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## Research Article

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## Physicochemical, Phytochemical and toxicity studies on gum and mucilage from plant *Abelmoschus esculentus*

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### Abstract

Okra is a popular health food due to its high fiber, vitamin C, and folate content. It is also a good source of calcium and potassium. In addition, the plant has been used medicinally in the treatment of several disorders like Anticancer, antimicrobial, hypoglycaemic and anti-ulcer activity, etc. The Present studies give pharmacopoeial standards like physicochemical constant Ash value, Specific gravity and pH. The phytochemical screening revealed the presence of Carbohydrate, Protein and Amino acid, flavonoids, phytosterol, and volatile oil. The toxicity studies were carried out according to the method of Knudsen and Curtis and up to dose 4000 mg/kg, no mortality; no toxic manifestations were observed.

**Keywords:** *Abelmoschus esculentus*, Okra, Ash value, Specific gravity, Phytosterol, Toxicity.

### Introduction

*Abelmoschus esculentus* L. is commonly known as lady's fingers, bhindi, okra or gumbo, is a flowering plant belongs to family Malvaceae. It is valued for its edible green seed pods. The geographical origin of okra is disputed, with supporters of South Asian, Ethiopian and West African origins. The plant is cultivated in tropical, subtropical and warm temperate regions around the world.<sup>1</sup> The species is an annual or perennial, growing to 2 m tall. It is related to such species as cotton, cocoa, and hibiscus. Okra is a popular health food due to its high fiber, vitamin C, and folate content. It is also a good source of calcium and potassium.<sup>2</sup> Greenish-yellow edible okra oil is pressed from okra seeds has a pleasant taste and odor, and is high in unsaturated fats such as oleic acid and linoleic acid.<sup>3</sup> In addition, the plant has been used medicinally in treatment of several disorders<sup>4-5</sup> like Anti-cancer, antimicrobial, hypoglycaemic and anti-ulcer activity<sup>5-7</sup> etc. It is also known for being high in antioxidants. The aim of present study is to highlight the Pharmacognostical, phytochemical and toxicological investigation of the plant and its constituents.

### Plant Profile

*Abelmoschus esculentus* L., is commonly known as lady's fingers, bhindi, okra or gumbo, is a flowering plant belongs to Family Malvaceae (Figure 1). It is valued for its edible green seed pods. The leaves are 10–20 cm long and broad, palmately lobed with 5–7 lobes. The flowers are 4–8 cm in diameter, with five white to yellow petals, often with a red or purple spot at the base of each petal. The fruit is a capsule up to 18 cm long, containing numerous seeds.



**Figure 1:** Fruit and Flower of Okra

### Taxonomical Status of Okra

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Malvales

Family: Malvaceae

Genus: *Abelmoschus*

Species: *Abelmoschus esculentus*

### Material and Methods

#### Plant material

The fruit of *Abelmoschus esculentus* was obtained from cultivated farm, Aniyad and authenticated by Mr. Satish V Iyer, Department of Pharmacognosy, GHB College of Pharmacy, Aniyad and a specimen sample is kept in our institution (herbarium voucher numbers GHB/13/ 202). The authenticated sample of the plant is subjected for size reduction and extraction.

#### Animals

The experimental protocol for this study was approved by an Institutional Animal Ethics Committee (IAEC), GHB Pharmacy College, Aniyad under the guidelines of CPCSEA(1359/ac/10/ CPCSEA), Ministry of Environment, Government of India. Male albino rats Wistar (Wt. range-160-200 Gm) were obtained from the Animal House Facility, Torrent Research Centre, Ahmedabad. Animals were housed in group of 6 in polypropylene cages with SS top grill containing autoclaved rice husk. All rats were provided with rodent pellet feed (Amrut Laboratory Animal Feed, B.No: 560831) and water ad libitum and maintained in 12 hr light-dark cycle (Light: - 06:00-18:00. Dark: - 18:00-

06:00), temperature  $22\pm 2^{\circ}\text{C}$  and relative humidity of  $55\pm 5\%$ .

### Extraction of the Mucilage

About 2 kg of fresh, immature fruit of *Abelmoschus esculentus* were purchased from a local market. After removal of the seeds, the fresh, immature fruits were sliced, homogenized and extracted with cold water containing 1% (w/v) sodium metabisulphate. The crude mucilage was centrifuged at 3000 rpm for 5 min and the gum was precipitated from the supernatant with acetone. The precipitated gum was washed several times with acetone; the obtained cream colored product was dried under vacuum in a desiccator. A light brown colored powder was obtained after complete removal of moisture. The dried gum was pulverized, using an end runner mill and screened through a 0.25 mm stainless steel sieve.<sup>8, 9</sup> This was stored in a well closed amber colored specimen bottle till ready for use. The yield of crude *Abelmoschus esculentus* mucilage was 10 g /kg immature fruits.

### Phytochemical Examination

Preliminary tests of aqueous and methanolic extracts were performed to confirm the nature of mucilage obtained. The chemical tests that were conducted are: Ruthenium red test, Molisch test, test for reducing sugars and Ninhydrin test.<sup>10, 11</sup>

### Physicochemical Examination

The qualitative physicochemical studies include parameters (Loss on drying, total ash, Acid insoluble ash).<sup>12</sup>

### Toxicity studies

Toxicity studies were carried out according to the method of Knudsen and Curtis<sup>13</sup>. The animals used in the toxicity studies were sanctioned by the Institute animal Ethics Committee. The male albino rats of Wistar strain weighing 160-200 gm were divided into different groups comprising of six animals each. The control group received normal saline 20 ml/kg i.p. The other groups received 500, 1000, 2000, 3000 and 4000 mg/kg of gum suspension in normal saline orally. The animals were observed continuously for the behavioural changes for the first 4 hours and then observed for mortality if any for 48 hours.

### Results and Discussion

Okra gum is a natural polysaccharide composed of d-galactose, L-rhamnose and L-galacturonic acid. It is soluble in cold water and used in the food industry as an emulsifying and a foam-stabilizing agent.<sup>12</sup> Addition of diluted lead acetate to the gum produces a white precipitation resemble to acacia gum.<sup>8</sup> The preliminary phytochemical screening reveals the presence of carbohydrate, gums and mucilages, proteins, phytosterols,

flavonoids, tannins and phenolic compounds. The results of phytochemical screening of extracts are shown in Table 1. The result of qualitative physicochemical examination of the gum and mucilage is tabulated in Table 2. The toxicity studies were carried out according to the method of Knudsen and Curtis and up to dose 4000 mg/kg, no mortality; no toxic manifestations were observed. So it is safe to use.

**Table 1:** Preliminary phytochemical screening of extracts

| Test for Phytoconstituents       | Methanolic extract | Aqueous extract |
|----------------------------------|--------------------|-----------------|
| <b>Carbohydrate</b>              |                    |                 |
| • Molisch's Test                 | +                  | +               |
| • Fehling's Test                 | +                  | +               |
| • Benedicts' Test                | +                  | +               |
| <b>Gums &amp; Mucilages</b>      |                    |                 |
| • Ruthenium red test             | +                  | +               |
| • Lead subacetate                | +                  | +               |
| • Gelatine solution              | +                  | +               |
| <b>Protein &amp; Amino acid</b>  |                    |                 |
| • Ninhydrin,s test               | +                  | +               |
| • Millon's test                  | +                  | +               |
| <b>Alkaloid</b>                  |                    |                 |
| • Mayer's test                   | -                  | -               |
| • Dragendroff's test             | -                  | -               |
| • Hager's test                   | -                  | -               |
| • Wagner's test                  | -                  | -               |
| <b>Glycoside</b>                 |                    |                 |
| • Legal's test                   | -                  | -               |
| • Brontager's test               | -                  | -               |
| <b>Phytosterol</b>               |                    |                 |
| • Salkowaski test                | +                  | +               |
| • Libermann's test               | +                  | +               |
| <b>Flavonoid</b>                 |                    |                 |
| • Alkali & Acid test             | +                  | +               |
| • Ferric chloride test           | +                  | +               |
| <b>Tannin &amp; Plant phenol</b> |                    |                 |
| • 5% ferric chloride test        | +                  | +               |
| • Lead acetate test              | +                  | +               |
| • Copper sulphate test           | -                  | -               |
| <b>Fixed oil</b>                 |                    |                 |
| • Spot test                      | -                  | -               |
| • Saponification test            | -                  | -               |
| <b>Volatile oil</b>              | +                  | +               |

**Table 2:** Physicochemical parameter of Okra gum

| Parameter                   | Practical value |
|-----------------------------|-----------------|
| • Total Ash (%)             | 7.56            |
| • Water soluble ash (%)     | 6.24            |
| • Acid insoluble ash (%)    | 0.52            |
| • Sp.gravity 0.01% solution | 0.997 gm/ml     |
| • pH of 1% solution         | Alkaline        |

## Conclusion

In the present study Physicochemical, Phytochemical and toxicity studies on gum and mucilage from plant *Abelmoschus esculentus* have been evaluated. For the proper identification of plant and its constituents, physicochemical parameters (Total ash, water soluble ash, acid insoluble ash, specific gravity and pH) provide useful information. The Preliminary phytochemical screening revealed the presence of Carbohydrate, Protein and Amino acid, flavonoids, phytosterol, and volatile oil. The toxicity studies were carried out according to the method of Knudsen and Curtis and up to dose 4000mg/kg, no mortality; no toxic manifestations were observed.

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