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Short Communication

EXTRACTION AND SUGAR COMPOSITION OF MUCILAGE IN *URGINEA INDICA/DRIMIA INDICA* (ROXB) KUNTH HYACINTHACEAE

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ABSTRACT

Objective: *Urginea indica (U. indica)* Kunth. Hyacinthaceae has high mucilage content; the aim of the study is to isolate the mucilage and to analyze the sugar present in mucilage and its Physicochemical properties.

Methods: The mucilage of *U. indica* extracted from the dried powder from bulbs of *Urginea indica* using Acetone Precipitation method. HPLC analysis has been made to see the presence of sugars in mucilage. The composition of polysaccharide analyzed based on the standard hydrolysis procedure using hydrochloric, sulfuric, and trifluoroacetic acid (TFA) at elevated temperature.

Results: The percentage yield of mucilage was found to be 4 %. The HPLC analysis revealed the presence of sugar such as Sucrose, Maltose, Fructose and Galactose in mucilage sample among which maltose was found to be higher with 21.84 µg/ml followed by Fructose (1.90 µg/ml), Galactose (2.09 µg/ml) and sucrose (0.82 µg/ml).

Conclusion: The present investigation showed that *U. indica* mucilage has high pharmaceutical significance with the presence of high amount of maltose, which makes it an attractive source of carbohydrate.

Keywords: *Urginea indica,* Mucilage, Sugar, Acetone Precipitation method, HPLC, Maltose

The genus *Urginea indica* (*U. indica*) belongs to the family Hyacinthaceae and comprise of about hundred species. *Urginea* species are found in certain floristic regions of the world. They are distributed in remote and difficult terrains, over the hills on the upper parts, particularly on the slopes. In India, the genus is found in southern and peninsular parts including the coastal belt, northern temperate regions and in the foothills of Himalayas. The bulbs of this plant are important which serve as an excellent source of medicine with pharmaceutical and biocidal applications such as anticancer agent, expectorant, cardiac stimulant, hypertension, dyspepsia and arteriosclerosis [1-3] in treating asthma [4], rheumatism, edema, dropsy, allergies [5], gout and various other ailments [6, 7]. The mucilage and its sugar composition in *Astragalus* species from Tran have been evaluated [8]. *U. indica* being the medicinally important plant is gaining immense global importance in view of its multiple uses. Hence, the present investigation is directed towards extracting the mucilage content and identifying the various sugars present in the bulbs of *U. indica*.

Mucilage is a sticky substance used as an adhesive and referred as gummy substance and are obtained from certain plants. The mucilage acts as a membrane thickener and food reserve in the plants [9]. It is a polysaccharide mixture having high molecular weight (20000 and more) [10] commonly found in various organs of many higher plant species [11]. This class of natural product has received much attention since ages as it has great importance in industry and medicine [12, 13]. Due to the high variability in terms of chemical constituents, the mucilage probably assumes a multitude of physiological functions in plants. It is also found in the rhizome, root and seed endosperm, where it acts primarily as energy reserve [14]. Foliar mucilage plays an important role in wound response [15], plant host-pathogen interaction [16] and in water transportation [17]. Therefore, Mucilage is a good candidate to be used as a pharmaceutical excipient.

The plant used for the present study has been identified and authenticated by the Department Taxonomist and also using Floras. It has been sent to Botanical survey of India and identified as *Urginea indica*/*Drimia indica* (Roxb) kunth. Hyacinthaceae. Plant material for the study was collected from Udupi of Karnataka state, India. The bulbs of *U. indica* were washed, shade dried, finely powdered and used for further analysis. The Mucilage from the plant was extracted using dried bulb powder by Acetone precipitation method [18].

The mucilage yield was calculated using the formula:

Wt. of dry mucilage obtained/Wt. of bulb powder taken ×100

The composition of polysaccharides analyzed was based on the standard hydrolysis procedure using hydrochloric, sulfuric or trifluoroacetic acid (TFA) at elevated temperatures [19]. TFA has been the acid of choice for carbohydrate analysis due to its effectiveness at hydrolyzing glycosidic bonds, without causing extensive destruction to the resulting monosaccharide components and also due to its volatility which minimize its interference with subsequent procedures [20].

The mucilage samples (100 mg) were dissolved in 4M Trifluoro-acetic acid (100 ml), boiled at 100 ^{o}C for 10 min and filtered through 0.45 µm syringe filter. Seven standards were used and the injected volume was 25 µl/ml from the master stock of 1 mg/ml. The sugar content in the mucilage was detected using HPLC with thermo Acela 1250, column-Syncronsis Amino 5 µm, 150 mm×4.6 mm and mobile phase of methanol and water in the ratio of 60:40. The RI detector was used having a flow rate of 1 ml/min and injection volume of 5 µl. The temperature was maintained at 35^{o} C. The sugars were released by Acid hydrolysis using Trifluoroacetic acid digestion. Mucilage refers to the viscous, clear liquid within the parenchyma cells. It is closely allied to gums and form slippery aqueous colloidal dispersions. Mucilage is commonly used adjuvant in pharmaceutical preparations. Plant mucilage is important polysaccharides with wide range of application. Mucilage is a complex polysaccharide and exhibits the osmotic property of retaining water strongly [21]. The mucilage is present only in the Golgi apparatus, and the mucilage is synthesized probably in it [22]. These polysaccharides swell when dissolved in water. *Urginea* contains a lots of mucilage in the bulbs of idioblast cells, leaves, ovary wall cells because of these properties the plant can withstand high temperature, water storage and in poor soil.

The mucilage appears as a calcium salt in mucilage cells. Calcium has a significant effect on water holding capacity and other biophysical

properties. So that the plant can survive in drought conditions and many of the health benefits associated with mucilage have been attributed to the polysaccharides contained in the gel. In *Artocarpus heterophyllus* fruits possess binding properties [10] and also the importance of *Aloe Vera* mucilage [23] in pharmaceuticals have been given.

During the present investigation, the sugars present in the mucilage sample of *U. indica* were isolated using HPLC technique. The mucilage sample was extracted using 100 grams of bulbs under different conditions. Percentage yield of *Urginea indica* mucilage was 3.8 %. The mucilage extracts obtained were further analyzed using various concentrations of the sample and compared with that of the standard. Based on the area and the retention time of the standard sample the variation in the sugar contents in the mucilage was determined using the formula:

Sugar Concentration (µg/5 µl) = (Sample Area/Standard area) X STD Concentration (µg)- ……..(1)

Sugar Concentration (µg/ml) = (1) X (1000 µl/Injected volume 5µl) ----------(2)

Sugar Concentration (µg/gm) = (2) X (Total volume of sample-100 mL) X (1000 mg/Quantity of sample taken

On the basis of the sugar, standards selected it was inferred that the sugar Maltose was found at higher concentrations (21.84 µg/ml) followed by Fructose (1.90 µg/ml), Galactose (2.09 µg/ml) and Sucrose (0.82 µg/ml) in the mucilage sample of *U. indica.* Xylose, Glucose and Rhamnose were not completely absent and were not detected (table 1). The physicochemical properties of *U. indica* mucilage have been represented (table 2). The present study shows the varying sugar content in the presently studied species of *Urginea.* Seven standards were used (fig-1) for HPLC analysis and the sugars obtained from mucilage extract of *U. indica* bulb showed variation in the number of peaks and expressed the difference in the quantity of various sugar content (fig 2).

Table 1: Sugars present in the mucilage sample of *U. indica*

S. No.	Sugar (Std)	Sugar content in mucilage sample (ug/ml)	Remarks
1	Maltose (RT: 3.359)	21.84±0.021	Detected
2	Fructose (RT: 4.073)	1.90±0.017	Detected
3	Galactose (RT: 5.053)	2.09±0.128	Detected
4	Xylose (RT: 6.137)	-	Not detected
5	Sucrose (RT: 7.352)	0.82±0.129	Detected
6	Glucose (RT: 9.925)	-	Not detected
7	Rhamnose (RT: 13.187)	-	Not detected

Each value is represented as means±SD (n=4).

Table 2: Physico-chemical properties of *U. indica* mucilage

S. No.	Properties	Observations
1	Colour	Light brown
2	Odour	Bitter
3	Nature	Amorphous
4	Solubility	Water soluble
5	Moisture content	72 %
6	PH	5.0

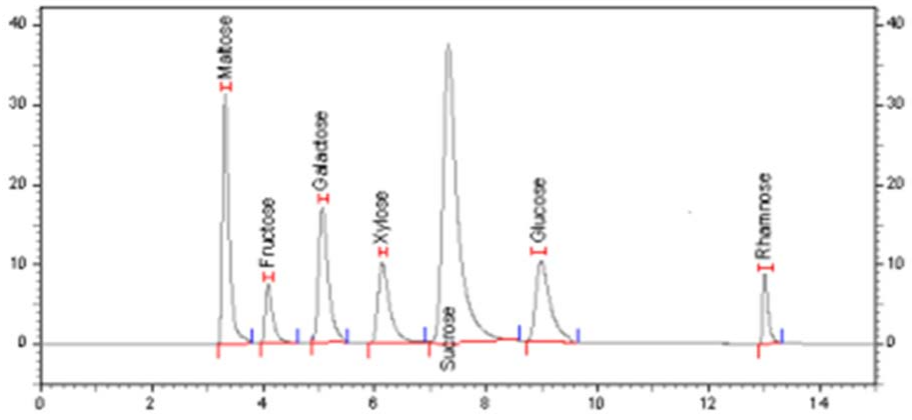

Fig. 1: Disaccharide (Standards)

Name	Retention time	Area	Area %
Maltose	3.359	390395	20.32
Fructose	4.021	180673	9.40
Galactose	5.053	242681	12.63
Xylose	6.137	205914	10.72
Sucrose	7.352	531388	27.66
Glucose	9.924	224015	11.66
Rhamnose	13.187	146227	7.61
Total		1921293	100.00

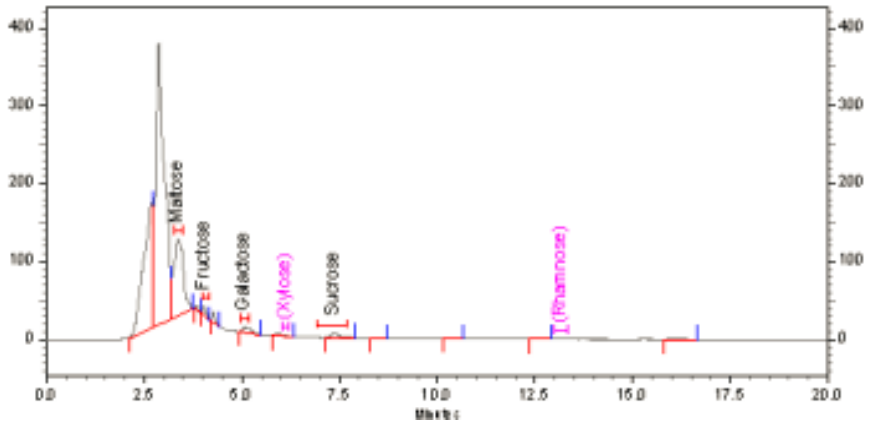

Fig. 2: Sugars in mucilage sample

Name	Retention time	Area	Area %
	2683	2629037	25.55
	2865	5529276	53.73
Maltose	3.360	1705047	16.57
	3.832	27585	0.27
Fructose	4.025	68815	0.67
	4.265	68719	0.67
Galactose	5.055	101230	0.98
	5.922	36660	0.36
Sucrose	7.357	86763	0.84
	8.470	8013	0.08
	10.377	7036	0.07
	12.637	7755	0.08
	16.180	14700	0.14
Total		10290636	100.00

These compounds are important for the plant's survival under desert conditions [24]. The mucilage of *U. indica* studied is a solid, amorphous, brown colored substance, which is soluble in water. The properties of mucilage from the bulbs of *U. Indica* have studied [25] and the yield was 4% whereas in our plant it is 3.8%. The present study showed that the mucilage content does not vary considerably in different species of *Urginea*. The mucilage is a complex polymeric substance of carbohydrate possessing varying proportions of sugars [26]. During the studies on *Opuntia* sps. Have emphasized upon the mucilage from the plant as an interesting ingredient, which can be utilized in the food industry because of their viscosity properties [27]. The significance of mucilage, their role in frost tolerance, water transport, wound response, plant host-pathogen interaction; pharmaceutical applications along with their binding properties have been studied [28]. The pharmaceutical evaluation of the *Chlorophytum borivilianum* mucilage has revealed the effective binding properties [18]. The present study revealed that *U. indica* consist of the complex mixture of sugars such as fructose, galactose and sucrose in traces and maltose was found to be the major disaccharide in the mucilage sample.

Therefore, Mucilage is a kind of hydrocolloid with a range of polysaccharide and proteins. They play important roles in improving foods appearance, shelf stability, quality and valve, hydrocolloids expert the functions as emulsifier [29]. Mucilage derived from plant sources projects a friendlier image and is more accepted by consumers. More use as traditional medicine with soothing properties. Steroidal components such as saponification and tannins were detected in *Opuntia* species [30], and the same have been reported in *Urginea indica.*

The present studies concluded that mucilage is a boon during stress condition for the survival of bulbs since *Urginea* species grow in dry regions, sandy areas in rocky crevices, hilly slopes and exposed to extreme sunlight. The physicochemical properties of *U. indica* mucilage have been described with respect to their color, odor, nature, solubility, moisture content, PH. Maltose is an important disaccharide used as an intermediate in the digestion of starch, and the plants in turn use the starch as a way to store glucose. Next to cellulose, the starch is the most important polysaccharide present in the plant cells. Maltose is formed from the starch when it is broken down and in turn can be readily digested into glucose molecule. The predominant form of carbon exported from the plant chlorophyll during night is due to break down of the starch [31]. Starch is the second member of an important biochemical series of glucose chain. Maltose is found in higher a concentration in *U. indica* mucilage, which can be used as an attractive source of Carbohydrate for further studies.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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