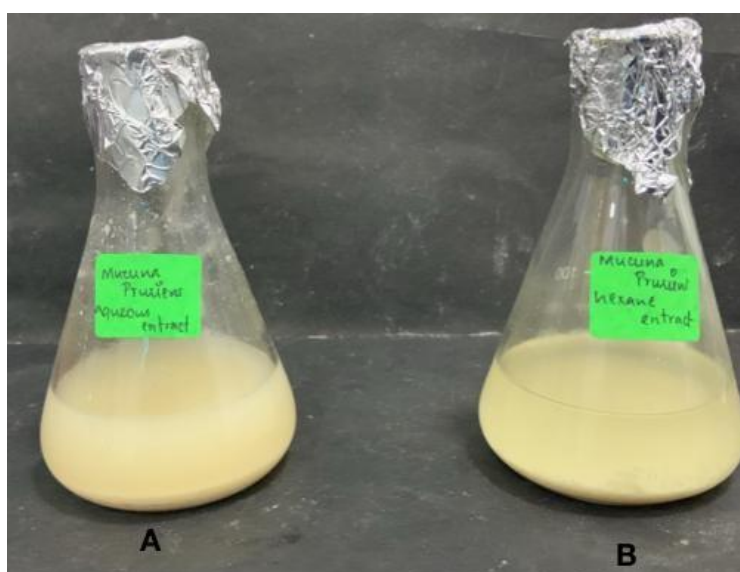
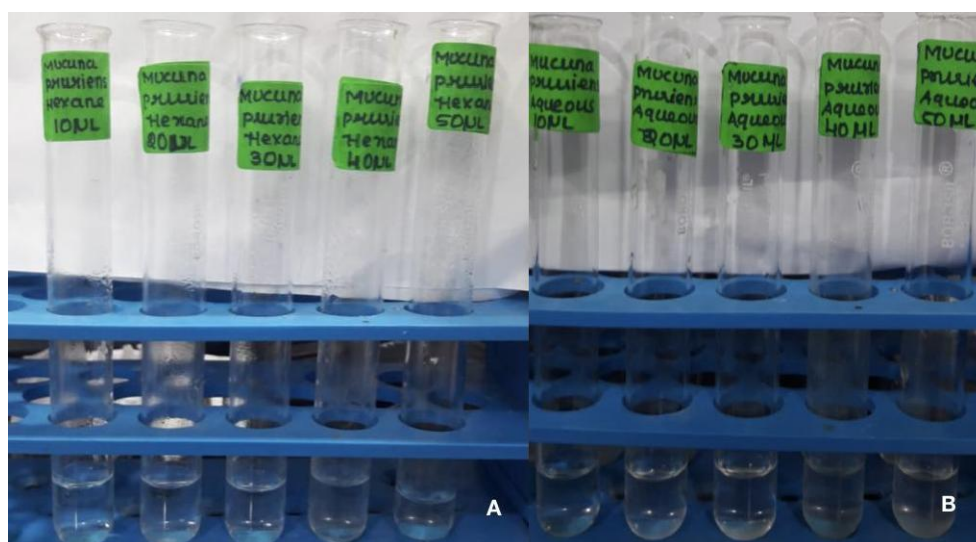


Fig. 1. Sample A is an aqueous extract of *Mucuna pruriens*, where Sample B is a hexane extract of *Mucuna pruriens*. Sample A shows a pale yellow turbid appearance of aqueous extract, where sample B shows a pale yellow translucent appearance of hexane extract



**Fig. 2. Anti-inflammatory activity assessed using albumin denaturation assay . Sample A test tube shows an anti-inflammatory activity of hexane and sample B test tube shows the anti-inflammatory activity of aqueous extract**

### 3. RESULTS

#### 3.1 Anti- Inflammatory Activity

The present study revealed that at the concentration of 10 $\mu$ l, hexane extract has 58% of inhibition and aqueous extract has 57% of inhibition which is more than the standard solution 46%. At a concentration of 20 $\mu$ l, hexane extract has 65% of inhibition and aqueous has 61% of inhibition when compared to this standard solution has less zone of inhibition of 60%. At the concentration of 30  $\mu$ l, hexane extract has more zone of inhibition 75% when compared with a standard solution, 71%, when compared with this aqueous, has less percentage of inhibition of 69%. At 40  $\mu$ l standard solution has more zone of inhibition 78% when compared with the percentage of inhibition with hexane extract of 76% and an aqueous solution of 70%. At 50 $\mu$ l of concentration, the standard solution has more inhibition of 82 % when compared with the %inhibition with hexane extract 78% and an aqueous solution of 71%.

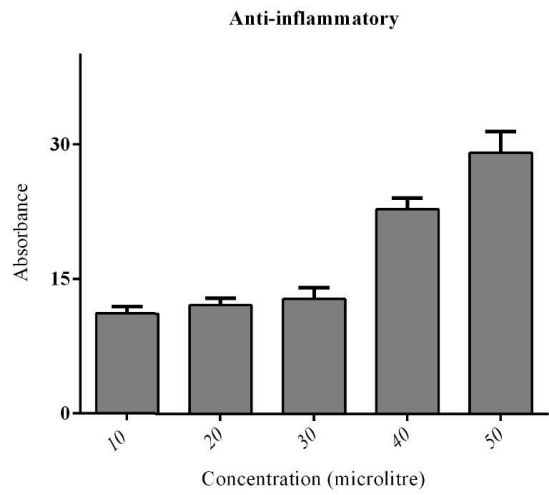
### 4. DISCUSSION

The present study revealed that at the concentration of 10 $\mu$ l, hexane extract has 58% of inhibition and aqueous extract has 57% of inhibition which is more than the standard solution 46%. At a concentration of 20 $\mu$ l, hexane extract has 65% of inhibition and aqueous has

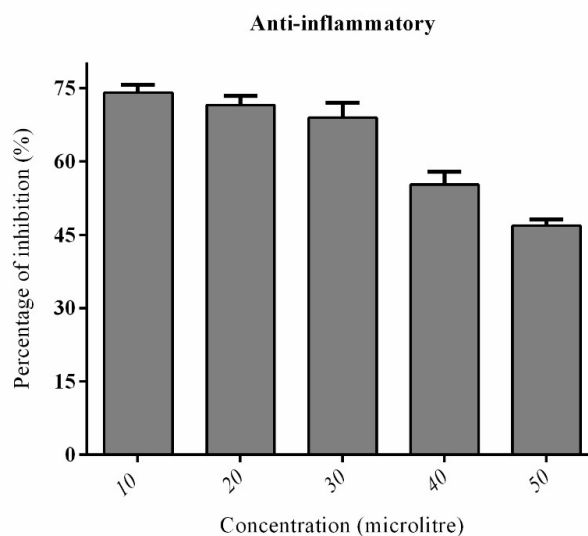
61% of inhibition when compared to this standard solution has less zone of inhibition of 60%. At the concentration of 30  $\mu$ l, hexane extract has more zone of inhibition 75% when compared with standard solution 71%, when compared with this aqueous has less percentage of inhibition of 69%. At 40  $\mu$ l standard solution has more zone of inhibition 78% when compared with the percentage of inhibition with hexane extract of 76% and an aqueous solution of 70%. At 50 $\mu$ l of concentration, the standard solution has more inhibition of 82 % when compared with the %inhibition with hexane extract 78% and an aqueous solution of 71%. So, Hexane extract shows in (Fig. 3) more percentage of inhibition when compared to the aqueous solution. In the hexane extract the spectrophotometric absorbance value. When the concentration increases the absorbance level also increases which shows that it has good anti-inflammatory activity in the hexane extract. In (Fig. 4) the spectrophotometric value of the percentage of inhibition shows when the concentration increases the percentage of inhibition decreases which shows that it has a good inflammatory effect. In (Fig. 5) the spectrophotometric value shows the percentage of inhibition and absorbance level at different concentrations of the extract. In this when the concentration increases the absorbance value also increases and the percentage of the inhibition decreases and it shows good anti-inflammatory activity. In (Fig. 6) the spectrophotometric shows the level of absorbance. When the concentration

increases the absorbance level also increases which shows that it has good anti-inflammatory activity in the aqueous extract. In (Fig. 7) the spectrophotometric value shows the percentage of inhibition. In this when the concentration increases the percentage of inhibition decreases which shows that it has a good inflammatory effect among the bovine serum albumin. And in

(Fig. 8) the spectrophotometric value shows the percentage of inhibition and absorbance level at different concentrations of the extract. In this when the concentration increases the absorbance value also increases and the percentage of the inhibition decreases and it shows good anti-inflammatory activity.



**Fig. 3. The spectrophotometric absorbance value. When the concentration increases the absorbance level also increases which shows that it has good anti-inflammatory activity in the hexane extract. Non parametric correlation was significant at p value less than 0.05. X axis extract in microlitre and the Y axis shows the percentage of shows the concentration of the inhibition ( $r = +1$ )**



**Fig. 4. The spectrophotometric value of the percentage of inhibition hows when the concentration increases the percentage of inhibition decreases which shows that it has a good inflammatory effect. Non parametric correlation was significant at p value less than 0.05. X axis shows the concentration of the inhibition ( $r = -1$ )**

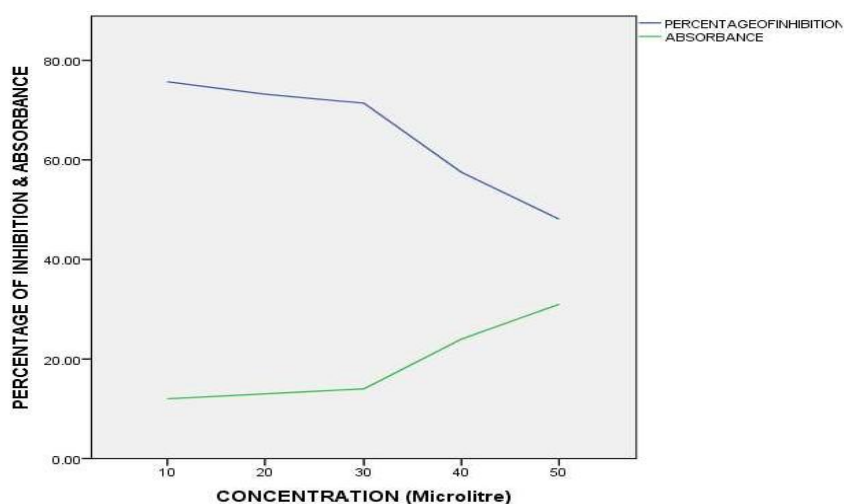


Fig. 5. The Line graph depicts the percentage of inhibition and absorbance level at different concentrations of the extract

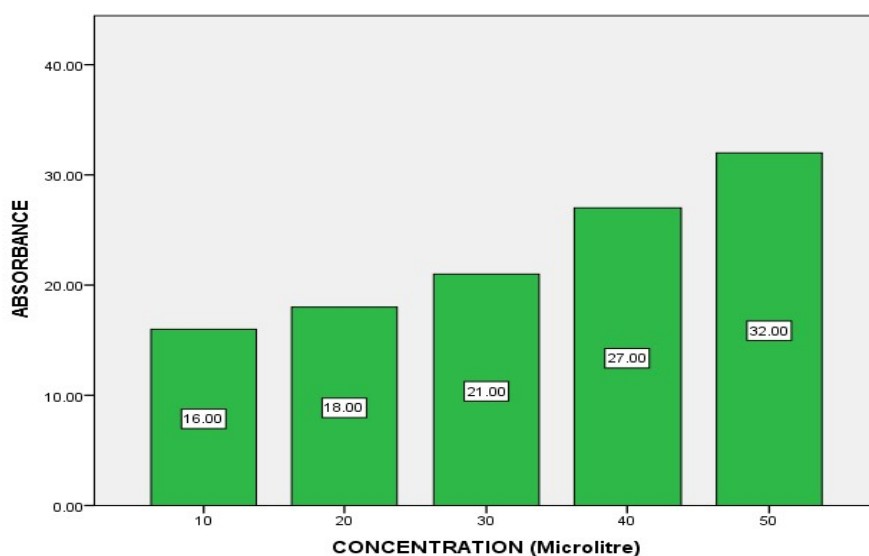


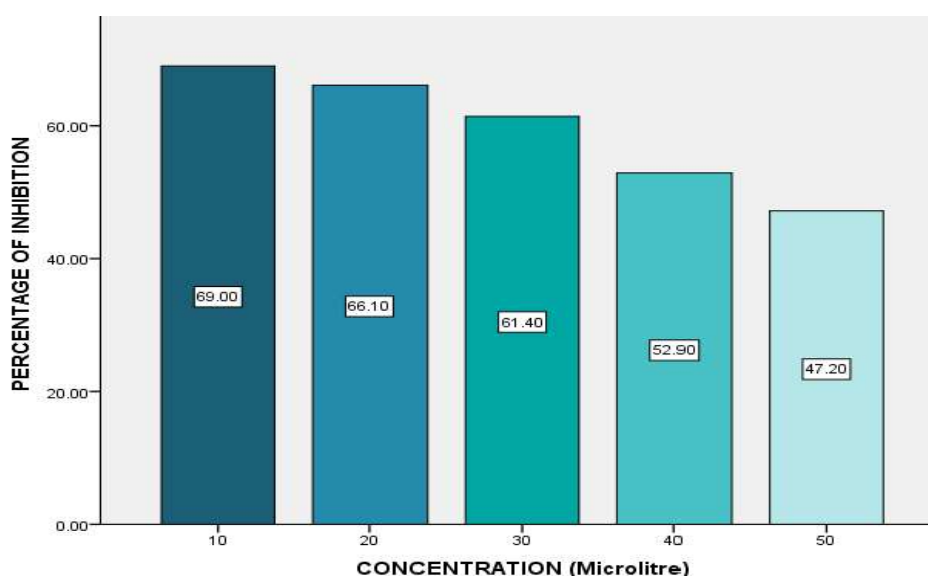
Fig. 6. The above bar diagram is on the level of absorbance. When the concentration increases the absorbance level also increases which shows that it has good anti-inflammatory activity in the aqueous extract. Non parametric correlation was significant at p value less than 0.05. X axis shows the concentration of the inhibition ( $r=+1$ )

Table 1. Anti -inflammatory activity of mucuna pruriens in the hexane extract The below table shows the anti -inflammatory activity of mucuna pruriens in the hexane extract along with % of inhibition

S.No	Concentration ( $\mu$ l)	Wavelength (nm)	Absorbents (wt%)	% of inhibition
1.	10	660	0.112	75.7
2.	20	660	0.11	73.2
3.	30	660	0.111	71.4
4.	40	660	0.112	57.5
5.	50	660	0.11	48.1

**Table 2. Anti -inflammatory activity of mucuna pruriens in aqueous extract The below table shows the anti -inflammatory activity of mucuna pruriens in aqueous extract along with % of inhibition**

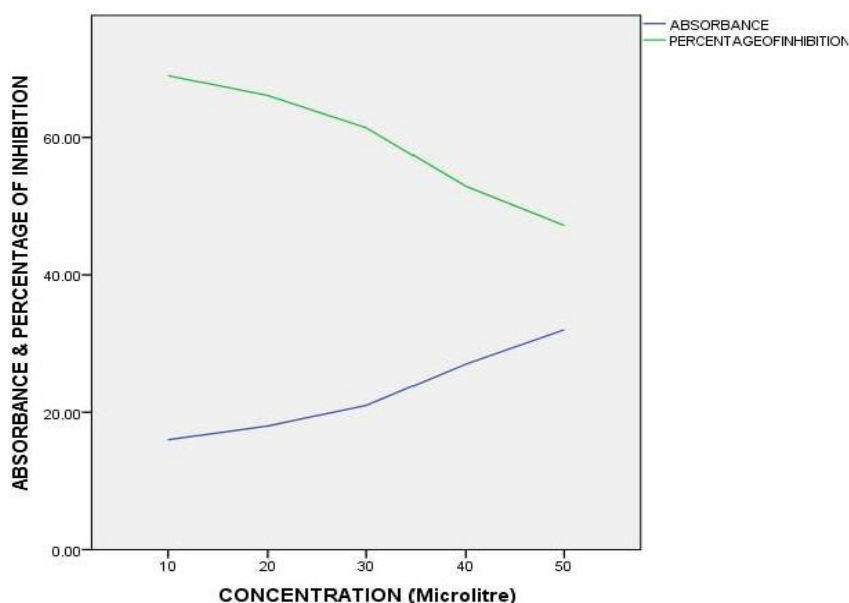
S.No	Concentration (µl)	Wavelength (nm)	Absorbents (wt%)	% of inhibition
1.	10	660	0.161	69
2.	20	660	0.18	66.1
3.	30	660	0.212	61.4
4.	40	660	0.276	52.9
5.	50	660	0.326	47.2



**Fig. 7. The above bar graph is on the percentage of inhibition. Concentration increases the percentage of inhibition decreases which shows that it has a good inflammatory effect among the bovine serum albumin. Non parametric correlation was significant at p value less than 0.05. X axis shows the concentration of the extract in microlitre and the Y axis shows the percentage of inhibition ( $r = -1$ )**

In the previous article, the author concluded that coriander oleoresin with selenium nanoparticles has good anti-inflammatory activity. And it is easy to find and it is eco-friendly [37]. The zinc oxide nanoparticles using the grape seed extract acts as an anti-inflammatory agent with the least side effects. It is used as an anti-inflammatory agent in labs [38]. Increasing concentrations of has increased anti-inflammatory activity. Chitosan nanoparticles have better anti-inflammatory activity. It can be used as an effective anti-inflammatory agent. Further formulations in various forms such as gel and microspheres can be potentially used for controlled drug delivery in the treatment of periodontitis [39]. The previous author concluded that the effect of aqueous extract of *Mucuna pruriens* leaves on liver enzymes studies.

*Mucuna pruriens* extract being used traditionally to improve liver disease conditions and improve antioxidant activity. Aqueous extracts of *M. pruriens* leaves have demonstrated antimicrobial and antioxidant activities with bioactive compounds such as phenols, polyphenols, and tannins [40]. In vitro test was done for anti-inflammatory property. 1% of BSA was taken and 2ml of it was mixed with the plant extract. and it is incubated and kept in the water bath for a few minutes after that absorbance value was estimated in that they concluded that zinc oxide nanoparticle has anti-inflammatory properties [41]. Antioxidant properties were done with *M. pruriens*. In vitro study, it has high phenolic content and it has high antioxidant activity. It has the benefit of levodopa where it is used for the treatment of snake bites, Parkinson's disease.



**Fig. 8.** The line graph shows the percentage of inhibition and absorbance levels at different concentrations of the extract. In this when the concentration increases the absorbance value also increases and the percentage of the inhibition decreases and it shows the good anti-inflammatory activity

And in this, it fails to describe each test, and the hydrophilic compound is used as an identification. DPPH and ABTS assay harm human health with the high phenolic activity of antioxidants [42] *M. presents* leaves as used for hallucinogenic tryptamines antinutritional activity with phenol tannin. In the invitro scavenge DPPH has radical reactivity with oxygen species [43].

No adverse effect was found in animal blood samples. The seed comet assay has negative results which cause damage to DNA. Alteration plant Wistar albino mice weigh 20.25gm used as a standard propylene cage and controlled temp and fed and its standard lab diet and water and libitum [44]. It poses significant analgesic activity and increases the dose of seed powder. It doesn't observe effects including mutagenicity seed. It has future scope such as it can isolate pure drugs which may be more potent [45]. Parkinson's disease (PD) is the most common neurodegenerative and movement disorder, a black tea polyphenol exhibited neuroprotective effects on rotenone-induced apoptosis in SH-SY5Y cells. Advanced studies can be done with this plant extract with a different activity [46]. The limitations of the present study is the small number of concentration and in vitro study. In the future, this study can be conducted in increased

concentration, and clinical studies can be done and animal studies can also be done. It can be used as an alternative drug in the future.

## 5. CONCLUSION

*Mucuna pruriens* aqueous and hexane extracts have anti-inflammatory properties. In comparison to aqueous extract, hexane extract shows good anti-inflammatory activity. *Mucuna pruriens* is used to treat a variety of disorders, and more research into its action and mechanism is needed.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## ACKNOWLEDGEMENT

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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