Research Article

Utilization and Food Value of the Seeds of *Benincasa hispida* and *Cucurbita maxima*

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ABSTRACT

Fruits are consumed for their taste, flavor and nutrient values excluding their seeds. These seeds also have more or less nutritive value compared to the fruits. In this present investigation seeds of two edible fruits are analysed for their nutrient contents and found out high amount of protein present in the seeds of *Benincasa hispida* (27.87±0.01%) than the seeds of *Cucurbita maxima* (22.10±0.07%). In mineral analysis, calcium and magnesium content was found to maximum in the seeds of *Cucurbita maxima* (160.00±0.03 µg/g; 76.80±0.68 µg/g) than the seeds of *Benincasa hispida* (8.00±0.01 µg/g; 19.20±0.14 µg/g).

Keywords: Edible seeds, proximate analysis, mineral analysis.

INTRODUCTION

Nutritional imbalance still exists all over the world. There is a demand for an alternative source of nutrition. Fruits are one of the most important components for nutrition in human diet. Mostly the fruit seeds are thrown as waste. These seeds contains enormous amount of nutrients, essential oils, which has an ability to produce a new plant. The seeds of some cucurbitaceae members are used as food supplement by the local communities of Coimbatore district during their season. Till now researchers made effort to analyse the nutrient content of leafy vegetables and fruits, it is quite interesting to analyse the nutrients of edible seeds.

MATERIALS AND METHODS

Plant Collection

The seeds of *Benincasa hispida* and *Cucurbita maxima* were collected from the ripen fruits and used in the analysis of proximate and mineral analysis.

Proximate Analysis of the Edible Seeds

Fresh seeds were used to determine the carbohydrate, protein, lipid, crude fibre, moisture and ash content.

Carbohydrate Content[1]

The seed was hydrolysed in boiling water bath for 3 hours with 2.5 N Hydrochloric acid and cooled at room temperature. It was neutralised with sodium carbonate and makeup the volume with distilled water, centrifuged for 5 minutes. The supernatant was taken with anthrone reagent and placed in boiling water bath for 8 minutes, cooled and optical density of the sample was read out in spectrophotometer at 630 nm. Glucose was used as a standard.

Protein Content [2]

The seed was ground with phosphate buffer in pestle and mortar, centrifuged at 2000 rpm for 5 minutes and the supernatant was collected. One millilitre was taken in test tube and 1N sodium hydroxide was added. After 5 minutes, Reagent C was added and kept undisturbed for 5 minutes at room temperature. Then folin ciocalteau reagent was added, kept in water bath for 5-10 minutes, cooled and optical density of the sample was read out in spectrophotometer. Bovine serum albumin was used as a standard.

Preparation of Reagent C- Reagent A (sodium hydroxide + sodium carbonate in distilled water) + Reagent B (sodium potassium tartrate + copper sulphate in distilled water)

Lipid Content[3]

Lipid content was determined by separating the water and solvent layers gravimetrically. The seed was homogenized with distilled water, chloroform and methanol, then centrifuged at 2000 rpm for 20 minutes. After centrifugation, the supernatant was transferred in to a separating funnel, undisturbed for 1 hour for separation of layers. The lipid layer determined by evaporating the solvent layer.

Crude Fibre Content[4]

Subsequent acid and alkaline treatment results in hydrolytic degradation of cellulose and lignin. The residue obtained was weighed, incinerated, cooled and weighed. Crude fibre was determined by the loss in weight. The seed was defatted by petroleum ether and boiled with dilute sulphuric acid for 30 minutes. The filtered residue was boiled with sodium hydroxide for 30 minutes. Again filtered and washed with dilute sulphuric acid, water and alcohol. Residue was weighed (W_1) and transferred to ashing dish and dried at 130° C for 2 hours, cooled and

weighed (W_2). The residue was ignited at 600◦ C for 30 minutes, cooled (W_3).

Crude fibre % = Loss in weight on ignition

$$\frac{(W_2 - W_1) - (W_3 - W_1) \times 100}{\text{Weight of the sample}}$$

Moisture Content[5]

Moisture content was determined by the difference in the weight before and after drying the seed in hot air oven. Empty dish and the lid was dried, cooled and weighed. The seed was spread uniformly in the dish and placed on oven at 105 °C. After 3 hours the dish was cooled and reweighed.

$$\text{Moisture content\%} = \frac{(W_1 - W_2) \times 100}{W_1}$$

W_1 = Weight of the sample before drying; W_2 = Weight of the sample after drying

Ash Content[5]

Silica crucible and the lid were dried, cooled and weighed. The seed was taken in the crucible and placed in the muffle furnace at 550°C overnight. The crucible was cooled down with the lid and weighed.

$$\text{Ash \%} = \frac{\text{Weight of the ash}}{\text{Weight of the sample}} \times 100$$

Mineral Analysis of the Edible Seeds

Mineral analysis was carried out by digesting the powdered seeds with 10 ml of the mixture of nitric acid, sulphuric acid and perchloric acid. The digest was allowed to cool and makeup to 100 ml with deionised water and used for further analysis.

Calcium[6]

The digested sample was diluted with distilled water. The masking reagent (Cyanide solution, Hydroxylamine, Potassium ferrocyanide solution and Triethanolamine) and dilute sodium hydroxide was added drop wise to raise the pH to 12. After that, calcan indicator was added drop wise and titrated with standardized EDTA, end point was the colour change from red to blue.

Magnesium[6]

The digested sample was diluted with distilled water. Buffer solution and sodium tungstate solution was pipetted out in to the sample and pH was raised to 10. The contents were heated for 1 hour, cooled and filtered. To that precipitate, masking reagent (cyanide solution, hydroxylamine, potassium ferrocyanide solution and triethanolamine) was added and after the reaction takes place eriochrome black T indicator was added and titrated with standardized EDTA, end point was the colour change from red to permanent blue.

Potassium[7]

Potassium content was measured by using flame photometer. The sample was drawn into a non-luminous flame which gets ionised and the energy gets absorbed and light was emitted in a characteristic wavelength in the unexcited ground level. The intensity of the radiation emitted by the sample depends upon the concentration of the potassium. Pressure was maintained at 10 lbs/sq.inch and the sample was analysed. Potassium chloride was used as a standard.

ppm = milli equivalent/litre of K^+ ion × atomic weight of potassium; mg of potassium ion present in 100g of the sample = ppm × 100.

RESULTS AND DISCUSSIONS

Benincasa hispida is known as ash gourd, wax gourd and white pumpkin and *Cucurbita maxima* is known as pumpkin. The fruits of both plant species are used as vegetable all over the world, but the seeds removed as fruit waste. The local communities of Coimbatore district used these seeds as a snack item during available season (December- February and June- August). These seeds are consumed as such, also it possess delicious taste when consumed as a recipe.

Nutrient Composition of the Edible Seeds

Proximate and mineral content of the seeds was tabulated in the Table- 2. The carbohydrate contents of the seeds of *Benincasa hispida* (21.00±0.04%) and the seeds of *Cucurbita maxima* (19.70±0.02%) was found to be lower than the carbohydrate content of *Nuclea latifolia*[8] (30.00±0.01%).

The protein contents of the seeds of *Benincasa hispida* (27.87±0.01%) was maximum, when compared to the seeds of *Cassipourea congoensis*[8] (26.01±0.12%); the seeds of *Cucurbita maxima* (22.10±0.07%) and the seeds of *Nuclea latifolia*[8] (22.32±1.00%) showed similar protein content.

Lipid content was lower in the seeds of *Cucurbita maxima* (2.53±0.01%) and the seeds of *Benincasa hispida* (1.84±0.01%) compared to the lipid content of the seeds of *Deterium microcarpum*[8] (11.12±0.09%).

The seeds of *Cucurbita maxima* (66.38±0.47%) and the seeds of *Benincasa hispida* (63.66±0.81%) contains higher amount of moisture content than the seeds of *Cassipourea congoensis*[8] (7.50±0.03%) and *Nuclea latifolia*[8] (6.00±0.12%).

From the experimental results, the ash content of the seeds of *Benincasa hispida* (5.43±0.01%) and the seeds of *Cucurbita maxima* (5.26±0.08%) was similar to the ash content of the seeds of *Nuclea latifolia*[8] (5.67±0.08%).

Crude fibre content in the seeds of *Benincasa hispida* (6.70±0.07%) was similar to the seeds of *Cassipourea congoensis*[8] (6.57±0.18%) and the seeds of *Cucurbita*

maxima (5.26±0.17%) was similar to the seeds of *Deterium microcarpum*[8] (5.21±0.17%).

Both the seeds of *Benincasa hispida* (212.04±1.03 Kcal/100 g) and *Cucurbita maxima* (189.97±1.45 Kcal/100 g) have high energy value.

Dietary calcium in food is mainly needed for bone development and to maintain skeletal mass, whereas magnesium plays a major role in active transport of calcium and potassium ions across the cell membranes. The calcium and magnesium content was maximum in the seeds of *Cucurbita maxima* (160.00±0.03 µg/g; 76.80±0.68 µg/g) than the seeds of *Benincasa hispida* (8.00±0.01 µg/g; 19.20±0.14 µg/g). Potassium controls acid-base balance and the electrical conductivity of the heart. The seeds of *Benincasa hispida* (11.82±0.55 µg/g) contains high amount of potassium when compared to the seeds of *Cucurbita maxima* (7.22±0.04 µg/g).

CONCLUSION

The seeds of *Benincasa hispida* and the seeds of *Cucurbita maxima* contains enormous amount of nutrients, hence they can be used as a supplement in day-to-day life for our health and wealth.

Table 1: Edible Fruit Seeds and their Consumption Pattern

S.No	Plant species	Vernacular name	Family	Mode of consumption
1	*Benincasa hispida* (Thunb.) Cogn.	Vellaipoosani	Cucurbitaceae	Seeds are dried and fried with salt, chilli powder and consumed
2	*Cucurbita maxima* Duch.	Arasani	Cucurbitaceae	Seeds are dried and fried with salt, chilli powder and consumed

Table 2: Proximate and Mineral Content of *Benincasa Hispida* and *Cucurbita Maxima*

S.No	Macronutrient composition (%)	*Benincasa hispida*	*Cucurbita maxima*
1	Carbohydrates	21.00±0.04	19.70±0.02
2	Proteins	27.87±0.01	22.10±0.07
3	Lipid	1.84±0.01	2.53±0.01
4	Moisture	63.66±0.81	66.38±0.47
5	Ash content	5.43±0.01	5.26±0.08
6	Crude fibre	6.70±0.07	5.26±0.17
7	Energy values (Kcal/100 g)	212.04±1.03	189.97±1.45
8	Calcium (µg/g)	8.00±0.01	160.00±0.03
9	Magnesium (µg/g)	19.20±0.14	76.80±0.68
10	Potassium (µg/g)	11.82±0.55	7.22±0.04

Results are expressed as mean of 3 replicates ± Standard deviation

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