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ANTI-ULCER ACTIVITY OF *OKRA MUCILAGE*

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ABSTRACT

Okra (*Abelmoschus esculentus L;* Family: Malvaceae), commonly known as lady finger (locally called "Bhindi") is a heat loving plant and an extensively grown vegetable crop in India. Mucilage has been found to be extensively present in Okra, which is used as an emulsifying agent. Mucilages are generally normal products of metabolism formed in the cell and are storage material. In this study, we aimed at preparing Okra mucilage using extraction technique for determining the anti ulcer activity. The experimental animal we used was *Swiss Albino Mice*. At the end of study good anti ulcer activity of Okra Mucilage was found.

Keywords: Okra ,Okra mucilage, Anti-Ulcer activity.

INTRODUCTION

The name "okra" is of West African origin and is cognate with "ọ́kụ̀rụ̀" in Igbo, a language spoken in Nigeria. In various Bantu languages, okra is called "kingombo" or a variant thereof, and this is the origin of its name in Portuguese, Spanish, Dutch and French. The Arabic "bāmyah" is the basis of the names in the Middle East, the Balkans, Turkey, Greece, North Africa and Russia. In Southern Asia, its name is usually a variant of "bhindi" or "vendi". The products of the plant are mucilaginous, resulting in the characteristic "goo". The mucilage and fiber found in okra helps adjust blood sugar by regulating its absorption in the small intestine.The fiber of okra has many superior qualities in maintaining the health of the gastro-intestinal tract.It helps reabsorb water and traps excess cholesterol, metabolic toxins and surplus bile in its mucilage and slips it out through the stool [1]. Due to greater percentage of water in the bulk it thereby prevents constipation, gas and bloating in the abdomen. Okra facilitates the propagation of good bacteria referred to as probiotics. These are similar to the ones proliferate by the yoghurt in the small intestine and helps biosynthesis of Vitamin B complex. Okra is an excellent laxative treats irritable bowels, heals ulcers and sooths the gastrointestinal track. Protein and oil contained in the seeds of okra serves as the source of first-rate vegetable protein. It is enriched with amino acids on the likes of tryptophan, cystine and other sulfur amino acids. Okra mucilage also useful as acid reflux, irritable bowel syndrome, constipation, probiotic, ulcers etc [2]. It is major source of linoleic acid, oleic acid, minerals and vitamins. Isolation of mucilages done with such experimental metods. Ethenol induced ulcer produced into Swiss albino mice and then studied positive control and negative control study of antiulcer activity of okra with different frequency of dose at different interval and then studied parameter such as total area, ulcerated area,X=T/U,Ulcer index (UI)=10/X , and % cytoprotection. And finally concluded that okra seeds have antiulcer activity [3].

MATERIAL AND METHODS

The name "okra" is of West African origin and is cognate with "ọ́kụ̀rụ̀" in Igbo.

Abelmoschus esculentus

Unpicked okra [4]

Scientific classification

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Kingdom : Plantae
Division : Magnoliophyta
Class : Magnoliopsida
(unranked): Rosids
Order : Malvales
Family : Malvaceae
Genus : *Abelmoschus*
Species : *A. esculentus*

Binomial name
Abelmoschus esculentus
Botanical Name Abelmoschus esculentus (L.) Moench
Synonym Hibiscus esculentus L.
Family Malvaceae
Common Names
Arabic: bamia, bamya, bamieh
English: okro, lady's finger, ladies finger, gumbo
India: bhindi, bindi, dheras, bandakai, vendakai

USES:
Okra Nutritional value per 100 g (3.5 oz)

Energy 30 kcal 150 kJ	
Carbohydrates	7.6 g
Dietary fibre	3.2 g
Fat	0.1 g
Protein	2.0 g
Folate (Vit. B9) 87.8 µg	22%
Vitamin C 21 mg	35%
Calcium 75 mg	8%
Magnesium 57 mg	15%

Vitamin A (660 IU)Percentages are relative to US recommendations for adults.

Abelmoschus esculentus is cultivated throughout the tropical and warm temperate regions of the world for its fibrous fruits or pods containing round, white seeds. The fruits are harvested when immature and eaten as a vegetable [5].

A traditional food plant in Africa, this vegetable has potential to improve nutrition, boost food security, foster rural development and support sustainable landcare.

In western parts of India, Okra is one of the most popular vegetables of all and is often cooked in day to day meals. Generally Okra is stir fried with spices and some sugar. Okra is also used in Kadhi [6]. In Caribbean islands okra is cooked up and eaten as soup, often with fish. In Haiti, it is cooked with rice and maize; it is also used as a sauce for meat. It became a popular vegetable in Japanese cuisine toward the end of the 20th century, served with soy sauce and *katsuobushi* or as tempura. It is used as a thickening agent in gumbo. Breaded, deep fried okra is served in the southern United States. The immature pods may also be pickled. Okra leaves may be cooked in a similar manner as the greens of beets or dandelions. The leaves are also eaten raw in salads [7]. Okra seeds may be roasted and ground to form a non-caffeinated substitute for coffee. As imports were disrupted by the American Civil War in 1861, the Austin State Gazette noted, "An acre of okra will produce seed enough to furnish a plantation of fifty negroes with coffee in every way equal to that imported from Rio."

Okra oil is a pressed seed oil, extracted from the seeds of the okra. The greenish yellow edible oil has a pleasant taste and odor, and is high in unsaturated fats such as oleic acid and linoleic acid. The oil content of the seed is quite high at about 40%. Oil yields from okra crops are also high. At 794 kg/ha, the yield was exceeded only by that of sunflower oil in one trial [8].
Unspecified parts of the plant reportedly possess diuretic properties. Contains male contraceptive gossypol.

Health Benefits

The worldwide used versatile vegetable called okra is characterized by green color, elongated and tapering ridged pods infused with double row of seeds and slimy texture when cut open. This integral member of the cotton family is indigenous to regions around the Nile in North Africa and the Middle East for it was discovered dating as far as 3500 years ago in Ethiopia. Early Egyptians are known to love its taste. Okra later transcended to North America enroute slave trade and then to Europe, Asia and South and Central America. Besides being low in calories it is aplenty with vitamins of the category A, Thiamin, B6, C, folic acid, riboflavin, calcium, zinc and dietary fiber. Eating okra is much recommended for pregnant woman besides other for it is rich in folic acid which is essential in the neural tube formation of the fetus during 4-12 weeks of gestation period in the mother's womb [9].

Research revelations by the eminent nutritionists' state
• The mucilage and fiber found in okra helps adjust blood sugar by regulating its absorption in the small intestine.
• The fiber of okra has many superior qualities in maintaining the health of the gastro-intestinal tract.
• It helps reabsorb water and traps excess cholesterol, metabolic toxins and surplus bile in its mucilage and slips it out through the stool. Due to greater percentage of water in the bulk it thereby prevents constipation, gas and bloating in the abdomen.
• It is an ideal vegetable for weight loss and is storehouse of health benefits provided it is cooked over low flame to retain its properties. This also to ensure that the invaluable mucilage contained in it is not lost to high heat.
• Okra facilitates the propagation of good bacteria referred to as probiotics. These are similar to the ones proliferate by the yoghurt in the small intestine and helps biosynthesis of Vitamin B complex.
• For adding bounce your hair. Boil horizontally sliced okra till the brew become maximally slimy. Cool it and add a few droops of lemon and use this as the last rinse and see your hair spring back to youthfulness and jump.
• Okra is an excellent laxative treats irritable bowels, heals ulcers and sooths the gastrointestinal track.

• Protein and oil contained in the seeds of okra serves as the source of first-rate vegetable protein. It is enriched with amino acids on the likes of tryptophan, cystine and other sulfur amino acids.
• Okra is commonly used in Southern, Creole, and Cajun cooking. This is due to the fact that it was initially introduced into the United States in its southern region. Since there is little frost in the southern region, okra grows well there.

Nutrition

Okra is more a diet food than staple. Pods are low in calories (scarcely 20 per 100 g cooked), practically no fat, and high in fiber. It does provide several valuable nutrients, including about 30 percent of recommended levels of vitamin C (16-20 mg), 10-20 percent folate (46-88 µg), and a little more than 5 percent vitamin A (14-20 RAE).The leaves provide protein, calcium, iron, and vitamins A and C. No toxic substances have been reported in the leaves [10]. The seeds are potentially a good source of an especially nutritious protein. In screening a large collection of seeds in Puerto Rico, it was found that their protein contents varied from 18-27 percent. The protein's amino-acid profile differed from that of either legumes or cereal grains [11]. It was rich in tryptophan (94 mg/g N) and had an adequate content of sulfur-containing amino acids (189 mg/g N). This okra protein thus complements, balances, and fulfills that of cereal grains and legumes, not to mention root crop.

Industrial Development

With such an array of possibilities, several rural industries might be built around this species, much as around bamboo or rattan in eastern Asia.

Oilseed: No one knows the future okra could have as an oilseed, but at least at first sight it could be quite big. The oil is easily extracted using either solvent or mechanical press. Both the greenish-yellow color and the not unpleasant odor are easily removed Machinery for harvesting the seed has been developed and to extract the oil machinery designed for cottonseed can be employed.

Mucilage: On the surface, there seems no reason why okra mucilage cannot play a part in supplying industries that now employ psyllium, flaxseed, and aloe vera. However, confirmation is needed. Issues needing clarification include the performance of okra product, safety, and likely price range. Again, growers or researchers should produce enough for evaluation by chemists, food technologists, and companies that buy mucilaginous materials. Again, it could open up the possibilities to vast new industries for many lands [12].

Paper Pulp: Any reader who already grows okra may by now be wondering if we really know the plant. But that is only because the types grown for vegetable purposes are specially bred dwarfs, typically less than a meter in height and surely inappropriate for papermaking or fuel or particleboard. However, among this species' huge biodiversity are African varieties with stems towering 5 m and "trunks" like small trees (up to 10 cm diameter). At least in principle, those can be harvested for pods, seeds, and leaves and later felled for fiber or fuel. Some varieties even show a perennial nature. This multi-year production—like the ratooning used with sugarcane—saves the expense, trouble, and delay that comes with making a second planting.

Horticultural Development: Although there has been considerable selection and breeding of okra, it has emphasized the production of immature pods. The rest of the fantastic genetic diversity within this species is basically untapped, or even unexplored. That situation should be changed, and fast. Germplasm needs to be gathered up not only in Africa but also in Asia and other regions that know the crop [13]. With this genetic variability in hand, the way should be open for improving the compositional value of the crop for the various separate products. Varieties could be bred, for instance, for fiber, biomass, oil, protein, mucilage (type and yield), color, and ornamental use. Breeding studies could also be expanded to include improving yields, cultivation conditions, nutritional value, and nutraceuticals.

Okra flowers are structured for insect-pollination (bees, wasps, flies, and beetles, and perhaps even occasional birds), but self-pollination usually occurs and both hand-pollination and seed handling are straightforward. Controlled breeding is thus not difficult, although success in bringing out some characteristics may require very large populations and very careful evaluation.

Toxicity Checks: Although both okra tofu and the protein-rich residue left after oil extraction offer promising foods and feeds, there is a possible drawback. Okra seeds, like cottonseeds, purportedly contain gossypol or a gossypol-like compound. All doubts will have to be removed before okraseed can be employed as a protein source [14]. Strangely, should gossypol be present in commercial amounts it might possibly be used for the long-sought male contraceptive (see sidebar). In at least some okraseed varieties the oil contains small quantities of cyclopropenoid fatty acids. These unstable compounds have strong physiological effects and in hens are believed to suppress egg laying. However, the fact that some okra plants had only low quantities (the overall range was 0.26-5.59 percent) suggests that the problem might be bred out. These unusual fatty acids are easily removed by heating the oil during processing, but having none to start with would surely be better [15].

Food Technology

Here, too, are possibilities for fascinating research. Examples include:

- **Okra Tea** Okra's close cousin roselle has been making a name for itself in recent years as a major ingredient in non-caffeinated teas (notably in the United States, where it stars in the popular Red Zinger Tea®). Jamaicans know this okra relative as sorrel and consider it one of the island's great delicacies, turning it not only into

cooling beverages but into famous tarts and jellies as well [16]. It is also a common tea in the Sahel, where it was introduced to provide plant fiber and vitamin C, and has now naturalized. Okras with red calyxes are known and should be tested for the possibility of producing a counterpart.

Decaffeinated Coffee Could okra seed be a direct route to a really good caffeine-free beverage? That is something for which a market seems more promising now than ever before, and the possibility deserves at least a look-see.

Medical uses and remedies
Acid reflux
Asthma
Atherosclerosis
Capillary structure
Cataracts
Colo-rectal cancer prevention
Constipation
Diuretic
High cholesterol
High homocysteine
Irritable bowel syndrome (IBS)
Multiple sclerosis (MS)
Probiotic
Ulcers

Dosage
No particular dosage levels were found for okra products. For healthy dose information particular to you, check with a doctor or medical professional [17].

Cautions and side effects
No cautions regarding to the use of okra were found.

Active ingredients
Linoleic acid
Oleic acid
Vitamins and minerals

ACTIVITY PERFOMED
Isolation of mucilage
Mucilage

Mucilages are polysaccharide macro molecules that dissolve more or less upon contact with water and form colloidal solutions Mucilages are generally normal products of metabolism formed with in the cell (intracellular formation) and many represent storage material.

Method
Plant material

Fresh fruits of A. esculentus were purchased from local market and were dried in sunlight and coarsely pulverized. The powdered material (1kg) was macerated with water for 24h. The solid matters were separated by passing thick suspension through muslin cloth. The filtrate so obtained was then added with ethanol (96 %) to precipitate out mucilage. The mucilage (17%w/w) was then subjected to air drying for sufficient period of time [18].

Animals

Swiss albino mice were used. The animals were housed under standard conditions of temperature (22 ± 10C), relative humidity (55 ± 10%), 12 hr light/dark cycles and fed with standard pellet diet and water.

Grouping of animals

The animals were divided into five groups each containing six animals. Group I served as untreated control and received distilled water (5ml/kg, p.o.), group II served as positive control and received sucralfet (500 mg/kg, p.o.) and group III, IV and V were treated with 100, 200, and 400 mg/kg, p.o. of mucilage respectively.

Ethanol-induced ulcer

Ethanol-induced ulcer in mice was studied using reported method. Absolute ethanol (1 ml) administered orally to 24 h fasted rats. The test samples were given 30 min before ethanol administration. The animals were sacrificed after 1 h by cervical dislocation and the stomach was removed, opened along the greater curvature, and washed gently with saline solution. The degree of erosion was calculated in terms of ulcer index using scion image software using following formula [19].

Ulcer index = 10/X
Where X = Total area of stomach mucosa / total ulcerated area.
Percentage cytoprotection was calculated according to following formula:
% Cytoprotection = (C-T/C) ×100
Where,
C= Ulcer index in control group
T= Ulcer index in treated group

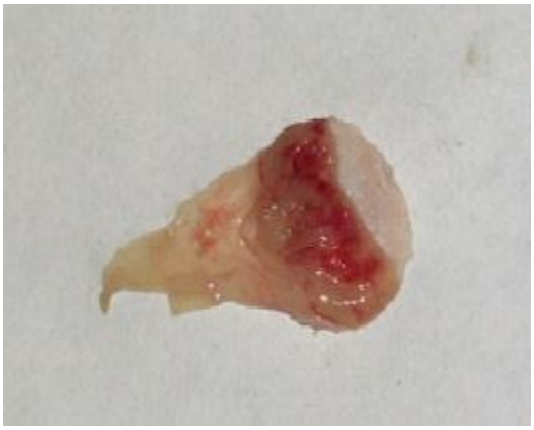
EXPERIMENTAL RESULTS

Groups	Dose(mg/kg)	Total area(T)	Ulcerated area(U)	X=T/U	Ulcer Index(UI)=10/X	% cytoprote-ction
Control	Water 5ml/kg	371.6±12.47	22.92±2.12	16.85±1.45	0.62±0.06	------
Sucralfate	100	357±9.01	6.45±0.4	56.38±3.06	0.18±0.01	70.97
Mucilage	100	399±27.6	11.5±1.1	31.46±1.7	0.32±0.01	48.39
	200	379.9±27.6	11.5±1.19	33.74±1.68	0.30±0.02	51.31
	400	427.8±39.17	9.9±1.7	48.4±7.1	0.22±.02	64.52

Fig 1. Okra slices show the pentagonal cross-section of the fruit

Fig 2. Experimental Observations

POSITIVE CONTROL



- Sucralfate solution 100mg/kg given.

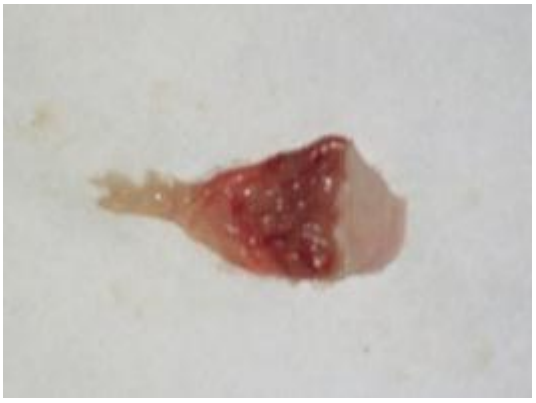
NEGATIVE CONTROL

- Water given as vehicle.

FIRST DOSE

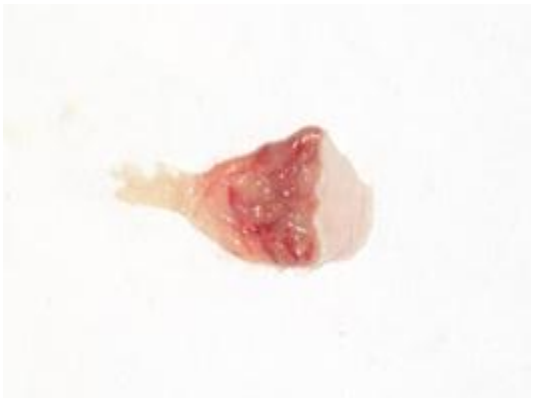
- 100 mg/kg mucilage**.**

SECOND DOSE



- 200 mg/kg mucilage.

THIRD DOSE



- 400 mg/kg mucilage**.**

CONCLUSION

The Mucilage might act as mechanical barrier that prevent penetration of the ethanol into the gastric mucosa. Probably, it forms a protective layer and prevents the deep necrotic lesions and the extensive exfoliation of surface epithelium induced by ethanol. This is similar to sucralfate which forms gel-like webbing over ulcerated or eroded tissues serving as a sort of a bandage.

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