

Comparing The Purple Yam Starch Extraction By Ultrasound And Conventional Method

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Abstract

A polymeric carbohydrate known as starch or amyllum is made up of many glucose units connected by Alpha-D-glycosidic linkages. Most green plants synthesis this polysaccharide as a means of storing energy. Starch is most frequently used as a binder and disintegrate in the creation of tablets and other solid dosage forms in pharmaceutical excipients. Typically, tubers contain a lot of starch. Kamara, potatoes (storage root), yam, taro, Jerusalem artichoke, and ulluco are a few examples. Purple yam is a starchy vegetable belonging to the "Dioscoreaceae" family and is known as greater yam. It is scientifically known as "Dioscoreaalata". Purple yam is a starchy root vegetable that is a great source of carbohydrates. However, there is no comparative extraction method for the extraction of starch from purple yam. So that current research aimed to extract the starch from purple yam using ultrasound and conventional method and comparing the purple yam starch production. Ultrasound extraction was performed using the ultrasonic probe UP 200ST, 200W, 20KHZ. Conventional method was performed in a beaker using distilled water. The slurry filtered by muslin cloth and the sediment of starch was collected and air dried. The dried powders of starch were weighed and the yield (%w/w) was calculated. The Ultrasound extraction method (71.3%) produced higher yield than conventional method (51.2%). This study confirms that, Ultrasound extraction method is optimal method than conventional method for extraction of starch from purple yam.

Keywords: *Dioscorea alata*, starch extraction methods, Ultrasound extraction, polymeric carbohydrate.

INTRODUCTION:

A polymeric carbohydrate known as starch or amyllum is made up of many glucose units connected by Alpha-D-glycosidic linkages. Purple yam is a starchy vegetable belonging to the "Dioscoreaceae" family and is known as greater yam. It is scientifically known as "Dioscoreaalata". This tuber is often confused with sweet potatoes. Humans are familiar with about 600 species of yam. Purple yam has greyish brown skin and purple flesh that resembles a sweet potato. Purple yam was first cultivated in new guinea and was later propagated throughout islands in southeast Asia. In India, the tribal regions of Karnataka, Maharashtra, odhisa and Kerala grow purple yam and several other varieties of roots and tubers. Starch is available abundantly in India. Purple yam having abundant quality of starch so we can use the starch as alternative binding agent to potato, wheat, maize starch. Purple yam is a starchy root vegetable that is a great source of carbohydrate, potassium, and vitamin C. They are rich in

Antioxidants including anthocyanin. The flavonoids in purple yams have been shown help lower blood sugar in those with type 2 diabetes. Purple yam may help improve your gut health. They have a wide range of culinary uses. Ultrasound extraction uses ultrasound energy and solvents to extract target compounds from various plants matrices. Ultrasound are the mechanical waves having frequency (>20KHZ) higher than audible frequency range of human hearing (20HZ to 20KHZ). The conventional extraction methods

including maceration, percolation, and reflux extraction, usually use organic solvents and require a large volume of solvents and long extraction.



METHODOLOGY:

materials:

Tubers of *Dioscorea Alata* were collected from the agriculture department in trichy. Sodium hydroxide, Fehling's solution A and B, Barfoed's reagent, Bial's reagent, Iodine and Ethanol were purchased from Rohini chemicals, Chennai.

CONVENTIONAL EXTRACTION OF STARCH FROM DIOSCOREA ALATA:

The collected *Dioscorea Alata* tubers were completely washed by using distilled water to remove the adhered soil and other impurities. Later, the tubers were sliced into small pieces, and soaked in an aqueous sodium hydroxide solution (0.05% W/V) for 24hrs at room temperature. After soaking, the sodium hydroxide solution was decanted and the tubers were washed with sufficient amount of distilled water repeatedly until the PH reaches neutral. The washed tubers were mixed with sufficient amount of distilled water and passed to wet milled to get slurry. The slurry filtered by muslin cloth and the sediment of starch was collected and air dried. The dried powder of starch was weighed and the yield (%W/W) was calculated.

ULTRASOUND EXTRACTION OF STARCH:

Ultrasound extraction was performed using the ultrasonic probe UP 200st, 200W, 20KHZ. A sample of 50gm of purple yam was weighed and a placed in a beaker as an extraction solvent. The mixture was then extracted for 10min at room temperature using ultrasound extraction. In order to understand the effect of extraction factors on purple yam starch production efficacy, three variables were evaluated, i.e., solvent to sample ratio (10:1-30:1), ultrasound power (30-90%) and pulse duty cycle (0.3-0.9). The resulting solution was then filtered by filter cloth to remove the solid material. The extract was deposited overnight and dried in a cabinet dryer at 50c for 24hr. The starch obtained was calculated.

PHYTOCHEMICAL TESTS:

The *Dioscorea Alata* starch was subjected to various phytochemical tests such as iodine test, fehling's test, alcohol test, barfoeds test and bials test for identify the presence of starch, mucilage, reducing sugar and glucose.

RESULTS AND DISCUSSION:

CONVENTIONAL EXTRACTION OF STARCH:

The conventional extraction of starch from *Dioscorea Alata* tubers was a relatively easy process. Starch granules were sedimented simply, and this sedimentation was not disturbed by the presences of other materials in the milled *Dioscorea Alata* tubers suspension. The fiber materials remained floating in the supernated solution and were separated out. After extraction of starch, the percentage of was calculated based on dry weight of conventional starch and it was found to be 51.2%. The result was compared to the ultrasound extraction of starch 71.3% is more than conventional extraction of starch. The above 50% yield of conventional extraction of starch could be used as a tablet binding agent.

W1 = 50gm; W2 = 25.6gm Starch yield is 51.2%

Figure 2: Conventional method for extraction of starch from purple yam



ULTRASOUND EXTRACTION

Ultrasound extraction increases starch yield, with highest values(71.3%) at 480W and 20min. A significant increases in the amylase content, solubility and swelling power of ultrasound extraction. The *Dioscorea Alata* starch using ultrasound ectraction was studied. It is observed that the three main variables (ultrasound power, pulse duty cycle, and sovent to sample ratio) demonstrated a significant effect on the extraction process.To obtained an starch yield is solvent to sample ratio (10:1-30:1), ultrasound power (30-90%) and pulse duty cycle (0.3-0.9). The kinetic study showed that 10min extraction resulted in the highest yield is 71.3% in purple yam starch.

Figure 3: Ultrasound method for extraction of starch from purple yam



W1 = 50gm; W2 = 35.6gm

Starch yield is 71.3%

EXTRACTION METHOD	WEIGHT OF PURPLE YAM USED (G)	WEIGHTOF STARCH EXTRACTED (G)	PERCENTAGE YEILD (%W/W)
Ultrasound extraction method	50	26.50	77.83
Conventional extraction method	50	23.5	56.74

PHYTOCHEMICAL TESTS:

Plants contain a variety of polysaccharides such as cellulose, hemicellulose, pectins, gums, mucilages and starches. These materials differ in their chemical, physiological function and sources. In order to differentiate starches, gum and mucilages various phytochemical test would be carried out. The table.1 shows the results of the phytochemical test for *Dioscorea Alata* starch compared with both extraction method (USP). Both conventional extraction and ultrasound extraction of starch insoluble in cold water. The other hand of conventional extraction of starch readily soluble in hot water while ultrasound extraction of starch slightly soluble in hot water. This result supported both extraction of starch suitable as solubility test was performed. The pH of ultrasound extraction of starch solution was 6.7 while the pH of conventional extraction of starch was 6.0 (table). Both the results were confirmed pH requirements are same as per USP. Both conventional and ultrasound extraction of starch solution developed deep blue colour with 3 drops of iodine solution, indicated that the presence of starch. Both conventional and ultrasound extraction of starch showed slight precipitate with an alcoholic solution confirmed that the presence of mucilage. *Dioscorea Alata* has abundant quantities of starch, moisture, vitamins and also contain mucilage, amylase, amino acids and glutamine, which precipitate in the presence of alcohol. Both conventional and ultrasound extraction of starch showed positive results with Fehling's test, Barfoed's test, which confirmed the presences of reducing sugars such as glucose, maltose. The Bial's test showed greenish blue colour with conventional and ultrasound extraction of starch, which confirm the presences of ribose and glucose. Starches, as polymers of glucose, gums are polymer of galactose with ribonose and mucilage's are polysaccharides. Based on the below results confirmed the *Dioscorea Alata tubers* of both conventional and ultrasound extraction of starch are same as positive results.

TABLE.1 PHYTOCHEMICAL TEST FOR ULTRASOUND AND CONVENTIONAL EXTRACTION METHODS

S.NO	EXPERIMENT S	CONVENTIONAL EXTRACTION METHOD	ULTRASOUND EXTRACTION METHOD
1.	SOLUBILITY	Soluble in hot water. Insoluble in cold water.	Slightly soluble in hot water. Insoluble in cold water.
2.	PH	6.2	6.7
3.	IODINE TEST:	Deep blue color is formed.	Deep blue color is formed.
4.	ALCOHOL TEST:	Slightly precipitate is produced.	Slightly precipitate is produced
5.	FEHLING'S SOLUTION:	Red color is formed.	Red color is formed.
6.	BARFOED'S TEST :	Brick red color is formed.	Brick red color is formed.
7.	BIAL'S TEST :	Greenish blue color is formed.	Greenish blue color is formed.

CONCLUSION:

The combination of these extraction is used to gain maximum extraction yield of "*Dioscorea alata*" in a short period of extraction. This study report comparison yields of "*Dioscorea alata*" in purple yam using conventional and ultrasound extraction. This research has shown that conventional, ultrasound extraction and phytochemical tests of amylase, maltose, glucose and polysaccharides are presence in

both extraction methods. The yield of “Dioscorea alata” can be easily extract by using an appropriate duty cycle of ultrasound during the extraction process. It is concluded from this research work that ultrasound extraction is more effective in yield obtained starch from purple yam in comparison to otherconventional extraction methods.

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