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Phytochemical Analyses of a Few Neglected and Underutilized Fruit Vegetables of Cucurbitaceae

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Abstract: ***Many of the plant species that are cultivated for food are neglected and underutilized while they play a crucial role in the food security, nutrition, and income generation of the rural poor. While these crops continue to be maintained by cultural preferences and traditional practices, they remain inadequately characterized and neglected by research and conservation. Three such members of the gourd family Cucurbitaceae (Sechium edule, Luffa cylindrica and Luffa acutangula) which are generally considered neglected and underutilized when compared to other fruit vegetables of Cucurbitaceae, were used for the present study. The fruits were tested for their total polyphenol content. The phenol content was found to be higher in Sechium edule (16.7mg GAE/g), followed by Luffa acutangula (12.3mg GAE/g) and Luffa cylindrica (13.5mg GAE/g). This can be considered as a very good indicator of their nutritional and medicinal values.***

Keywords: Cucurbitaceae *Luffa acutangula Luffa cylindrica*, *Sechium edule*, polyphenols

1. Introduction

Modern agricultural systems that promote cultivation of a very limited number of crop species. Some relegated indigenous crops have been assigned the status of neglected and underutilised crop species (NUCS). Across the world, many of the food crops are neglected and underutilized while they play a crucial role in the food security, nutrition, and income generation of the rural poor [1]. While these crops continue to be cultivated by cultural preferences and traditional practices, they remain inadequately characterized and neglected by research and conservation. Lack of attention has meant that their potential value is underestimated and underexploited. Neglected or underutilized crops have the potential to play a number of roles in the improvement of food security [2] [3].

The family Cucrbitaceae includes a large group of plants which are valuable mainly as vegetable crops. It is a family of about 130 genera and about 800 species distributed mainly in tropical and sub-tropical region and are collectively known as cucurbits. The family is commonly known as gourd, melon and pumkin family. The members are important in their phenol and flavanoid content. Plants are potential sources of natural bioactive compounds such as secondary metabolites and antioxidants. Flavanoids and phenolic acids are the most important groups of secondary metabolites in plants. They also have antioxidant properties and are capable of scavenging free superoxide radicals.

2. Materials and Methods

Plant materials used

Three species of Cucurbitaceae (*Sechium edule, Luffa cylindrica*, *Luffa acutangula*) were selected for the present study. The plant materials were collected from different parts of Kozhikode district, Kerala.

Phytochemical Analysis

Phytochemical Screening for secondary metabolites

Chemical tests were carried out qualitatively on the extract following standard procedures to identify the phytochemical constituents;

1. Test for alkaloids

Dragendorff's test: In a test tube containing 1 ml of extract, few drops of Dragendorff's reagent was added and the colour developed was noticed. Orange colour indicated the presence of alkaloids.

2. Test for flavonoids

Alkaline reagent test**:** To the test solution, a few drops of sodium hydroxide solution were added. Formation of intense yellow colour which turns to colourless by addition of few drops of dilute acetic acid indicated the presence of flavonoids.

3. Test for phenolic compounds

Ferric chloride test: To the test solution, a few drops of ferric chloride solution were added. A dark green colour indicated the presence of phenolic compounds.

4. Test for tannins

Lead acetate test: To the test solution, a few drops of 10% lead acetate solution were added. Precipitate formation indicated the presence of tannin.

5. Test for terpenoids & steroids

Salkowski's test: Extracts were treated with chloroform and filtered. The filtrates were treated with few drops of concentrated sulphuric acid, shaken well and allowed to

stand. Appearance of red colour in the lower layer indicated the presence of steroids.

In the above filtrate, formation of reddish brown colour of interface after addition of concentrated sulphuric acid to the side carefully (without shaking) indicated the presence of terpenoids.

6. Test for saponins

Foam test: Crude extract was mixed with 5 ml of distilled water in a test tube and it was shaken vigorously then some drops of olive oil were added. The formation of stable foam was taken as an indication for the presence of saponins.

7. Test for coumarins

2 ml of the extract was mixed with 3 ml of 10% NaOH. Colour was noted.

8. Test for Glycosides

5 ml of the plant extract was and added 2 ml of the glacial acetic acid and 2 ml of 2% ferric chloride solution was added and mixed well.2 ml of conc. Sulphuric acid was added along the sides. Presence of brown ring at the interphase was noted.

B. Estimation of total phenol content

The total phenolic content was determined by using the Folin-Ciocalteu assay. An aliquot (1 ml) of extracts or standard solution of Gallic acid (100, 200, 300, 400, and 500µg/ml) was added to 25 ml of volumetric flask, containing 9 ml of distilled water. Reagent blank using distilled water was prepared.1 ml of Folin-Ciocalteu phenol reagent was added to the mixture and shaken. After 5 minutes 10 ml of 7% Na2CO3 solution was added to the mixture. The volume was then made up to the mark. After incubation for 90 minutes at room temperature, the absorbance against the reagent blank was determined at 550 nm with an UV-Visible spectrophotometer. Total phenolics content was expressed as mg Gallic acid Equivalents (GAE) [4].

3. Results and Discussion

Presence of secondary metabolites in the methanolic extract was tested and the results are summarized in table 1. All the analyzed samples contained phenolics, flavanoids coumarins and glycosides. Other constituents showed variations among the samples.

Table 1: *Phytochemical constituents of the fruits of Cucurbitaceae*

Sl No	Secondary Metabolites	*Sechium edule*	*Luffa cylindrica*	*Luffa acutangula*
1	Alkaloids	+	+	-
2	Flavonoids	+	+	+
3	Phenolics	+	+	+
4	Tannins	+	-	-
5	Terpenoids	+	-	+
6	Saponins	-	+	+
7	Coumarins	+	+	+
8	Glycosides	+	+	+
9	Steroids	-	+	+

(+) implies presence; (-) implies absence

Concentrations of phenolic substances in three of the samples studied were detected from the standard graph of gallic acid. Highest concentration (16.7mg GAE/g) was detected in *S. edule*. This was followed by *L. acutangula* (12.3mg GAE/g) and *L. cylindrica (*13.5mg GAE/g) respectively (Table 2).

Table 2: *Concentration of phenolics in the samples*

Sl no	Plants	Concentration of phenolics* (mg GAE/g)
1	*Sechium edule*	16.7± 0.7
2	*Luffa cylindrica*	12.3± 0.4
3	*Luffa acutangula*	13.5± 0.6

* Values are the mean of triplicate experiments, represented as Mean ± Standard Deviation, GAE= Gallic Acid Equivalents

In recent years, fruits and vegetables are considered as important food items in the prevention and treatment of chronic nutritional diseases. The beneficial role of fruits and vegetables is linked to their secondary metabolites content, including antioxidants [5]. Phenolic compounds commonly found in plants, have been reported to have multiple biological effects, including antioxidant activity [6]. Many studies had revealed that phenolic content in plants have a direct correlation to their antioxidant activities. Antioxidants are compounds that protect cells against the damaging effects of reactive oxygen species such as singlet oxygen, superoxide, peroxyl radicals, hydroxyl radicals and peroxynitrite [7]. Phenolics are the largest group of phytochemicals that account for most of the antioxidant activity in plants or plant products. Phenolics possess a wide spectrum of biochemical activities such as antioxidant, antimutagenic, anti-carcinogenic as well as ability to modify the gene expression [8]. These kind of natural products and antioxidant substances are capable of scavenging free superoxide radicals and have a very crucial role in maintenance of human health.

In the present study it is revealed that some neglected crops like *S. edule*, *L. cylindrica* and *L. autangula* possess considerable amounts of polyphenols on their fruits. This can be considered as a very good indicator of their nutritional and medicinal values.

4. Conclusion

Comparatively higher phenol content were detected in S. *edule*, *L. acutangula* and *L. cylindrica*. This can be considered as a very good indicator of their nutritional and medicinal values. Considering the high nutritional values, the usage of these neglected vegetables has to be promoted in the future.

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