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ISOLATION OF *ALOCASIA INDICA* LINN. STARCH AND ITS PERFORMANCE AS A DISINTEGRATING AGENT.

MR. LODHA G. K AND MRS. NEMADE C.T.*

Department of Pharmacognosy, SSDJ College of Pharmacy, Neminagar, Chandwad, Nashik. 423101

ABSTRACT

Starch obtained from *Alocasia indica* Linn. Tubers *(*Araceae*)* was a fine, almost white powder. The isolated starch was evaluated as a disintegrating agent by preparing a placebo tablet formulation at concentrations of 6.0 to 12.0 % w/w in the present study. The limit tests, loss on drying, and ash value were well within the official limits. The starch was also evaluated for various parameters as per Indian Pharmacopoeia. The granules prepared by wet granulation technique were evaluated for bulk and tapped densities and flow properties. Tablet properties including thickness, average weight and weight variation, hardness, friability, and disintegration time were evaluated. The disintegrant efficiency of isolated starch was compared with that of the maize starch in tablets prepared using lactose , guar gum, maize starch and magnesium stearate as diluent, binder and lubricant respectively. The disintegration time for tablet formulations prepared using 10 % w/w isolated starch was less (109 s) than that of the tablet formulations prepared using maize starch as a disintegrant (129 s).Studies indicates that *Alocasia indica* Linn. Starch possesses disintegrating property and could be useful in Conventional tablet formulation.

Key Words: Alocasia indica, maize, starch, tablet, disintegrant.

***Corresponding author**

MRS. NEMADE C.T
Department of Pharmacognosy, SSDJ College of Pharmacy,
Neminagar, Chandwad, Nashik. 423101

INTRODUCTION

The excipients are additives added to convert active pharmaceutical ingredients into dosage forms suitable for administration to patients. Plant products serve as an alternative to synthetic products because of local accessibility, environment friendly nature and lower prices compared to imported synthetic products. Herbs are non-polluting renewable resources for sustainable supplies of cheaper pharmaceutical products. Today, we have a number of plant-based pharmaceutical excipients.[1]

Excipients of natural origin are of particular interest to us for reasons of reliability, sustainability and avoiding reliance upon materials derived from fossil fuels. Plant products are therefore attractive alternatives to synthetic products because of biocompatibility, low toxicity, environmental "friendliness" and low price compared to synthetic products. Excipients from natural products are also generally non-polluting renewable sources for the sustainable supply of cheaper pharmaceutical products.[2]

Starches are used extensively in pharmaceutical industries as disintegrants, binders and lubricants in tablet formulations[3] because of its low bacterial contamination, world-wide availability, and good color stability, chemically pure, less hygroscopic in nature and comparable with wide range of drugs. Starch is inexpensive relative to other disintegrants, physiologically inert and physiochemical inactive adjuvant.[4]

Alocasia indica Linn.also known as elephant tree. The tubers of *Alocasia indica* are used as vegetables in Assam, West Bengal, Maharashtra and South India. The plant is documented to possess mild laxative, diuretic, astringent and can be used in anasarca, piles, inflammation and in eyeche (due to vitamin A content).[5,6,7] The plant is reported to possess analgesic and anti-inflammatory[8], anti-oxidant and anti-nociceptive[9], anti-protozoal and anti-diarrheal activity[10] and heapatoprotective activity[11].

The objective of present work was to isolate starch from Alocasia indica tubers and explore its use as a disintegrant in tablets. It has approximate starch content of 46.35 % w/w. The appreciable starch content as well as its local availability motivated this work. No significant work has been reported on *Alocasia indica* starch for its use as tablet disintegrant. With increasing demand and search for natural starches with desirable properties for use in the pharmaceutical industries, the present work evaluates the possible use of *Alocasia indica* starch as disintegrant to placebo tablets.

MATERIALS AND METHODS

The fresh tubers of *Alocasia indica* Linn. were collected from the local market of Chandwad, Dist. Nasik, 423101 and authenticated by Miss Rohini Raghunath Athre, Department of Biology, S. N. J. H. Chandwad, Dist Nashik. Maize starch, lactose, Magnesium stearate, and guar gum were all obtained from SD fine chemicals, Mumbai.

EXTRACTION OF STARCH

The tubers (500 gm) were washed free of soil and then peeled, peeled tubers were cut to small sizes and grated. The grated portion was soaked in water and sieved using a nylon sieve. This ensured the removal of unwanted debris. The starch slurry was collected in a large basin and allowed to settle for 10 h. The supernatant was decanted. The resultant starch slurry was severally washed with distilled water while passing through a 100-mesh sieve. The final starch slurry was allowed to settle for 10 h, decanted and dried to a constant weight in a hot air oven set at 60^{o}C for 2 h. The dried starch was pulverized,

passed through a 200 mesh sieve and stored in well closed container.[12]

Physico-chemical Properties of isolated starch

Physico-chemical properties of the powdered starch such as solubility, ash values (Lab Star Muffle furnace), loss on drying[13] (Lab Star Hot Air Oven), swelling capacity and viscosity[14] (Brookfield viscometer RV) were carried out. The pH of the starch was determined using a digital pH meter (Model ME 962-P).

Measurement of Diameter of Starch Grains[15]

The diameter of starch grains was measured by using a eyepiece micrometer and a compound microscope. Powder was stained with N/20 iodine, mounted on a microscopic slide using glycerin and the diameter of 300 starch grains was calculated randomly. From this data the average diameter of starch grain was calculated as below:

$$\text{Average diameter of starch grains} = \frac{\text{Sum of diameter of 300 grains}}{300}$$

Granulation and Evaluation

Tablet formulation was prepared by wet granulation technique[16, 17]. Required quantities of lactose and starch as disintegrating agent except the magnesium stearate were mixed thoroughly and a sufficient volume of granulating agent (starch: Guar gum slurry 9:1) was added slowly. After enough cohesiveness was obtained, the mass was sieved through 12- mesh. The granules were dried at 65°C for overnight and then were passed through 20 mesh. Magnesium stearate was finally added as glidant and lubricant. The prepared granules were then evaluated for flow properties (by measurement of angle of repose). The bulk and tapped densities of the granules were assessed in accordance with the USP 25 using a tapped Density tester (Electrolab ETD-1020). Compressibility index of the granules was determined by Carr's compressibility index.

COMPRESSION AND EVALUATION OF TABLETS

Tablets were formulated using isolated starch by wet granulation technique. (Table 3) The prepared granules were compressed (8 mm diameter, standard concave punches) using a Rotary tablet compression machine (8 station, Rimek). The batch size prepared was of 50 tablets and weight of each was 250 mg. The prepared tablets were stored for 10 days and no chemical change was observed. The tablets were evaluated for average weight and weight variation, hardness (Monsanto Hardness tester), friability (Electrolab Friabilator USP) and disintegration time[18] (Electrolab ED-2L Disintegration tester USP). Total 8 batches having 6.0, 8.0, 10.0 and 12.0 % w/w of isolated and standard starch were prepared to evaluate the disintegrant properties.

RESULTS AND DISCUSSION

Starch obtained from the *Alocasia indica Linn.* Tubers was a fine powder with almost white color. It was partially soluble in water and forms a translucent and viscous jelly on cooling. It was identified by qualitative chemical tests. (Table 1) The practical yield of this starch was found to be 30.0 % w/w.

The pH of the starch was found to be 8.1. The results for viscosity, swelling factors, particle size, ash value and loss on drying, are shown in table 2.The results from Table 3 indicate that the granules possessed satisfactory flow properties and compressibility. The physicochemical parameters observed support the applicability of the selected excipient as tablet disintegrant.

The tablets were prepared using starch of *Alocasia indica* at four different concentrations 6.0, 8.0, 10.0 and 12.0% w/w. The disintegration time for tablet formulations prepared using 10 % w/w isolated starch was less (109 s) than that of the tablet formulations

prepared using maize starch as a disintegrant (129 s). (Table 4)

The percentage friability for all the formulations was below 1% w/w. All the tablets showed uniform thickness. Increase in disintegrant concentration resulted in the decrease in disintegration time. The isolated starch and maize starch showed comparative effectiveness as disintegrant in placebo tablets.

Hence it can be concluded that *Alocasia indica* tubers starch could compete favorably with maize starch as disintegrant in tablet formulations.

Table No. 1
Identification of Starch

Sr. No.	Chemical tests	Observation	Inference
1	Molisch's test	Violet ring at junction	Presence of carbohydrates
2.	Benedict's test	No change in colour	Absence of reducing sugars
3.	Barfoed's test	No red precipitate	Absence of reducing disaccharides
4.	Iodine test	Blue colour appears	Presence of starch
5.	Biuret test	No violet or pink colour appears	Absence of proteins
6.	Libermann burchard test	No blue colour appears	Absence of steroids

Table No. 2
Physico-Chemical Characterization of Starch

Sr. No.	Physical property	Values
1.	p^H	8.1
2.	Viscosity (cp) (5% W/V)	8.16
3.	% loss on Drying	9.4- 9.8
4.	Swelling factor	10.63
5.	Diameter of starch grains	4.77 µm
6.	Ash value %	3.2

Table No.3
Granule Properties

Percentage of Starch		Bulk density (gm/cm^3)	Tapped Density (gm/cm^3)	Carr's Index	Angle of repose (^0C)
6% starch	Std starch	0.4783±0.011	0.5363±0.011	10.81±3.00	37.8±1.28
	Isolated starch	0.4893±0.014	0.5712±0.025	13.80±2.86	32.2±1.30
8% starch	Std starch	0.4866±0.015	0.5491±0.023	11.38±3.38	33.8±1.14
	Isolated starch	0.4813±0.017	0.5649±0.023	14.33±2.12	31.5±1.56
10% starch	Std starch	0.4839±0.02	0.5449±0.03	11.19±2.63	39.8±1.30
	Isolated starch	0.4766±0.018	0.5629±0.014	14.63±2.24	34.1±1.73
12% starch	Std starch	0.4732±0.016	0.5361±0.012	12.01±3.00	36.9±1.16
	Isolated starch	0.4813±0.012	0.5613±0.011	14.25±2.45	33.3±1.17

Table No. 4
Evaluation of Formulated Tablets

Parameters		Average Weight of tablet (g)	Hardness (Kg/cm^2)	Friability (%)	Disintegration time (Sec)
6% starch	Std starch	0.2492 ±0.0092	5.52 ±0.42	0.23	143
	Isolated starch	0.2487 ±0.0048	5.1 ±0.33	0.36	174
8% starch	Std starch	0.2476 ±0.0046	5.58 ±0.48	0.37	138
	Isolated starch	0.2483 ± .0086	5.24 ±0.45	0.46	163
10% starch	Std starch	0.2482 ±0.0089	5.54 ±0.46	0.32	129
	Isolated starch	0.2479 ±0.0094	5.39 ±0.39	0.39	109
12% starch	Std starch	0.2493±0.0088	5.53 ±0.47	0.32	94
	Isolated starch	0.2486 ±0.0076	5.17 ±0.43	0.28	88

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