HYGEIA
JOURNAL FOR DRUGS AND MEDICINES
ISSN 2229 3590 (online)
ISSN 0975 6221 (print)

MICROWAVE ASSISTED ISOLATION OF MUCILAGE FROM THE FRUITS OF *ABELMOSCHUS ESCULENTUS*

Biren. N. Shah[1]* and Avinash. K. Seth[2]

1. Vidyabharti Trust College of Pharmacy, Umrakh, Gujarat, India.
2. Sumandeep Vidyapeeth University, Piperia, Gujarat, India.

Article history: Received: 12 October, 2010, revised: 10 December, 2010, accepted: 18 January, 2011, Available online: 14 April 2011

Abstract .

A microwave assisted extraction technique was developed to optimize the extraction of mucilage from the fruits of *Abelmoschus esculentus* plant. The plant has been extracted by conventional and microwave assisted methods for the isolation of mucilage. Microwave extraction at 160 W intensity and 40 min heating duration increase 11.55% in the yield of mucilage when compared to 1 h conventional heating method. The products obtained by both the methods were of similar nature chemically. The developed microwave procedure can be used successfully in commercial and routine laboratory isolation of mucilage.

Key Words: Microwave, Mucilage, *Abelmoschus esculentus*.

1. Introduction

In the past few years, microwave heating has been found to be a convenient source of energy not only in kitchen, but also in chemical laboratories [1]. Many of the basic principles of green chemistry are best suited for microwave processes [2]. It is one of the simple, fast, clean, eco-friendly and efficient method. It is economic in saving energy, fuel and electricity. A very short response time and better yields of the products are the main advantages of microwave heating. Commercial microwave ovens are used as a source of energy in chemical laboratories for efficient heating of water, moisture analysis, wet ashing of biological and geological materials, waste material management, sterilization of pharmaceutical preparations, inactivation of enzymes in food products, etc.

For Correspondence: birenpharma@yahoo.co.in
Contact: mobile: +91 9978262799

In the past few years, a large number of reports have appeared on the use of this technique in acceleration of organic reaction for rapid and green synthetic procedures[1]. Extraction is one of the most crucial point in the analytical chain in the effort of achieving a complete recovery of target compounds. Recently, microwave energy is being used for extraction of phytoconstituents from plants [3,4].

Microwave extraction follows the same principle as maceration or percolation, but the speed of breaking up of plant cells and plant tissues is much higher. This reduced processing time is an economic advantage and also there is less risk of decomposition or disintegration and oxidation of the valuable plant constituents. Microwave assisted extraction methods require shorter time, less solvents, higher extraction rate and better products with lower costs [4]. The microwave consists of a number of radiation chambers in order to manipulate the required energy. The energy requirement can be controlled much better than with conventional thermal energy. A great deal of work is required to standardize experimental procedures using this technique.
Today, the whole world is turning towards finding suitable alternatives for the synthetic compounds used in pharmaceutical industries from natural sources [2].

The synthetic polymers used as excipients suffer from many disadvantages such as high cost, toxicity, non- biodegradability and environmental pollution caused during their synthesis[5]. Natural polymers like mucilages and pectins are easy to isolate, purify and are non-toxic and biocompatible. They are biodegradable and will not cause environmental pollution [5]. They are found as common ingredients in cosmetic, food and non-food industries. They are used as binding, thickening, emulsifying, suspending and stabilizing agents in pharmaceutical industries and used as matrices for sustained release of drugs, because of their higher water swellability, non-toxicity, low cost and free availability [5].

Conventionally, mucilages are isolated by heating for 1 h, in aqueous solvents [5,6]. In order to reduce the duration involved in their extraction and study the yield, mucilage from the fruits of *Abelmoschus esculentus* plant was isolated in the present study using microwave method.

2. **Materials and methods**

2.1. **Collection and Authentication:**

The fruits of *Abelmoschus esculentus* (Malvaceae) plant were used for the isolation of mucilage. These materials were purchased from the local market of Bardoli, Gujarat and authenticated by Botanist from Science College Bardoli. The voucher specimen was kept in the college museum (Voucher No. VBTCP-011).

2.2. **Isolation of Mucilage by Conventional Procedure:**

Abelmoschus esculentus fruits (5 g) were powdered for 5 min in a mechanical blender and soaked in distilled water (150 ml) for 24 h in a RB flask. It was boiled for 1 h under reflux with occasional stirring and kept aside for 2 h for the release of mucilage into water. The material was filtered through a muslin bag and hot distilled water (25 ml) was added through the sides of the marc and squeezed well in order to remove the mucilage completely.

Equal volume of ethanol was added to the filtrate to precipitate the mucilage and kept inside a refrigerator for one day for effective settling. It was filtered and dried completely in an incubator at 37º C, powdered and weighed. It was subjected to chemical tests to confirm its identity [6,7].

2.3. **Isolation of Mucilage by Microwave Procedure:**

Abelmoschus esculentus fruits (5 g) were powdered in a mechanical blender for 5 min and soaked in distilled water (150 ml) for 24 h in a 1000 ml beaker. It was kept in a microwave oven (LG Grill Intello wave System, Model No. MG-2381LE) along with a glass tube inside to prevent bumping. It was subjected to microwave irradiation at 800 W intensity for 3 min. The beaker was removed from the oven and kept aside for 2 h for the release of mucilage into water. It was processed in a similar way as explained in the conventional procedure, weighed and chemical tests were carried out.The experiment was repeated several times using various intensities and different durations as shown in Table 1. In each case, the yield was calculated.

3**. Results and discussion**

Using *Abelmoschus esculentus* fruits for the isolation of mucilage, microwave standardization was carried out at several intensities and durations (Tables 1). Using 160 W intensity and 40 min heating duration, 11.55 % increase in the yield of mucilage compared to the conventional heating method.

The mucilage isolated by both the methods was found to be identical in nature and gave positive results for all the chemical tests performed. The chemical tests that were conducted are: Ruthenium red test and Molisch test. Thus, the selected plant source produced high yield of mucilage in shorter duration by the developed microwave method when compared to conventional heating.

In recent years, modern techniques are effectively being used for the extraction and isolation of phytoconstituents. Ways to minimize the consumption of energy and developing efficient isolation and purification processes is of utmost global importance today. Plant mucilages are found as common ingredients in cosmetic, pharmaceutical, food and non-food industries due to their low cost compared to the synthetic polymers [8]. In view of the rising costs and fluctuations in availability of the synthetic polymers, scientists are engaged in finding suitable alternatives to these [9]. Such an effort would be welcomed both locally and internationally. In India, only few units are manufacturing mucilages on commercial scale. USA, Switzerland and other European countries are producing these in large scale. Most of the Indian needs are mainly met by import. The conventional isolation of mucilages from plants consumes more time and gives low yields. Hence, the cost of production of these is increasing.

In the present study, mucilage was isolated in high yields and in lesser durations by the developed microwave method when compared to the conventional heating. Same quantities of raw materials were used for both the methods.

The developed microwave methods save 20 min heating duration, for the isolation of mucilage. The speed of breaking up of plant cells and plant tissues is much higher under microwave conditions [4]. The present study also proves the same.

4. **Conclusion**

In the present study, a microwave assisted method for rapid extraction of mucilage from *Abelmoschus esculentus* fruits has been optimized. The developed method improved the yield of mucilage from the selected source. In conclusion, the developed microwave procedure can be used successfully in commercial and routine laboratory isolation of mucilage.

Table 1: Standardization of microwave method for the isolation of mucilage from *Abelmoschus esculentus* fruit.

	Conventional Method		**Microwave Method**			
Sr. No.	**Duration**	**Yield (g)**	**Intensity (W)**	**Duration (min)**	**Yield (g)**	**Percent increase in yield***
1	1h	0.476	800	3	0.273	--
2			640	5	0.180	--
3			480	10	0.309	--
			320	30	0.099	
5			320	20	0.349	--
6			160	30	0.195	--
7			160	40	0.531	11.55
8			160	60	0.389	--

*In comparison to conventional method

References

1. Sharma SV, Ramasarma GVS, Suresh B.M. Chemistry: an eco-friendly technology. *Indian J Pharm Sci.* 64: 337-344 (2002).
2. Anastas PT, Warner JC. Green Chemistry: Theory and Practice. New York: Oxford Press; 1998.
3. Mattina *et al*. Microwave assisted extraction of taxanes from Taxus biomass. *J Agric Food Chem.*, 45: 4691-4696 (1997).
4. Fulzale DP, Satdive RK. Comparison of technique for the extraction of the anticancer drug camptothecin from *Nothapodytes foetida. J Chromatogr A.*, 1063: 9-13 (2005).
5. Kulkarni GT, Gowthamarajan K, Satish Kumar MN, Suresh B. Gums and mucilages: therapeutic and pharmaceutical applications. *Nat Prod Rad.*, 1(3): 10-17 (2002).
6. Kokate CK. Practical Pharmacognosy. New Delhi: Vallabh Prakashan; 1999.
7. Kulkarni GT, Gowthamarajan K, Brahmajirao G, Suresh B. Evaluation of binding properties of selected natural mucilages. *J Sci Ind Res.*, 61: 529-532 (2002).
8. Franz G. Polysaccharides in pharmacy: current applications and future concepts. *Planta Med.*, 55: 493-497 (1989).
9. Verma PRP, Razdan B. Studies on *Leucaena leucocephala* seed gum: evaluation of emulsifying properties. *J Sci Ind Res.*, 62: 198-206 (2003).