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UNVEILING THE ANTIOXIDANT POTENTIAL OF CITRULLUS COLOCYNTHIS PULP EXTRACT

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ABSTRACT

This study evaluates the antioxidant potential of *Citrullus colocynthis* fruit pulp extract, a medicinal plant traditionally used for various health conditions. The extract demonstrated broad-spectrum antioxidant activity, suggesting its efficacy in neutralizing free radicles and reducing oxidative stress. Phytochemical screening confirmed the presence of bioactive compounds such as alkaloids, glycosides, flavonoids and carbohydrates. These constituents are known to contribute significantly to antioxidant defense mechanisms. Along with its antioxidant effect, *Citrullus colocynthis* exhibits multiple pharmacological properties including antimicrobial, diuretic, hypolipidemic, anticancer activities. The findings highlight the promising role of citrullus colocynthis pulp extract as a natural source of antioxidants, supporting its potential therapeutic applications in managing oxidative stress related disorders.

KEYWORDS: *Citrullus colocynthis*, Antioxidant activity, Phytochemical analysis, DPPH assay.

INTRODUCTION

Plants are widely acknowledged as fundamental sources of nutrition and therapeutic agents for humans. Phytochemicals or biologically active compounds derived from plants are often

associated with fewer adverse reactions compared to synthetic drugs. *Citrullus colocynthis* a species within the Cucurbitaceae family, It is known by various regional names, such as coloquinte in French, “bitter gourd”, “bitter apple”, “bitter cucumber” in English and Koloquinthe in German. These vernacular names highlight the plant’s notably bitter flavor, which is primarily attributed to Colocynthine, its major active constituent.[1] It is a perennial herb and in India most usually found in sandy lands of Northern West region such as Sind, Punjab, Central region, Southern region and Coromandel costal area.[2] *Citrullus colocynthis* are widely known for their diverse pharmaceutical, medicinal, and nutraceutical benefits.[3]

Botanical description

Citrullus colocynthis is a perennial herbaceous vine known for its small, pale yellow flowers and distinct fruit. The plant features angular, rough stems covered with coarse hairs. These fruits are green with undulating yellow stripes, turning fully yellow upon drying. The fruit is hard, bitter and encased in a rind, containing approximately 200-300 seeds per gourd. Seeds are small (about 6mm long), ovoid, compressed, smooth and brownish when riped.[4] Leaves are alternatively arranged on petioles, rough to the touch, 5-10cm long and 1.5-2cm wide, deeply 3-7 lobed. Flowers are solitary, monoecious, yellow, pedunculated, and located in leaf axils. Each plant produces 15-30 globular fruits, measuring 7-10cm in diameter.[5]

Vernacular names

English	Colocynth, Bitter apple, Bitter cucumber
Hindi	Indrayan
Sanskrit	Indra Varuni
Kannada	Hamekkae, haramekkikayi
Telugu	Eti-puchcha
Tamil	Paedikari Attutummatti
Malayalam	Paikummatti

Taxonomical classification

Kingdom	Plantae
Sub kingdom	Tracheobionta
Super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Sub- class	Dilleniidae

Order	Cucurbitales
Family	Cucurbitaceae
Genus	Citrullus
Species	Colocynthis

Pharmacological activities

Citrullus colocynthis exhibits a wide range of biological activities. Its phenolic compounds show antioxidant properties, while saponins contribute to anti-hyperlipidemic and antidiabetic effects. A reduction in cholesterol levels has been linked to its anti-fertility activity. Flavonoids, Saponins, Tannins and Alkaloids are reported to possess anti-ulcer properties, whereas alkaloids, tannins and Flavonoids demonstrate antimicrobial effects. Additionally, tannins, steroids, flavonoids, alkaloids and iridoids have been associated with antibacterial activity.[6]

MATERIALS AND METHODS

Collection and identification of plant material

The dried *Citrullus colocynthis* fruits were collected from the local market Bengaluru. The identification of study fruit was authenticated by the Department of Botany at Central Ayurvedic Research Institute.

Fig no. 1: Dried Citrullus colocynthis fruit pulp.

Method of extraction

Prior to extraction preparation, the dried fruit pulps were finely ground using a grinder and it is sieved. Subsequently, required amount of the powdered pulp were soaked in a sufficient volume of water and ethanol (20:80) for 24hrs. Then the mixture is filtered and subjected to rotary evaporator to get the crude extract.[7]

Fig no: 2: Maceration. **Fig no: 3: Extract.**

Antioxidant activity

Free radical scavenging activity of *Citrullus colocynthis* fruit pulp extracts were measured by 1, 1- diphenyl-2-picryl hydrazyl (DPPH).[41] Briefly, 0.1 mM solution of DPPH was prepared by dissolving the DPPH in ethanol to prepare 400 µg/mL and stored at 4 °C. Sufficient quantity of the fruit pulp extract was dissolved in ethanol in order to prepare 400 µg/mL stock solutions and then serial dilution with ethanol was performed to prepare the required concentrated solutions (50, 100,150, 200, 250, 300 µg/mL). A 2 mL of extract solution from each concentration was taken in a test tube and then, 3 mL of DPPH solution was added in each test tube. After 30 min incubation in the dark, the absorbance at 517 nm was recorded using a UV–Vis Spectrophotometer. Reference standard compound being used was ascorbic acid. A stock solution of 800 µg/mL was prepared by dissolving 2 mg ascorbic acid in 2.5 mL of distilled water. Ten, serial dilution with different concentrated solution was prepared (50, 100,150, 200, 250, 300 µg/mL). EtOH were used as the blank for the extract. A mixture of 3 mL of 0.1 mM DPPH and (100 µL EtOH for ethanol extract) was used as control. All determinations were performed in triplicate. The percent of inhibition were plotted against concentration from which IC50 values were calculated. where, A control is the mixture of ethanol and DPPH solution, and A sample is the mixture of sample extract and DPPH solution.

$$\text{DPPH \% Inhibition} = \frac{\text{Control} - \text{Sample}}{\text{Control}} \times 100$$

where, Control is the mixture of methanol/ethanol/ water and DPPH solution, and sample is the mixture of sample extract and DPPH solution.[8]

RESULTS

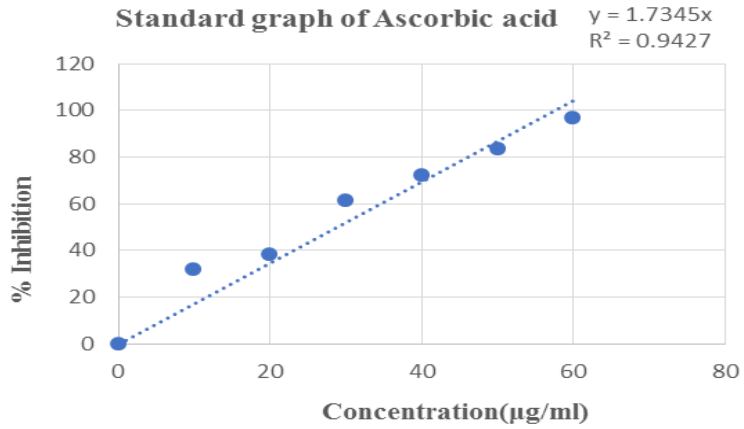

Fig no: 4: Standard graph of Ascorbic acid and its absorbance.

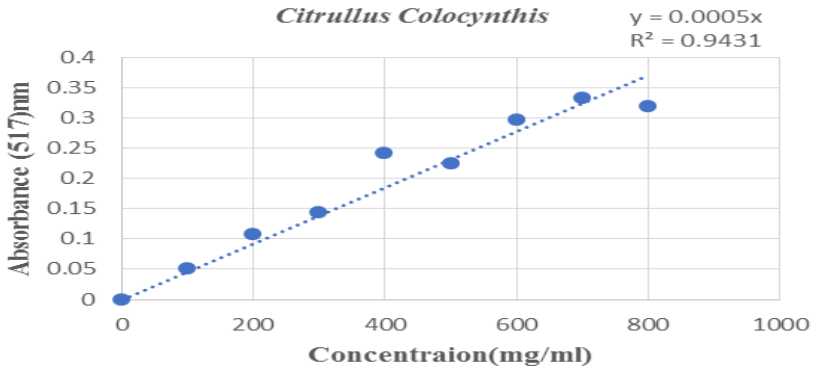

Fig no: 5: Standard graph of *Citrullus colocynthis* and its absorbance.

DISCUSSION

The findings from this study clearly demonstrates that the *Citrullus colocynthis* pulp extract possesses significant antioxidant potential, as indicated by its effective free radicle scavenging activity in the DPPH assay. The extract showed a concentration dependent inhibition of DPPH radicles, which can be attributed to the presence of bioactive phytoconstituents such as flavonoids, alkaloids and carbohydrates identified in the phytochemical screening.

Flavonoids and phenolic compounds are well documented for their ability to donate hydrogen atoms and neutralize reactive oxygen species, thereby mitigating oxidative stress. The observed antioxidant activity of the *Citrullus colocynthis* pulp extract aligns with previous studies that reported strong radicle scavenging and reducing properties in various plant parts of the same species.

Furthermore the extract antioxidant efficacy supports its traditional use in herbal medicine for managing aliments related to oxidative stress, including inflammation, hyperlipidemia and diabetes. The result thus emphasize the importance of plant derived antioxidants as safer alternatives to synthetic compounds that may pose toxicity concerns.

CONCLUSION

The present study concludes that the *Citrullus colocynthis* fruit pulp extract exhibits strong antioxidant activity, suggesting its potential role as natural source of antioxidants. The presence of various phytochemicals such as flavonoids and alkaloids contributes to its ability to neutralize free radicles and reduce oxidative stress. These findings support the therapeutic potential of the plant in treating oxidative stress related disorders and justify its traditional medical applications.

Further studies focusing on isolation, characterization, and in vivo evaluation of the active compounds are recommended to better understand the mechanism of antioxidant action and to develop standardized formulation for potential pharmacological use.

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