

Comparison of starch content among the selected crops essay sample

[Food & Diet](#)



This study would not have been possible without the guidance and the help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of this study;

To God, for his gift of wisdom and understanding to the researchers and for answering their prayers in their times of need.

To their Chemistry teacher, Mrs. Grace Guaves for teaching them the fundamental of research and investigatory writing and for showing a great deal of patience through at times they tend to be naughty.

To their parents and family members, for the unending love and support that they gave to the researchers.

To the observer/respondents, for their integrity and cooperation.

And lastly, to all those who were a part of this work, the researchers would like to extend their deepest gratitude.

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CHAPTER I

INTRODUCTION

Background of the Study

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Starch is a type of carbohydrate, a nutrient that provides us with energy. Plants make starch during photosynthesis and then store it in their stems or in their roots, like the potato, taro and sweet potato to use as food when they need it. Some plants make more starch than others. Orange iodine solution is used to test for starch because it changes to a blue/black color if there is starch in the sample.

Starch powder is a congealing agent used in cooking to thicken puddings, pie fillings, sauces, gravies and other liquids. The various powders are preferred over flour as a thickener because they are flavorless and dissolve easily in hot and cold liquids. Further, many can add a gloss to the foods to which they are added. Cornstarch, arrowroot and tapioca are the most commonly used culinary thickeners. It also can be used in a mixture to lift fingerprints.

Root crops are an important source of food, feed, and industrial products because of their high yield potential and versatility in use. Root crops can be our answer to the increasing demand for food supply. Due to the expensive prices of corn and imported feeds for livestock and poultry, more and more proprietors use root crops as part of feed rations for animals. Gabi/Taro (*Colocasia esculenta*), sweet potato (*Ipomea batatas*) and potato (*Solanum tuberosum*) are root crops rich in complex carbohydrates (starch), dietary fiber, beta carotene (a vitamin A equivalent nutrient), vitamin C, and vitamin B6. Their roots are most frequently boiled, fried, or baked.

In this relation, the researchers want to find out which among gabi/taro (*Colocasia esculenta*), sweet potato (*Ipomea batatas*) and potato (*Solanum tuberosum*) contains more starch thus, also giving way to know which among

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the said root crops can be a good additional source of starch for the current mass production starch powder.

Statement of the Problem

This study was conducted to answer the following problems:

☛ Which among gabi/taro (*Colocasia esculenta*), sweet potato (*Ipomea batatas*) and potato (*Solanum tuberosum*) contains more starch? ☛ Which among gabi/taro (*Colocasia esculenta*), sweet potato (*Ipomea batatas*) and potato (*Solanum tuberosum*) has the least starch content?

Hypothesis

The researchers assumed that among gabi/taro (*Colocasia esculenta*), sweet potato (*Ipomea batatas*) and potato (*Solanum tuberosum*), sweet potato (*Ipomea batatas*) contain more starch. They believe that as its common name suggests, it is sweet and therefore contains more starch. They also think that the least container of starch among the mentioned crops is the gabi/taro (*Colocasia esculenta*).

Significance of the Study

This study will help people know which among gabi/taro (*Colocasia esculenta*), sweet potato (*Ipomea batatas*) and potato (*Solanum tuberosum*) contains more starch and also the least container of starch. In relation to that, it will also provide information of which among the mentioned root crops can be a good additional source of starch for current mass production

of starch powder which is widely used in different important aspects like cooking.

The most common sources of starch are corn, wheat, rice and other grains which are somehow hard to grow and are sensitive to different weather changes, unlike root crops that can be easily grown and take care of. People can mass grow the root crop with the highest amount of starch content for them to be able to produce different starch powder varieties and qualities and can also increase the production of starch itself.

Furthermore, the outcome of the study can motivate parents to feed their child healthy root crops containing much starch likewise, providing all people an opportunity to enjoy living healthy.

Scope and Limitation

This study focused on which among gabi/taro (*Colocasia esculenta*), sweet potato (*Ipomea batatas*) and potato (*Solanum tubersum*), contains more starch. Just a qualitative test was conducted regarding this. It is limited to the use of iodine solution as starch indicator.

The experiment was conducted at Mapute's and Tumambing's residences, from July 23, 2012 to August 26, 2012 by the researchers namely, Caramel R. Arcillas, Jhazel Pink L. Alcaraz, April Mae N. Mapute, Crisha Sein R. Atienza and Jesse Orven J. Tumambing.

Definition of Terms

- *Colocasia esculenta* (taro / gabi) – a tropical plant which is cultivated as an important staple food in most of Pacific island countries and certain parts of Asia and Africa.
- Distilled water – water that has many of its impurities removed through distillation.
- Iodine solution – a solution which is used to test whether there is any starch.
- *Ipomea batatas* (sweet potato) – a tender, warm-weather vegetable that requires a long frost-free growing season to mature large, useful roots.
- Qualitative – refers to descriptions or distinctions based on some quality or characteristic rather than on some quantity or measured value.
- *Solanum tuberosum* (potato) – a versatile, carbohydrate rich good highly popular worldwide and prepared and served in a variety of ways.

CHAPTER II

REVIEW OF RELATED LITERATURE

Most cooks are familiar with the thickening properties of corn starch, but potato starch is every bit as much up to the job, say scientists with Agriculture and Agri-Food Canada (AAFC). They're working on a project to further examine the structure and functional properties of potato starch, improve the nutritional quality of potato foods, and develop new uses for modified potato starch in food processing, pharmaceutical and industrial applications. Potato starch is currently used by the food processing industry

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as a general thickener, binder, texturizer, anti-caking or gelling agent. It also shows up in finished products such as snack foods, processed meats, baked goods, noodles, pet foods, shredded cheese, sauces, gravies and soups. Potato starches are also used in yeast filtration and as additives in the cosmetics and pharmaceutical industries. AAFC's research team is lead by Dr. Qiang Liu, a food scientist at the Guelph Food Research Centre in Guelph, Ontario. The project includes plant breeders, food scientists, molecular biologists and plant production specialists from AAFC research centres across Canada including Lethbridge, Alberta, St-Hyacinthe, Quebec, Fredericton, New Brunswick, Guelph and Ottawa, Ontario.

“ Our team is examining many aspects and uses of potato,” says Dr. Liu. “ We are working directly with our potato breeders in Fredericton and Lethbridge to produce new potatoes with desirable starch structure and increase in the content of ‘ resistant starch’ and ‘ slowly digestible starchs ’ in the processed potato foods. ‘ Resistant starch’ refers to the starch in starchy foods that is not digested or absorbed in the small intestine. This resistant starch reaches the large intestine essentially intact where it is considered to have similar physiological effects and health benefits of fibre – that is, provides bulk, protects against colon cancer, improves glucose tolerance and insulin sensitivity, and lowers plasma cholesterol and triglyceride concentrations. Members of the research team are studying aspects of resistant starch formation and characteristics during the food processing, starch digestion and its effect on human nutrition and disease prevention. This information may be a valuable tool in treating and

preventing several health issues such as diabetes and cardiovascular disease.

“ From here we hope to formulate a value-added potato starch with improved nutritional properties. It will benefit both consumers and the food processing industry,” emphasized Dr. Liu. “ The possibilities are endless. We are collaborating with the University of Toronto on possible pharmaceutical applications. Our goal is to further develop a new modified potato starch to be used as a pharmaceutical excipient, an inactive substance used as a carrier for the active ingredients of a medication. Pharmaceutical excipients derived from renewable, green sources are more environmentally friendly and less energy-dependent than synthetic polymers.”

A study was conducted by the American Association of Cereal Chemist, Inc.; J. Jane, L. Shen, J. Chen, S. Lim, T. Kasemsuwan, and W. K. Nip. Their findings were written in an article entitled, Physical and Chemical Studies of Taro Starches and Flours. Taro (*Colocasia esculenta* (L.) Schott) flours were prepared from taro corms of Bun-long, Dasheen, Hawaii Red (Lehua), Hawaii White, and Niu'e varieties. Starch contents of the flours varied from 73 to 76% as determined by enzymatic analysis. Starch yields of the flours varied from 51 to 58%. Nitrogen contents varied from 0.33 to 1.35% and from 0.014 to 0.025% in the flours and starches, respectively. Taro starches had irregular, polygonal shapes and small granular sizes. Among the five varieties, Bun-long starch had the smallest average diameter (2.6 micrometers), whereas Dasheen starch had the largest (3.76 micrometers). Amylose contents in these five starch varieties varied from 18 to 22% as

determined by iodine affinity and from 19 to 24% as determined by gel permeation chromatography. Molecular sizes of the taro amyloses at the peak of gel permeation chromatography ranged from degree of polymerization (DP) 150 to 550.

Branch chain lengths of the taro amylopectin varied from DP 16.8 to 18.4 and from DP 37.2 to 40.5 for short and long branches, respectively. All five starch varieties gave an A-type X-ray diffraction pattern. The taro starches contained 0.23-0.52% lipid and 0.017-0.025% phosphorus. ³¹P-nuclear magnetic resonance spectra revealed that the phosphorus in the starches was in the form of phosphate monoester derivatives. The onset gelatinization temperatures of the taro flours varied from 72 to 79 C, whereas those of the taro starches ranged from 60 to 74 C. Retrogradations of the starches and the flours, as measured by their enthalpy changes, appeared to be more severe than that of corn starch. Taro starch pastes had significantly higher viscosities than their flour counterparts. Among the varieties, Hawaii Red and Hawaii White starches had the highest peak viscosities, whereas Bun-long starch had the lowest. Both starch and flour pastes set to weak gels.

It was written in an item record by Anton Mais of Massey University in New Zealand, titled Utilization of sweet potato starch, flour and fibre in bread and biscuits : physico-chemical and nutritional characteristics : a thesis submitted in partial fulfilment of the requirements for the degree of Master of Technology in Food Technology, Massey University that sweet-potato contains a limited amount of protein, although rich in dietary fibre content and carbohydrate, so a successful combination with wheat flour for bread

and biscuit production would be nutritionally advantageous. In particular, the role of these ingredients in relating to acceptability of breads and biscuit with higher percentage of sweet potato starch, flour in wheat flour.

In this study, starch, flour and residue fibre of three sweet-potato varieties (red, orange and white -types) were studied. The 5 -10% combination levels for biscuit-making were found to be acceptable, without affecting the quality of the biscuit (combination of texture and biscuit size). In bread, bread containing 15% red and white replacement starches and orange replacement flour was found to be acceptable level, without affecting the quality of the bread, in an attempt to replace wheat at higher per cent level. The physicochemical study was complemented with a nutritional study to determine beneficial effects of food rich in dietary fibre and starches, in the context of improving diet related problems. RVA results showed sweet-potato ingredients affected differently the pasting temperature, peak viscosity and final viscosity of the normal wheat flour.