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Extraction and Anti -Oxidant activity of okra Mucilage

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Abstract: Okra (Abelmoschus esculentus L.) is a flowering plant of the Malvaceae family which is also known as lady's finger, gumbo, bamya or bania or commonly known as bhindi. Natural polymers have been used in different pharmaceutical formulations. They are easily available, non-toxic, biodegradable and cost effective to be used as pharmaceutical excipients. In present investigation, we have reviewed about method for extraction and characterization of mucilage (Hibiscus esculentus) and further characterized to be used as pharmaceutical excipient.

Main focus of review was to study about anti cancer activity of okra mucilage. Different methods for isolation and physicochemical method for characterization was focused. Antioxidant activity as well as IR spectra determination was noted. Okra is rich in phenolic compounds with important biological properties like quartering and Flavonol derivatives, Catechin Oligomers and hydroxycinnamic derivatives. Okra is also known for being high in antioxidants activity. Okra has several potential health beneficial effects on some of the important human diseases like cardiovascular disease, type 2 diabetes, digestive diseases and some cancers.

Keywords: Okra Mucilage, Extraction, Antioxidant

I. INTRODUCTION

Indian system of medicine has a deep root in our cultural heritage and cater to the medicare of large section of our population. This system mainly used herbs, recent times there has been a marketed shift towards herbal cures because of pronounced cumulative and irreversible ill effects of many modern drug. Indian system of medicine (Ayurveda, Siddha, Unani, Yoga and Naturopathy) has developed over a long period of time. Herbal medicine is also called botanical medicine or phytomedicine. (1)

Herbalism is a traditional medicine practice based on the use of: a plant seeds, berries, roots, bark or flowers and plant extract for medicinal purposes. Advances in clinical research show the value of herbal medicine in the treating and preventing disease. Plants had been used for medicinal purposes long before recorded history. Okra (Abelmoschus esculentus L.) is a flowering plant of the Malvacae family which is also known as lady's finger, gumbo, bamya or bamia or commonly known as bhindi. Natural polymers have been used in different pharmaceutical formulations. They are easily available, non-toxic, biodegradable and cost effective to be used as pharmaceutical excipients. (2)

In present investigation we have reviewed about method for extraction and characterization of mucilage (Hibiscus esculentus) and further characterized to be used as a pharmaceutical excipient. Main focus of review was to study about anti-cancer activity of okra mucilage. Different methods for isolation and physicochemical method for characterization was focused. Antioxidant activity as well as IR spectra determination was noted. Okra is rich in phenolic compounds with important biological properties like quartering and flavonol derivatives, catechin oligomers and hydroxycinnamic derivatives. Okra is also known for being high in antioxidants activity. Okra has several potential health beneficial effects on some of the important human diseases like cardiovascular disease, type 2 diabetes, digestive diseases and some cancers. (3)

Nowadays, plant gums and mucilage have evoked large interest due to their various pharmaceutical applications as diluents, binders, disintegrants thickeners and gelling agents in gel making them attractive substitutes for costly synthetic excipients. Binders play important role in tablet formulation as tablet formulation to impact cohesion on

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powder mix and hence improve on he flow properties of Extraction, characterization and medicinal activity of okra mucilage 8 the granules. (4)

A majority of the investigations on natural excipients in drug delivery systemshave centred on proteins and polysaccharides, due to their ability to produce a wide range of materials and properties according to molecular structural alteration mucilage's are very often used in various industry. Two plants are prominently used, and have been chosen for this investigation; these are the leaves of Hibiscus rosasinensis Linn and fruits of Okra (abelmoschus esculentus Linn).

This plant was formerly name as Hibiscus esculentus and was originated fromIndia. Size of okra can be divided into three categories; large (L), Medium (M)and Small (S) with respect to their lengths. Mucilage can be termed as plant hydrocolloid having polymer of a monosaccharide. But polysaccharide is having mucilage having hydrophilic substance with high molecular weight molecules. Their swelling properties are observed by characterized by the entrapment of large amount of water between the polymer chains and branches.

From literature it was found that okra possess anticancer activity. For the detection of activity okra was isolated and characterized for significant cell growth inhibition in human breast cancer (MCF7) cells up to 63% is reported. Hot buffer extraction of okra pod could induce apoptosis in melanoma cells by interacting with Gal-3 and cause a cell cycle arrest in G2/M phase. Moreover, the fraction of okra polysaccharide extract had inhibition effects on MCF-7, Hela, and MCG803 cells with the lowest survival rates of 63.90, 63.5, 1 and 67.71%, respectively. (5)

From okra contains significant levels of protein, carbohydrate, neutral sugars,minerals and other complex polysaccharides and medically reported to be linked with anticancer, antimicrobial, hypoglycaemic, anti-ulcer activities. Therheological behaviour of okra mucilage is pseudoplastic and can be used to enhance viscosity hence it acts as an ideal substitute for costly synthetic and semi-synthetic excipients.

History

Okra was first found in former Abyssinia (present Ethiopia) was later distributed to the Caribbean, South America, North America, Africa, India, and Eastern Mediterranea.

For the present moment, after its long-term glory in southern countries. okra is gaining popularity in the west (6)



Properties of okra -

1) Okra is vegetable from Africa.

2) It is very rich in mucilage.

3) Suitable to treat constipation.

4) Mucilage softens and smoothes mucous. So, it is suitable for Gastritis, digestive ulcers, etc.

5) Extraction, characterization and medicinal activity of okra mucilage (8)

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BENIFITS

In Pharmaceutical Field:-

OM used as a emulsifier, binder, anti-oxidant, excipient, polymer in drug delivery system

In Food industry:-

Used as emulsifying agent, stabilizer, confectionery and thickening agent in sauce

In Cosmetics:-

Skin cleanser, moisturizer, prevent skin pigmentation, reduce acne, hair conditioner, etc... Binder:-

Extracted okra mucilage as a binder in tablet formulation shows significant effect on physicochemical property like hardness, friability disintegration time

Excipients:-

In atenolol floating tablet, the okra mucilage with gas forming agent like sodium bi carbonate gives effective floating tablet with

extended the drug release and also followed the first order kinetics and higuchi's mechanism.

Polymer:-

The okra mucilage as a polymer in Lamivudine tablets shows better drug release because that retarded the drug due to increased gel strength.

Microspheres:-

Ambroxol hydrochloride microspheres developed by OM shows better impact on sustaining the drug release and improved bioavailability.

Oral dispersible tablet:-

Taste masking of bitter drug (Promethazine HCl oral dispersible tablet) was successfully prepared by okra mucilage.

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Gastro retentive drug delivery system:-

Ziprasidone HCl gastro retentive formulation enhanced gelation property and shows excellent buoyancy rate in oral gastro retentive drug delivery sytem.



Okra dietary and nutritional values :

Okra plays an important role in the human diet by supplying carbohydrate, minerals and vitamins. K, Na, Mg and Ca were found to be the principle elements, with Fe,Zn, Mn and Ni also present. Okra seeds could serve as alternate rich sources of protein, fat, fiver and sugar. The natural phenolic content of okra seeds has been reported. (9,10)

Nutritional Value of Okra	100gms
Energy	33kcal
Dietary fibre	3.3gm
Carbohydrate	7.6gm
Fat	0.1gm
Protein	2.0gm
Calcium	75mg
Magnesium	57mg
Potassium	299mg
Vitamin- A	669IU
llVitamin C	671IU
Vitamin B	665IU

Nutritional Value of Okra per 100gms (11)

Literature review

Suhailah H et al, 2019: Observed anticancer activity of okra raw polysaccharides extracts against human liver cancer cells. For the detection of activity okra was isolated and characterized for significant cell growth inhibition in human breast cancer (MCF7) cells up to 63% is reported

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Habtamu F. et al, 2018: Observed that Okra pods were immersed in water at room temperature. In that solid was separated from the filtrate. Lastly the resultant fine powder was obtained and stored in an amber recipient until the moment of use.

Mark L. Woolfe. Et al, 2018: Studied physicochemical characterization of isolated mucilage. In that identification tests for carbohydrates, proteins, mucilage and gums are carried out. Then organoleptic evaluation of isolated mucilage, pH of mucilage and infrared spectra of the mucilage was performed

Leonardo G. et al, 2014: Reviewed determination of antioxidant properties by Methanolic extraction and lastly the determination of DPPH scavenging activity of Okra mucilage.

Ahiakpa J. K. et al, 2014: Reported that mucilage from okra contains significant levels of protein, carbohydrate, neutral sugars, minerals and other complex polysaccharides and medically reported to be linked with anticancer, antimicrobial, hypoglycemic, anti-ulcer activities. it acts as an ideal substitute for costly synthetic and semi-synthetic excipients

Rishabha M et al, 2011: Found extraction methods and isolation of mucilage. In present study we have concluded two different methods for extraction of okra which can give maximum yield with minimum requirements..

Ameena K et al, 2010: Studied an isolation of the mucilage from Hibiscus rosasinensis Linn. and Okra and studies of the binding effects of the mucilage. Binders play important role in tablet formulation as tablet formulation to impact cohesion on powder mix and hence improve on the flow properties of the granules. Vast application of plant mucilage and gums in various industries is because of low cost, ready availability and important properties which they confer on products.

Noorlaila A et al, 2010: Focused on Emulsifying properties of extracted Okra mucilage of different maturity index and its applications in coconut milk emulsion. Size of okra can be divided into three categories; large (L), medium (M) and small (S) with respect to their lengths. Their swelling properties are observed by characterized by the entrapment of large amount of water between the polymer chains and branches.

PLAN OF WORK;



Aim : Extraction and Anti-Oxidant Activity of okra mucilage

Objective : The major objective of the present investigation was to extract a natural okra mucilage and check the antioxidant activity of okra mucilage

Material and method :

Material : Okra mucilage, ethanol, water , DPPH (analytical grade), Methanol or ethanol (analytical grade) ,Test samples (plant extracts or compounds), Standard antioxidant (e.g., Ascorbic acid, Trolox, or BHT), 96-well microplate, Microplate reader (set at 517 nm), Pipettes and tips, Aluminum foil or dark box (to protect from light)

In present study I have concluded two different methods for extraction of okra which can give maximum yield with minimum requirements.

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First method

Step 1: Extraction of mucilage

1. Hibiscus esculentus fruit were used for isolation of mucilage.

2. Firstly, fruit were washed with water to clean it fromdirt if any and grinded into a mixer.

3. The material obtained was soaked in warm water for 4 hours, boiled for 2 hour and kept aside for 2 hours for release of mucilage into water.

4. After a period of 2 hours material was squeezed in a muslin bag to remove the mark from the filtrate.

Step 2: Isolation of mucilage:

1. Equal volume of ethyl alcohol was added to filtrate to precipitate the mucilage.

2. The mucilage was separated, dried in oven at about 450 C powdered and passed through sieve #80. The powdered mucilage was stored in a desicator until further use



Fig. Extracted okra mucilage

Second method Step 1:

Extraction of mucilage:

1. Okra pods (without seeds) were sliced and immersed in water at room temperature.

2. After 12th with the aid of muslin cloth, the solid was separated from the liquid fraction.

3. Three volumes of ethanol were added to the filtrate and liquid was slowly stirred by handling until mucilage was precipitated.

Step 2:

Drying of sample:

1. The mucilage was dried for 12th hour at 30o C in an oven.

- 2. Pulverized to fine powder with the aid of grinder and passed through sieves.
- 3. The resultant fine powder was stored in an amber recipient until the moment of use. (15,16)



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Fig. Okra mucilage in ethanol **DOI: 10.48175/IJARSCT-27308**





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Antioxidant Activity by DPPH Method (96-Well Plate) Anti-oxidant is a substance that helps protect your cells from damaged caused by free radicals – can damage cells, proteins, and DNA, Contribute to aging and disease like cancer and heart disease . Anti-oxidant neutralize these free radicals, helping to prevent or reduce this damage Reagent Preparation:

- 1. DPPH Solution (0.1 mM):
- o Dissolve 3.94 mg of DPPH in 100 mL methanol.
- o Store in dark bottle and use freshly
- 2. Sample and Standard Preparation:

o Dissolve samples and standard in methanol to prepare a series of concentrations (e.g., 250, 500, 1000 µg/mL).

Procedure:

- 1. Add 100 µL of each test sample or standard into wells in triplicates.
- 2. Add 100 µL of freshly prepared 0.1 mM DPPH solution to each well (except blank).
- 3. Add 100 μ L methanol to blank wells (no DPPH).
- 4. Cover plate with aluminum foil and incubate in the dark for 30 minutes at room temperature.
- 5. Read absorbance at 517 nm using a microplate reader.

Calculation:

Inhibition (%) = (OD Control – OD Sample) / OD Control ×100

In the present study, Ascorbic acid, used as the reference standard, demonstrated strong dose-dependent antioxidant activity with percent inhibitions of:

- * 77.40% at 250 µg/ml,
- * 79.26% at 500 $\mu\text{g/ml},$ and
- * 86.17% at 1000 $\mu g/ml.$

This confirms the reliability of the assay.

Sample-S1 also exhibited moderate and dose-dependent antioxidant activity:

* At 250 µg/ml, percent inhibition was 47.23%,

- * At 500 µg/ml, it increased to 53.49%, and
- * At 1000 µg/ml, it reached 60.62%

Result and discussion

Sr.no	Sample code	Conc.	OD			Mean	Percent inhibition
1	Control	-	1.456	1.564	1.485	1.501	
2	Standard	250	0.334	0.337	0.347	0.339	77.40
	Ascorbic acid	500	0.315	0.316	0.303	0.311	79.26
		1000	0.213	0.201	0.209	0.207	86.17
3	Sample S1	250	0.789	0.799	0.789	0.792	47.23
		500	0.698	0.699	0.698	0.698	53.49
		1000	0.598	0.589	0.587	0.591	60.62

Although Sample-S1 showed lower antioxidant activity compared to ascorbic acid, the consistent increase in percent inhibition with concentration indicates the presence of active compounds capable of neutralizing free radicals. These results suggest that Sample-S1 possesses moderate antioxidant potential.

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II. CONCLUSION

The study demonstrates that Sample-S1 exhibits moderate antioxidant activity, increasing with concentration, as measured by the DPPH method. While it is less potent than ascorbic acid, its ability to scavenge free radicals suggests that Sample-S1 may be a useful source of natural antioxidants

REFERENCES

- [1]. Suhailah H et al, Anticancer activity of okra raw polysaccharides extracts against human liver cancer cells, Tropical Journal of Pharmaceutical Research (2019)18 (8): 1667-1672
- [2]. Mark L. Woolfe .et al, Studies on the Mucilage Extracted from Okra Fruits (Hibiscus esculentus L.) and Baobab Leaves (Adansonia digitata L.), J. Sci. Fd Agric. (2018)1917(28),519-529.
- [3]. Noorlaila A et al, Emulsifying properties of extracted Okra (Abelmoschus esculentus L.) mucilage of different maturity index and its application in coconut milk emulsion, International Food Research Journal, (2015)22(2): 782-787
- [4]. Ahiakpa J.K. et al, Mucilage Content of 21 Accessions of Okra (Abelmoschus spp L.), Scientia Agricultural, (2014) 2 (2): 96-101
- [5]. Leonardo G. M et al, Lectin of Abelmoschus esculentus (okra) promotes selective antitumor effects in human breast cancer cells, Biotechnol Lett (2014) 36:461–469
- [6]. Rishabha M. et al, Extraction Characterization and Evaluation of Selected Mucilage as Pharmaceutical Excipient, PHARMACEUTICAL EXCIPIENT, (2011)39-43
- [7]. Ameena K et al, Isolation of the mucilage from Hibiscus rosasinensis Linn. and Okra (Abelmoschus esculentus Linn.) and studies of the binding effects of the mucilage, Asian Pacific Journal of Tropical Medicine, (2010)539-543.
- [8]. Pranati S. et al, formulation and evaluation of paracetamol tablet, international journal of pharmaceutical science review and research, volume 3, issue 1, July august 2010, article 0
- [9]. Habtamu F. et al, Nutritional quality and health benefit of okra (abelmoschus esculentus L.) a review, international journal of nutrition and food science 2015. 4(2): 208-215.
- [10]. Cotrim, M.A.P.; Mottin, A.C.; Ayres, E. Preparation and characterization of okra mucilage (Abelmoschus esculentus) edible Films.Macromol. Symp. 2016, 357, 90–100.
- [11]. Mohammadi, H.; Kamkar, A.; Misaghi, A. Nanocomposite films based on CMC, okra mucilage and ZnO nanoparticles: Physico mechanical and antibacterial properties. Carbohydr. Polym. 2018, 181, 351–357.
- [12]. Araújo, A.; Galvão, A.; Silva Filho, C.; Mendes, F.; Oliveira, M.; Barbosa, F.; Sousa Filho, M.; Bastos, M. Okra mucilage and corn starch bio-based film to be applied in food. Polym. Test. 2018, 71, 352–361.
- [13]. Ma, D.; Jiang, Y.; Ahmed, S.; Qin, W.; Liu, Y. Physical and antimicrobial properties of edible films containing Lactococcus lactis. Int. J. Biol. Macromol. 2019, 141, 378–386.
- [14]. Mane, K.V.; Manthen, M.U.; Mhamane, S.S. Evaluation and formulation of okra extract (mucilage) containing moisturizing hair conditioner. Int. J. Res. Eng. Sci. Manag. 2019, 2, 330–332.
- [15]. Mistry, A.K.; Nagda, C.D.; Nagda, D.C.; Dixit, B.C.; Dixit, R.B. Formulation and In Vitro Evaluation of Ofloxacin Tablets using Natural Gums as Binders. Sci. Pharm. 2014, 82, 441–448
- [16]. Alalor, C.A.; Uhumwangho, M.U.; Iwuagwu, M.A. Evaluation of ciprofloxacin floating-bioadhesive tablet formulated with okra gum as multifunctional polymer. UK J. Pharm. Biosci. 2018, 6, 01–11.
- [17]. Malviya R., Srivastava P., Kulkarni G. T.: Applications of Mucilages in Drug Delivery A Review. Advances in Biological Research, (2011), 5, (1), 1–7
- [18]. Malviya R., Shukla P., Srivastava P.: Preparation, Characterization and Evaluation of Chitosan–Gum Arabic Coacervates as Excipient in fast dissolving/disintegrating dosage form. FABAD Journal of Pharmaceutical Sciences, (2009), 34, 213–223.
- [19]. [7] Srivastava P., Malviya R.: Extraction, Characterization and Evaluation of Orange Peel Waste Derived Pectin as a Pharmaceutical Excipient, The Natural Products Journal,(2011) (InPress)

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- [20]. Malviya R., Srivastava P., Bansal M., Sharma P. K.: Mango Peel Pectin as Superdisintegrating Agents. Journal of Scientific and Industrial Research, (2010), 69, 688–690.
- [21]. Srivastava P., Malviya R., Kulkarni G. T.: Formulation and Evaluation of Paracetamol Tablets to Assess Binding Property of Orange Peel Pectin. International Journal of Pharmaceutical Scie
- [22]. Malviya R., Srivastava P., Bansal M., Sharma P. K.: Formulation and Optimization of Sustained Release Matrix Tablets of Diclofenac Sodium Using Pectin as Release Modifier. International Journal of Drug Development & Research, (2010), 2, (2), 330–335



