



IJPPR

INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH  
An official Publication of Human Journals

ISSN 2349-7203



Human Journals

Research Article

June 2024 Vol.:30, Issue:6

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## Pharmacological Investigation of Seeds of *Cardiospermum halicacabum* L.: *Invitro* Antidiabetic and Antiarthritic Activity



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ISSN 2349-7203

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**Submitted:** 23 May 2024  
**Accepted:** 28 May 2024  
**Published:** 30 June 2024

**Keywords:** hydroalcoholic, *Invitro*, antiarthritic,  $\alpha$ - amylase enzyme inhibition.

### ABSTRACT

India, with its diverse ethnic groups and unique biodiversity, has a centuries-long tradition of ethnobotanical health promotion and illness treatment. Among the medicinal herbs, the plant *Cardiospermum Halicacabum* L. is a plant with wide range of medicinal use, belongs to the family Sapindaceous. It is commonly known as 'ballon vine', 'heart seed' or 'kanphuti' in local language. The present investigation evaluates *Invitro* Antiarthritic, Antidiabetic Activity of hydroalcoholic seed extract of *Cardiospermum Halicacabum* L. It gives 79% antiarthritic activity at 300 $\mu$ g/ml conc., 74.37% antidiabetic activity at 400 $\mu$ g/ml conc. The extract shows significant activities.



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## INTRODUCTION

Traditional Indian medicine is gaining popularity, and it has proven effective for many chronic conditions. While the use of medicinal plants and Indian spices is common and harmless, the use of more concentrated products made from single plants, such as herbal teas or extracts, is more concerning.<sup>8</sup>

Medicinal plants are natural sources of bioactive phytochemical constituents that, due to their strong physiological effects on the human body, can be used to treat a wide range of ailments. India, with its diverse ethnic groups and unique biodiversity, has a centuries-long tradition of ethnobotanical health promotion and illness treatment. Among the medicinal herbs, the plant *Cardiospermum Halicacabum* L. belongs to the family Sapindaceae and has a wide range of medicinal properties.<sup>3</sup>

Rheumatoid arthritis (RA) is a chronic systemic inflammatory disease that mainly affects the synovial lining of the joints, causing articular cartilage breakdown and synovial growth. It is linked to increased disability, an increased risk of premature mortality, and economic difficulties.<sup>6</sup> RA is more frequent in females than in males. Although the precise etiology of RA is still unknown, infection with microbes, most likely viruses, in those who have a genetic susceptibility to the disease may be the initial step towards the development of inflammation.<sup>5</sup>

In rheumatoid arthritis, synovial alterations develop as the illness progresses. Tissue oedema and fibrin deposition are predominant in the early weeks of the illness, and can present clinically as joint swelling & discomfort. Herbal products have a wide range of chemical diversity, pharmacological specificity, and molecular properties, making them ideal candidates for lead structure identification. Thousands of plant isolates that exhibit antiarthritic (AA) properties have been studied and reported. These plant isolates have been classified as alkaloids, glycosides, terpenoids, flavonoids, etc.<sup>2</sup>

Diabetes is a condition in which the body either produces insufficient insulin or fails to use the insulin that it does produce effectively. There are three types of diabetes: Type 1 insulin-dependent diabetes mellitus (IDDM), in which the body is unable to secrete insulin and the patient must currently use an insulin pump or inject insulin. Another name for this is "juvenile diabetes". Type 2, non-insulin-dependent diabetic mellitus (NIDDM), is caused by insulin resistance, a disorder in which cells are unable to utilize insulin as intended, either

completely or partially. The term "adult-onset diabetes" was once used to describe this kind. Gestational diabetes, the third primary form, occurs due to elevated blood glucose levels in pregnant women who have never had diabetes before. It might occur before type 2 DM develops.<sup>1</sup>

Diabetes is a serious metabolic disorder, and several marketed medications are available to treat its symptoms. However, these over-the-counter medications are costly and come with a variety of side effects. Herbal medicines are gaining popularity because they are less expensive and provide better therapeutic results with fewer side effects.<sup>11</sup>

The current study focuses on medicinal properties of *Cardiospermum Halicacabum* L seeds extract viz., antiarthritic, antidiabetic used to treat above mentioned disorders.

## **MATERIALS AND METHODS**

### **Collection of plant**

The seeds sample of *Cardiospermum Halicacabum* L were collected from local area of Malshiras, Solapur (District), Maharashtra, India during October 2023. The seeds sample was shade dried at room temperature for 3 weeks. The dried seeds were later coarsely powdered with help of electric grinder after passed through sieve no 20 to obtain coarse powder. Powder was stored at room temperature to protect it from moisture.

### **Extract preparation:**

The Soxhlet apparatus was employed during the extraction preparation process. The extraction is carried out by using Hydroalcoholic solvent. the coarse powder (35g) was subjected to successive extraction in 100 ml of Hydroalcoholic solvent methanol : water ( 6 : 4 ) by using Soxhlet apparatus. The cycles carried out until clear solvent obtained (9 cycles). Whatmann filter paper, (No. 2), was used to filter the extracts. while hot, dried in evaporator and later air dried.

## **INVITRO ANTIARTHRITIC ACTIVITY**

To evaluate its efficacy, the protein denaturation inhibition assay was employed. Plant extract made, ranging from 100 to 300ug/ml. For each dose, a reaction mixture was created using 1 ml of the test medication and 0.9 ml of a solution containing 1% bovine serum albumin.

These created samples were incubated at 37<sup>0</sup> c for 20 min and heated at 57<sup>0</sup> c for 3 min which were cooled and 2.5 ml of phosphate buffer (pH 6.3) was added. After cooling turbidity was measured spectrophotometrically at 660 nm. Diclofenac sodium was used as the reference drug and processed in the same way as the test extract at concentrations ranging from 100 to 300ug/ml. Using a control with no medicine given, the percentage inhibition of denaturation was computed. The average was calculated after experiment. The Utilizing, one could determine the percentage suppression of protein denaturation following equation. <sup>12</sup>

### Calculation

$$\% \text{ inhibition} = \frac{\text{Abs. of control} - \text{Abs. of test}}{\text{Abs. of control}} \times 100$$

## INVITRO ANTIDIABETIC ASSAY

### Inhibition of $\alpha$ - amylase enzyme

For performing  $\alpha$ -amylase enzyme inhibition assay, the different concentration of test samples and standard drug (100, 200, 300 and 400  $\mu$ g/ml) and prepared by adding of 0.20 mM phosphate buffer (pH 6.9) containing  $\alpha$ -amylase (0.5mg/ml) solution and were incubated at 25°C for 10 min. after that 1% starch solution prepared in 0.02 M sodium phosphate buffer (pH 6.9) was added to each tube. Again, reaction mixtures were incubated for 10 minutes at 25°C. With the addition of 1.0 ml of 3, 5 dinitro salicylic acid color reagent, the reaction was stopped. This reaction mixture incubation in a boiling water bath for 5 min and cooled at room temperature. After cooling diluted by adding 10 ml distilled water and absorbance was measured at 546 nm. The control was performed in a similar manner by replacing the extract with vehicle. Black is buffer solution.<sup>4</sup>

### Standardization

Standardization of the in vitro Inhibition of  $\alpha$ -amylase enzyme assay was done by using standard acarbose.

### Calculation:

Percentage Inhibition of  $\alpha$ -amylase enzyme is calculated by

$$\% \text{ inhibition} = \frac{\text{Abs of control} - \text{Abs of test}}{\text{abs of control}} \times 100$$

**Result and discussion**

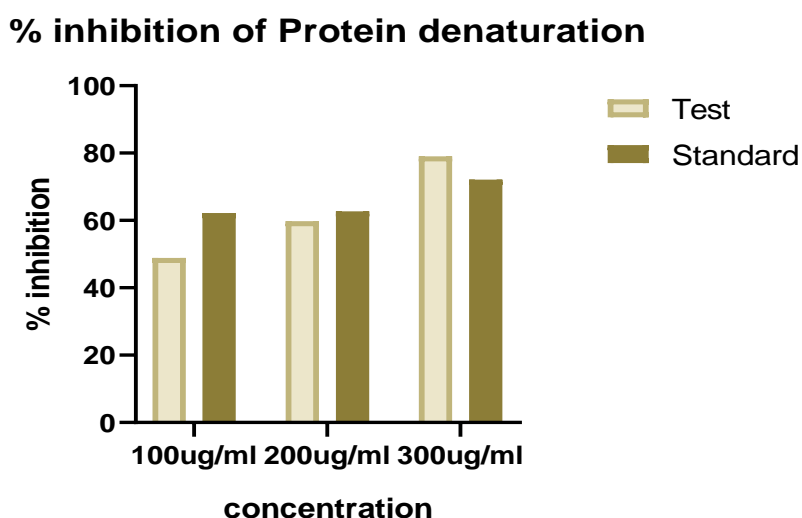
**IN VITRO ANTIARTHRITIC ACTIVITY**

- **Protein denaturation inhibition**

Table no 1: Result of *invitro* antiarthritic activity of seeds extract of *C. Halicacabum* L

Sr no	Plant extract	Concentration $\mu\text{g/ml}$	% inhibition
1	Control	-	-
2	Standard	100	62.22%
		200	62.71%
		300	72.15%
3	Hydroalcoholic	100	48.91%
		200	59.80%
		300	79.00%

Graph no1: Result of *Invitro* antiarthritic activity of seeds extract



The current study investigates the anti-arthritic Activity of the seed extract of plant *Cardiospermum Halicacabum* L by using protein Denaturation inhibition assay. It is found that percentage inhibition increases with increase in concentration from 100  $\mu\text{g/ml}$  to 300  $\mu\text{g/ml}$ . Hydroalcoholic extract of seed of *Cardiospermum Halicacabum* L shows the maximum percentage inhibition of 79.00% at 300  $\mu\text{g/ml}$  concentration. This percentage inhibition of

seed extract is then compared with the percentage inhibition of standard diclofenac sodium. Seeds extract shows significant activity.

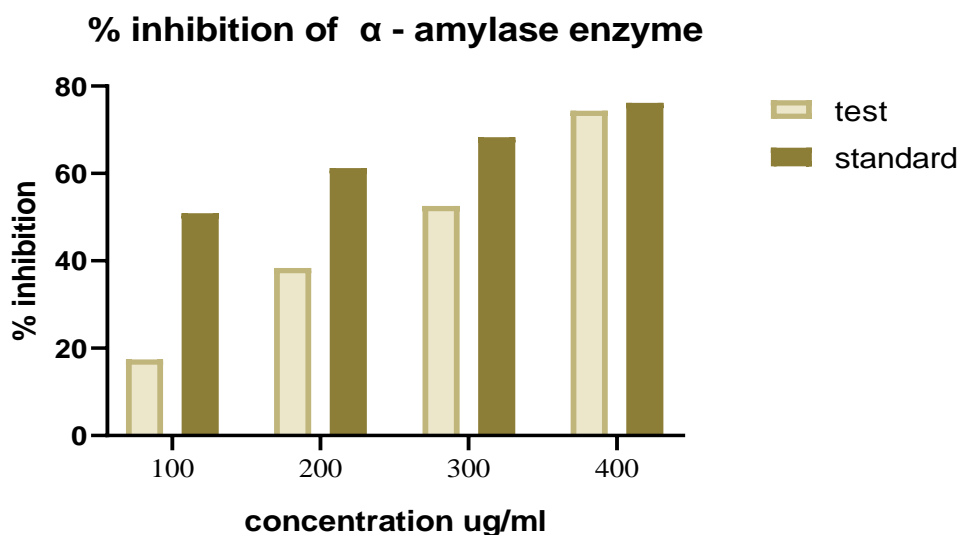
**Invitro Antidiabetic activity**

- **Inhibition of  $\alpha$  - amylase enzyme**

Table no 2: Percentage Inhibition of  $\alpha$ - amylase enzyme of seed extract

Sr.no.	Treatments	Concentrations	% inhibition
1	Control	-	-
2	Acarbose (std)	100	50.89%
		200	61.26%
		300	68.29%
		400	76.16%
3	Hydroalcoholic extract	100	17.40 %
		200	38.37%
		300	52.56%
		400	74.37%

Graph no 2: Result of *Invitro* antidiabetic activity of seeds extract



The present investigation is to assessing the antidiabetic activity of the seeds extract of *Cardiospermum Halicacabum* L by using  $\alpha$ -amylase enzyme inhibition assay. This study concluded that percentage inhibition increases with increase in concentration from 100  $\mu$ g/ ml

to 400 µg/ ml. Hydroalcoholic extract of seeds shows the maximum percentage inhibition of 74.37% at 400 µg/ml concentration, which is compared with standard. The standard shows the percentage inhibition of 76.16% at 400 µg/ml concentration. The overall result shows extract have a near result of standard drug.

## Conclusion

The *In vitro* antiarthritic activity of seeds extract of *Cardiospermum Halicacabum* L is confirmed. From this study it is concluded that hydroalcoholic extract of seeds of *Cardiospermum Halicacabum* L shows 79% activity at 300 µg/ml, which is significant compared to standard diclofenac sodium. This study also evaluates the *invitro* antidiabetic activity and it is confirmed by using the  $\alpha$ -amylase enzyme inhibition assay method of hydroalcoholic extracts. From this evaluations it is concluded that the  $\alpha$ - enzyme inhibition assay of hydroalcoholic extract shows the significant inhibition of 74.37% at 400 µg/ml concentration compared with the standard acarbose.

## ACKNOWLEDGEMENT:

The author is very appreciative of Sahyadri College of Pharmacy for allowing him to complete the task. Author expresses sincere gratitude to respected advisor Associate Professor Dr. Shinde mam for her support, insightful counsel, and careful attention.

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