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EVALUATION OF ANTIDIABETIC, ANTIOXIDANT, AND PHYTOCHEMICAL ANALYSIS OF CEREUS JAMACARU D.C. SEED EXTRACT

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Keywords:

Cereus jamacaru, Medicinal, Phytochemical, Antioxidant and Antidiabetic activities

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ABSTRACT: Central and eastern Brazil is home to the cactus species *Cereus jamacaru*, also called mandacaru or cardeiro. It frequently reaches a height of 6 metres. For animal feed, a kind without thorns is utilized. The most typical type is quite thorny; however, if the thorns are The native Brazilian cactus *Cereus jamacaru D*.C., also known as "mandacaru," grows naturally in the Caatinga biome and is characterized as a source of food and medicines used to cure kidney inflammation, urinary infection, and rheumatism. However, the antioxidant activity and phenolic chemicals have not yet been assessed. The current study's phytochemical examination of the ethanolic extract to assess the phytochemical, antioxidant, and anti-diabetic effects of C. jamacaru root extracts showed the Presence of terpenoids and flavonoids, saponins, alkaloids, steroids, coumarin and carbohydrates. This study has demonstrated that *C. jamacaru* root extract contains primary and secondary metabolites that can be pharmacologically useful and possess some antidiabetic and antioxidant properties. It was also discovered that *C. jamacaru* root ethanol extract possessed antioxidant and antidiabetic activity against high doses.

INTRODUCTION: The native Brazilian cactus *Cereus jamacaru* D.C., sometimes referred to as "mandacaru," develops naturally in the Caatinga biome and is renowned for providing food and medications for treating kidney inflammation, urinary infection, and rheumatism [1]. It is cultivated in gardens, has nocturnal flowers, and needs to be cross-pollinated, which is typically done by insects like moths and bees [2, 3]. Although several species live in rainforests, some plants are particularly prone to surviving in dry settings [4]. A columnar cactus with a multibranch trunk and yellowish spines, Mandacaru has big, white, nocturnal blooms [5].

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If the plant was formed from a cutting, fruits are produced about two to three years following propagation; if it was borne from a seed, fruits are produced between three and five years after propagation. The fruits are huge, smooth, and have smooth skin that ranges in colour from yellow to red. The white pulp inside the fruit is filled with countless tiny black seeds. They are roughly 20 cm long and 12 cm in diameter, with an ellipsoid or circular shape [6, 7]. Cacti can be reproduced sexually or asexually, according to [8]. Micropropagation's success depends on a number of variables, including the genotype, culture environment, and culture medium composition.

Creating techniques for quick *in-vitro* clonal micropropagation of cacti could be very profitable for the agricultural industry. By reducing the time it takes to introduce new cultivars to the commercial market, tissue culture techniques should boost the availability of plants with better horticultural traits [9].

Utilization of *in-vitro* methods to assess the antioxidant and antiproliferative capabilities of natural compounds has increased recently. Multiple and complementary measurements of antioxidant and cytotoxicity activity have been assessed using these approaches [10]. In this context, *in-vitro* antiproliferative assays using cell lines like sarcoma 180 (murine cancer) and antioxidant assays like 2,2'-azino-bis (3- ethylbenzthiazoline-6-sulfonic acid) (ABTS), 2,2-diphenyl-1-picrylhydrazyl (DPPH), and Fe^{2+} ion chelating activity have been successfully used as screening tools for natural products of plant origin with potential [11]. This study focused on the phytochemical components of *C. jamacaru* root extracts. The current study involves the collection of *Cereus jamacaru root ethanol extracts* from Tiruchirappalli. Phytochemical analysis was then completed using ethanolic solvents, and the effects of *Cereus jamacaru* extract on various antioxidant and antidiabetics activity can be assessed.

MATERIALS AND METHODS:

Collection of Plant and Extracts Preparation: The roots of *C. jamacaru* are collected from the village of poonampalayam, Mannachanallur. The roots are collected from the healthy plant of *C. jamacaru*. The roots were then dried in the shade for a period of around 14 days. The dried leaves were ground into a powder and stored for later analysis.

Qualitative Analysis: Phytochemical screening was performed using standard procedures [12].

Characterization of Active Compounds: The active compounds in the root of *C. jamacaru* were characterized using UV-Visible spectrophotometer, FTIR spectroscopy (Fourier Transform Infrared Spectroscopy) and GCMS (gas chromatography-mass spectroscopy).

FTIR Analysis: Analysis using FTIR was discovered FTIR analysis was used to identify the functional groups that were present in the produced nanoparticles. The pellet formed after centrifuging the nanoparticle-containing fluid at 60,000 rpm was used for the study.

Antioxidant Activity: Using the DPPH reagent, the nanoparticles' capacity to scavenge radicals [12] was assessed. Ascorbic acid was employed as the control, solvent served as the blank, and five different concentrations of the test sample were collected. All the tubes were then given DPPH, and the absorbance of each was assessed at 517 nm [13]. The Benzie and Strain method can be used to perform FRAP assay [14]. *In-vitro* Anti diabetic α-amylase Inhibitory activity.

***In-vitro* Anti Diabetic α-amylase Inhibitory Activity:** *In-vitro* Anti diabetic α-amylase Inhibitory activity carried out by [15].

RESULTS AND DISCUSSION: In a qualitative analysis of ethanol extracts of the root of *C. jamacaru* plant exhibited results for phytochemical tests.

TABLE 1: PRESENCE OF PHYTOCONSTITUENTS ROOT EXTRACT OF *C. JAMACARU*

S. no.	Phytoconstituent	Test performed	Results
1	Terpenoids	Salkowskitest	+++
2	Flavanoids	Alkaline reagent test	+++
		Leadacetatetest	+++
3	Saponins	Foamtest	+++
		Frothtest	+++
4	Alkaloids	Mayerstest	++
		Hagerstest	++
5	Steroids	Salkowskitest	++
6	Glycosides	Libermannstest	---
7	Phlobatannins	Precipitatetest	---
8	Protein	Xanthpterictest	+
		Ninhydrintest	+
9	Coumarin		++
10	Carbohydrates	Fehlingstest	++
		Benedictstest	++
11	Phenols		----

Intensity Range: (+) Presence, (++) Medium concentration, (+++) High concentrations, (–) Absence.

In the qualitative analysis, 11 tests were conducted in the ethanol extract. 8 tests are shown positive results and 3 tests were shown negative results.

Terpenoids, flavonoids, saponin, alkaloids, steroids, carbohydrates, and proteins were present in the root of *C. jamacaru* plant. Glycocides, Phlobatannins, phenols were shown negative results.

Quantitative Analysis Results: The amount of phytochemicals which are found in the *C. jamacaru* root extract was quantitatively analyzed by standard procedures. The extracts of *C. jamacaru* root showed different amount of phytochemicals. Among the 3 components, terpenoid content wash highest amount the root extract, followed by alkaloids and flavonoid compounds.

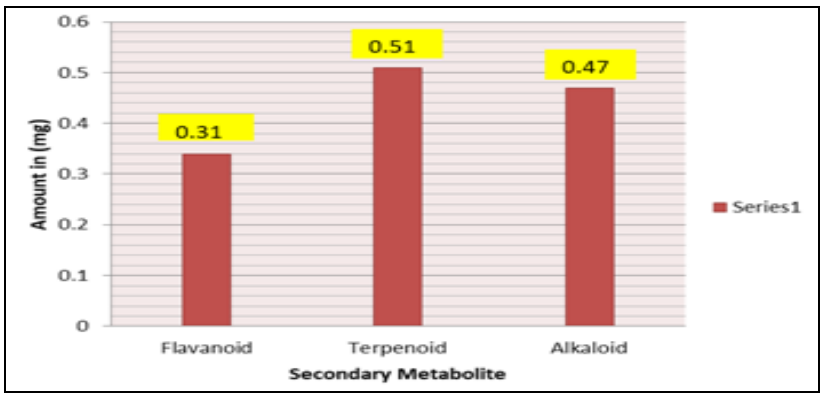

FIG. 1: QUALITATIVE ANALYSIS IN ROOT EXTRACT OF *C. JAMACARU*

FT-IR Analysis: The FTIR spectrum of ethanol extract of root of *C. jamacaru* is presented in Table. The data on the peak values and the probable functional groups (obtained by FTIR analysis) present in the methanol extracts of *C. jamacaru* are represented in **Fig. 2**. The region of IR radiation helps to identify the functional groups of the active components present in extract based on the peaks values of the FTIR spectrum. When the extract was passed into the FTIR, the functional groups of the components were separated based on the ratio of its peak. The results of FTIR analysis confirmed the Presence of O-H groups, CO_2 mode in metallic cations, H_2O molecules, and metal-organic elements. The absorbance band analyses in bioreduction process are observed in the region between 400–4000 cm^{-1}. So the present study results indicate that the primary functional group presentin *C. jamacaru*.

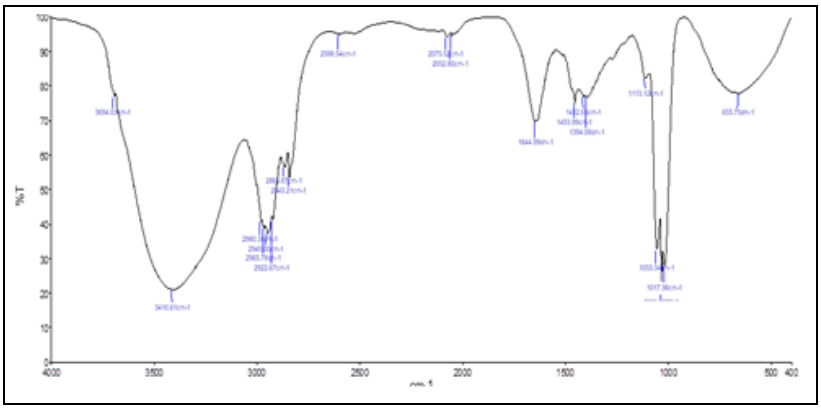

FIG. 2: FTIR SPECTRUM OF *C. JAMACARU*

Antioxidant Activity: DPPH is stable at room temperature and accepts an electron/hydrogen radical to become a stable diamagnetic molecule. The reduction capacity of DPPH radical is determined by the decrease in its absorbance at 520ηm. The various concentration solution were used, and the highest inhibition effect (75%) were recorded at 250 µg/ml. The result indicates that the extract reduces the radicals to the corresponding hydrazine when it reacts with the hydrogen donors in the antioxidant principle.

TABLE 2: THE INHIBITION EFFECTS OF DPPH RADICAL ACTIVITY IN *C. JAMACARU*

Concentration (µg/ml)	Standard (Absorbance at 520ηm)	Sample (Absorbance at 520ηm)	Standard % of inhibition	Sample % of inhibition
50	67.8	3.962	34.8	46.9
100	51.5	11.65	29.4	57
150	47.6	20.061	23.6	62
200	38.7	27.016	16.5	69
250	24.5	39.94	13.8	75

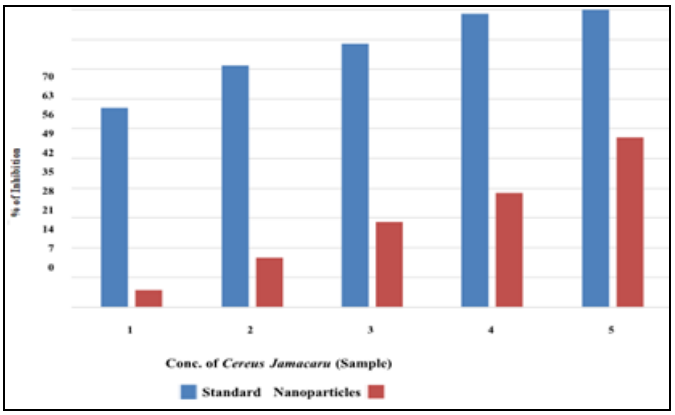

FIG. 3: DPPH RADICAL ACTIVITY OF *C. JAMACARU*

FRAP Results: It was observed that the phenolic contents correlate well with the FRAP assay. The correlation coefficient of FRAP assay is 0.768. Confirming that phenolic compound is likely to contribute to the radical scavenging activity of *C. jamacaru* root extract. A significant correlation is also seen in FRAP values.

TABLE 3: EFFECT OF VARIOUS CONCENTRATION OF ROOT EXTRACT IN FRAP ASSAY

Concentration(µg/ml)	Standard	Plant extract
50	0.212	0.336
100	0.488	0.457
150	0.71	0.589
200	0.784	0.671
250	0.892	0.768

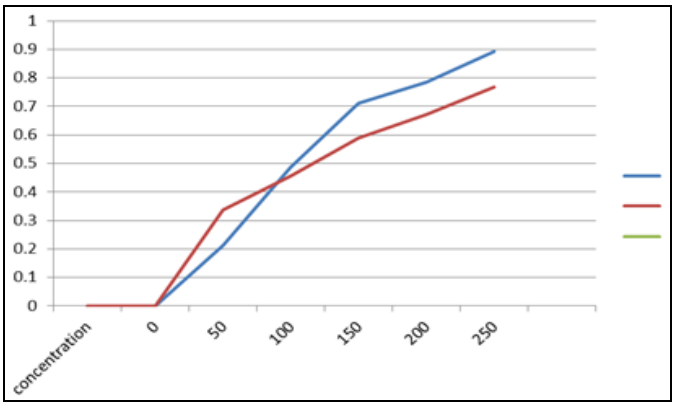

FIG. 4: FRAP ASSAY OF *C. JAMACARU*

TABLE 4: α-GLUCOSIDASE ACTIVITY OF *C. JAMACARU*

Concentration(µg/ml)	standard	Plant extract
50	21.7	11.6
100	29.6	32.35
150	47.4	49.68
200	65.4	60.98
250	75.6	77.54

Antidiabetic Activity: The results of Antidiabetic activity using α-glucosidase inhibitory assay of the methanol extracts of *C. jamacaru* root are shown in **Table 4**. The extract revealed a significant inhibitory action of α-glucosidase enzyme. The percentage inhibition at 50-250µg/ml concentration of *C. jamacaru* extract showed a dose-dependent increase in percentage inhibition. The percentage inhibition varied from 11.6%-77.54 %.

α-amylase Inhibitory Assay: The experiment showed that there was a dose-dependent increase in percentage inhibitory activity against the α-amylase enzyme. The methanol extract of the plant exhibited potent α-amylase inhibitory activity in a dose-dependent manner. α-amylase inhibitory activity between the standard and plant extracts has been depicted in **Fig. 5**. The extract showed inhibitory activity from 10.28 ± 0.03 to 59.12 ± 0.05% with an IC_{50} value of 250 µg dry extract.

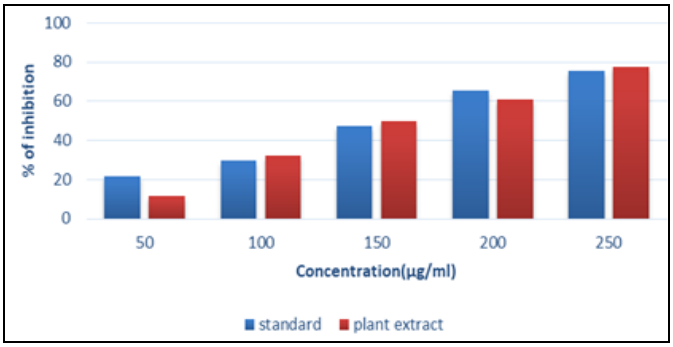

FIG. 5: α-AMYLASE INHIBITION ASSAY OF *C. JAMACARU*

CONCLUSION: Due to its accessibility and low cost, particularly for people residing in remote locations, the study's findings seem to support using *C. jamacaru* root in treating various health concerns. The current study showed that *C. jamacaru* root had strong anti-inflammatory and anti-diabetic properties. The current study might provide a rationale for the traditional use of this plant based on scientific evidence and make a good case for further research into the bioactive chemical responsible for these biological characteristics and a possible mechanism of action.

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CONFLICTS OF INTEREST: Nil

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