RESEARCH ARTICLE JPAR 2019

Journal of Pharmaceutical Advanced Research

(An International Multidisciplinary Peer Review Open Access monthly Journal)

Available online at: www.jparonline.com

Physicochemical characterization of starch from Ginger (*Zingiber Officinale*)

Praveen N M*, Manasa S, Kiran B Muchadi, Sathish Kumar B Y

Department of Biotechnology, JSS College, Ooty Road, Mysuru, Karnataka, India-570025.

Received: 10.01.2019 Revised: 22.01.2019 Accepted: 16.02.2019 Published: 28.02.2019

ABSTRACT: Background: Ginger (*Zingiber officinale*) is extensively used nutritionally as well as in remedies of several complications such are nausea, vomiting, arthritis, inflammation and many more. It contains starch, fat, gingerol and volatile oil. **Aim:** The study was aimed to extract the starch from *Z. officinale* and to characterize the extracted starch physic-chemically. **Method:** The starch was extracted from *Z. officinale* by using 1 % w/v sodium metabisulphite solution. The extracted starch was characterized for moisture content, pH, foam capacity, swelling index, solubility and gelatinization temperature. The starch also evaluated chemically for presence of carbohydrate. **Results:** The starch was found to be crystalline and non-hygroscopic, with swelling index value of 1.3 %. Its solubility index was found to be 37 %, with gelatinization temperature at 80 °C. **Conclusion:** The study revealed that the extracted starch from *Z. officinale* contained carbohydrate with good physical properties.

Corresponding author*
Mr. N M Praveen
Department of Biotechnology,
JSS College, Ooty Road,
Mysuru, Karnataka, India-570025.
Mail ID: pravis087@gmail.com

Keywords: *Zingiber officinale*, Physicochemical, Reducing Substance, Antioxidant, Starch.

INTRODUCTIONS:

Ginger *(Zingiber officinale)* is an herbaceous persistent plant of the family *Zingiberaceae*, which is used worldwide in cooking and traditional medicine with exceptional acidity and typical aroma. The increased consumption of food supplements is recognized as a non-pharmacological treatment. It is commonly used for the treatment of stomachache, arthritis, and nausea. Starch is solitary prolific organic chemicals that synthesize amyloplasts of seeds, grains, roots, and leaves of green plants in the plasmids that serve as an elementary storage form of energy from the sun. Starch recognized as biodegradable and biopolymer of the digestible

polysaccharide of renowned nutritional superior to a low molecular weight of carbohydrate or sugar [1].

The World Health Organization (WHO), traditional plants are used as a complementary medicine used in pharmaceutical products coupled with desire traditional medicine used for quality and traceability of botanical element in food enhancement [2,3]. Ginger has antibacterial resistance used for traditional medicine of *Zingiberaceae* family that strengthen gastrointestinal (GI) disorder such as dyspepsia, to cure upper intestine ulcers include gastritis and peptic ulcer disease (PUD) caused due to bacterial infection (BI) [4,5]. The carbohydrates consist of large glucose units of polysaccharides which can produce using green plants as an energy store. The purest form of starch viewed as white, unsavory and unscented powders which are inexplicable in cold water or alcohol. Ginger component act as tough antioxidants and valuable antimicrobial agents used primary sources gastritis and peptic ulcer in the gram-negative bacterium [6,7]. Ginger inhibits numerous pro-inflammatory cytokines includes Interleukine-1 (IL-1), Tumor necrosis factor alpha (TNF-α) and Interleukine-8 (IL-8) with hamper prostaglandin (PG) and leukotriene (LT) synthesis enzymes, they expressed with gene encoding cytokines. They are conventional non-steroidal anti-inflammatory drugs (NSAIDs) [8]. The objective of the present study to characterize physic-chemically the starch extracted from the *Z. officinale*.

MATERIALS AND METHODS:

The fresh sample of Ginger root was collected from the local area of Mysuru district, Karnataka. The samples were cleaned and packed in a sealed container at room temperature until needed. The chemicals sodium metabisulphite was purchased from Himedia Pvt. Ltd, New Delhi. All other chemicals and reagents used in this study were of analytical grade and procured from an authorized dealer.

Extraction and Purification of Starch from *Z. Officinale*:

The fresh 2 kg of ginger roots were brought, peeled and washed. The sample was chopped into tiny pieces and soaked in 1 % of sodium metabisulphite solution in 1 l of distilled water at room temperature. Thereafter, scraps of root were impassive and drench pulverized into slurry using a grater. The paste was discrete through a huge amount of 1 % sodium metabisulphite and filtered in muslin cloth.

The deferment was centrifuged at 3500 rpm for 10 min to assist for the exclusion of dirty. The supernatant was carefully decanted and the mucilage scraped off, repeated four times with the mucilage on the starch tattered constantly in anticipation of a pure starch was obtained. The starch was auxiliary dried at 60 °C in a hot air oven, minced and stored in a sample bottle for analysis [9].

Determination of Swelling Insex:

Starch sample (0.1 g) was kept in a test tube and to it; 10 ml of distilled water was added. The mixture was heated in water bath at a room temperature of 50 °C for 30 min with uninterrupted shaking. The test tube was centrifuged at 1500 rpm for 20 min in order to facilitate the removal of the supernatant, which was carefully decanted and the weight of the starch paste was recorded by using digital balance. The swelling index (SI) was calculated by using the equation;

SI (%) = WSP/WDS …….(1)

Where, WSP is weight of starch paste and WDS is weight of dry starch sample.

Solubility study:

Solubility index was determined over a temperature range of 50 °C. The starch sample (0.5 g) was added to 10 ml distilled water in a test tube. This was subjected to heating in a water bath with a starting temperature of 50 °C for 30 min. Thereafter, it was centrifuged at 1500 rpm for 30 min. About 5 ml of the supernatant was decanted and dried to constant weight. The solubility was expressed as the percentage (%) by weight of dissolved starch from heated solution.

Solubility (%) = [WSP/WSDB]×100 …..(2)

Where, WSP is weight of starch paste and WSDB is weight of sample on dry basis.

pH determination:

A 20 % w/v dispersion of the sample was shaken in water for 5 min in distilled water and the pH was determined using digital pH meter.

Gelatinization Temperature:

This was evaluated using the starch sample (0.5 g) which was put in a 20 ml beaker. To the beaker, 5 ml of distilled water was added. The dispersion was heated on a hot plate. The gelatinization temperature was then read with a thermometer suspended in starch slurry [10].

Foam Capacity:

The starch sample (1 g) was homogenized in 50 ml distilled water using vortex mixer for 5 min. The

homogenate was poured into a 100 ml measuring cylinder and the volume recorded after 30 s. The foam capacity (FC) was expressed as the percent increase in volume.

$FC = (V_f/Vi) \times 100$ …. (3)

Where, V_i and V_f are initial and final volume of foam.

Test for Carbohydrates:

The presence of carbohydrate in starch of *Z. officinale* was assessed by carrying out the Molish's Test, Benedict's test, Fehling's Test, Barfoed's Test, Selwinoff's Test and Iodine Test. The test was carried out for both reducing and non-reducing sugar [11].

RESULTS AND DISCUSSION:

The Table 1 shows the physical evaluation data of starch extracted from Ginger. The pH of starch paste was found to be slightly acidic (6.2±0.2). The Gelatinization Temperature was found to be 80±0.02 °C. The foam capacity, swelling Index and solubility of starch extracted from ginger was found to be 4±0.1, 1.3±0.42 and 37±0.22 % respectively. The phyto-chemical analysis revealed that the ginger starch paste contain carbohydrate as evident from Table 2. The result showed the ginger starch paste possess good physic-chemical properties.

Table 1. The physic-chemical data of Ginger paste.

Parameters	Ginger
pH	6.2±0.2
Gelatinization Temperature (^{0}C)	80±0.02
Foam Capacity (%)	4±0.1
Swelling Capacity (%)	1.3±0.42
Solubility Capacity (%)	37±0.22

All values are presented as mean±stardard deviation (n=3).

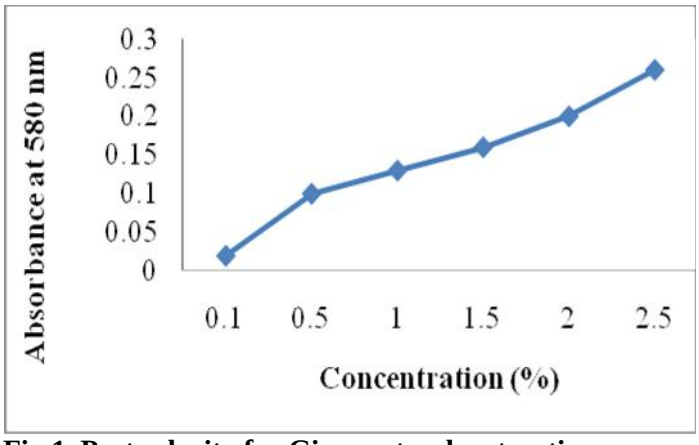

Fig 1. Paste clarity for Ginger starch extraction.

Table 2. Phyto-chemical screening of starch paste of Ginger.

Chemical Test	Remark
Test for Carbohydrates a) Molishs Test b) Fehling Test c) Benedicts Test	 Positive Negative Negative
Test for Monosaccharide a) Barfoed's Test	 Negative
Test for Hexose Sugar a) Selwinoff's Sugar	 Positive
Test for Non-Reducing Sugar a) Benedicts Test	 Negative
Test for Non-Reducing Polysaccharides a) Iodine Test	 Positive

CONCLUSION:

Ginger is a flowering plant whose rhizome, ginger root or ginger, is widely used as a spice and a folk medicine. The starch extracted from *Z. officinale* exhibited good physical properties, which might be use in Pharmaceutical excipient purposes in concentration dependent manner. There starch indicated the presence of carbohydrates.

ACKNOWLEDGEMENT:

Authors wish to thanks JSS College, Ooty Road, Mysuru, for providing Laboratory facility to carry out this research work.

REFERENCES:

1. Zhu J, Chen H, Song Z, Wang X, Sun Z. Effects of Ginger (*Zingiber officinale* Roscoe) on Type 2 Diabetes Mellitus and Components of the Metabolic Syndrome: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Evid Based Complement Alternat Med, 2018; 10: 1155-1158.
2. Stanisiere J, Mousset PY, Lafay S. How Safe Is Ginger Rhizome for Decreasing Nausea and Vomiting in Women during Early Pregnancy? Foods, 2018; *7*(4): 50-54.
3. Mahady GB, Pendland SL, Yun GS, Lu ZZ, Stoia A. Ginger (*Zingiber officinale* Roscoe) and the gingerols inhibit the growth of Cag A+ strains of *Helicobacter pylori*. Anticancer Res, 2003; 23: 3699-3702.
4. Wagesho Y, Chandravanshi BS. Levels of essential and non-essential metals in ginger (*Zingiber officinale*) cultivated in Ethiopia. SpringerPlus, 2015; 4(1): 107-110.

5. Akinyemi AJ, Adedara IA, Thome GR, Morsch VM, Rovani MT, Mujica LKS, Schetinger MRC. Dietary supplementation of ginger and turmeric improves reproductive function in hypertensive male rats. Toxicology reports, 2015; 2: 1357-1366.
6. Poeloengan M. The effect of red ginger (*Zingiber officinale* Roscoe) extract on the growth of mastitis causing bacterial isolates. Afr J Microbiol Res, 2013; 5(4): 382-388.
7. Moussa A, Noureddine D, Hammoudi SM, Saad A, Bourabeh A, Houari H. Additive potential of ginger starch on antifungal potency of honey against *Candida albicans*. Asian Pacific J Trop Biomed, 2012; 2(4): 253-255.
8. Mahluji S, Ostadrahimi A, Mobasseri M, Attari VE, Payahoo L. Anti-inflammatory effects of *Zingiber officinale* in type 2 diabetic patients. Adv Pharm Bull, 2013; 3(2): 273-276.
9. Zhu L J, Liu QQ, Sang Y, Gu MH, Shi Y C. Underlying reasons for waxy rice flours having different pasting properties. Food Chem, 2010; 120(1): 94-100.
10. Chanapamokkhot H, Thongngam M. The chemical and physico-chemical properties of sorghum starch and flour. Kasetsart J Nat Sci, 2007; 41: 343-349.
11. Zobel HF. Starch crystal transformations and their industrial importance. Starch Stärke, 1988; 40(1): 1-7.

Conflict of Interest: None
Source of Funding: Nil
Paper Citation: Praveen NM, Manasa S, Kiran BM, Sathish KBY. Physicochemical characterization of starch from Ginger (*Zingiber Officinale*). J Pharm Adv Res, 2019; 2(2): 475-478.