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Powdered Vegetable Leaves as A Food Ingredient

Chrozel P. Gapuz[1], Gina Mae U. Pugong[2]

[1,2]Teacher

ABSTRACT

Gapuz, Chrozel P. & Pugong, Gina Mae U. (2022). Powdered vegetable leaves as a food ingredient. This study determined the level of acceptability, palatability and aesthetic value of powdered vegetable leaves as a food ingredient and determine the significant difference in the acceptability, palatability and aesthetic value of powdered vegetable leaves as a food ingredient and the control group.

The data was taken using a researcher made checklist to the conveniently selected Grade 12 TVL Home Economics students of Nueva Vizcaya State University-Bayombong Campus.

Descriptive inferential statistics was used to describe the level of acceptability, palatability and aesthetic value of powdered vegetable leaves (camote leaves, ampalaya leaves and kangkong leaves) as a food ingredient. In addition, the mean was computed to determine the level of acceptability, palatability and aesthetic value of the powdered vegetable leaves (camote leaves, ampalaya leaves, and kangkong leaves) as a food ingredient. Moreover, the paired t-test was used to determine significant difference in the acceptability, palatability and aesthetic value of powdered vegetable leaves (camote leaves, ampalaya leaves and kangkong leaves) and the control group.

In the level of acceptability and palatability, powdered ampalaya leaves was very desirable while powdered camote tops was extremely desirable together with the powdered kangkong leaves. In the level of aesthetic value, powdered ampalaya leaves and powdered camote tops were both very desirable while powdered kangkong leaves was extremely desirable. The averaged desirability of each powdered leaves was very desirable for the powdered ampalaya leaves while powdered camote tops and powdered kangkong leaves were very extremely desirable.

In the comparison on the level of acceptability, palatability and aesthetic value of each powdered leaves to the control group, it was concluded that all vegetable leaves were significantly lower than he overall desirability of the control group.

CHAPTER I
INTRODUCTION

Background of the Study

In every usage, a vegetable is any part of a plant we eat as part of our savory meal. For the past years, different varieties of vegetables have been used as a course meal. But nowadays, they are not given much attention compared to meats and frozen food most especially by children and teens. They are being set to the side of the plate and later on will be fed to the dogs or at worst put into garbage bins. It is important that we have a healthy food. Vegetables give us vitamins and energies needed by the body; therefore, we need to take at least a small amount every meal.

Today, many vegetable products such as candies, chips, jams, jellies, coffee, teas, dehydrated and even

powdered ones are favored by children and teens. An example is the carrot powdered for various food preparation, research mainly by Jubelag (2008) and the research done by Ananieva, et al. (2016) of the department of Organic Synthesis and Nanotechnology National Technical Universiy in Kharkiv, Ukraine, research of the dry plan concentrates- ingredient of a food health improvement. In the carrot powder, the researcher has produced the carrot powder using table salt. It is recommended in the study to find a way for the powder not to affect the food's taste, color and odor, and to find out the exact amount of preservative, to added to given volume of the vegetable's extract that is to be powdered. While the research by Ananieva, et al. (2016) was carried out by spectrometric method using X-ray fluorescence spectrometer that was based on collecting and analyzing spectrum that has been obtained after initiation of characteristically x-ray radiation, which occurs during the transition of atoms from the excited in the ground state. It has been found that samples of vegetable raw materials have content of calcium to 57% and potassium to 96% and the maximal amount of magnesium, chrome and zinc is found in grape skin powders.

There are also supplements and green powders made by the doctors and scientists usually nutritional, health and diet supplements such as prebiotics, amino acids, conjugate linoleic acid, botanicals and others. These come in variety of forms like traditional tablets, capsules, and powders, as well as drinks and energy bars. Eating a diet rich in vegetables provides health benefits. People who eat more vegetables and fruits as part of an overall healthy diet are likely to have a reduced risk of some chronic diseases because vegetables provide nutrients vital for health and maintenance of our body. Eating a diet rich in vegetables and fruits as part of an overall healthy diet may reduce risk for heart disease, obesity, type 2 diabetes and stroke, may protect us against certain types of cancers, may lower blood pressure, and may also reduce the risk of developing kidney stones and help to decrease bone loss and it is also useful in helping to lower calorie intake.

In our backyard garden, we may end up with an excess of produce. One way to preserve and store the fruits and vegetables before they decay is to turn them into a dried vegetable powder which is also a good way to make the children and teens to eat healthy. With this powder, we can use it for preparing various foods we wanted to be deliciously healthy.

It is in this light that the researcher used camote tops, ampalaya leaves and kangkong leaves as the main material in the study.

Statement of the Problem

This study aimed to determine the acceptability, palatability, and aesthetic value of powdered vegetable leaves as a food ingredient.

Specifically, it sought answers to the following questions:

1. What is the level of acceptability, palatability and aesthetic value of powdered vegetable leaves as a food ingredient?
2. Is there a difference in the acceptability, palatability and aesthetic value of powdered vegetable leaves as a food ingredient and the control group?

Objectives of the Study

This study aimed to:

1. determine the level of acceptability, palatability and aesthetic of powdered vegetable leaves as a food ingredient; and

2. determine the significant difference in the acceptability an aesthetic value of powdered vegetable leaves as a food ingredient and the control group.

Statement of Hypothesis

There is a significant difference in the acceptability, palatability and aesthetic value of powdered vegetable leaves as a food ingredient and the control group.

Significance of the Study

The result of the study would be significant of the following:

Mothers. They would not be bothered forcing their children in eating their veggies Because their children will not notice that they eating vegetables in which they hate.

Chefs or cooks. This would give them on what to cook in their restaurant or working place.

They could use their product as an ingredient in their menu.

Farmers. They could make a business out of it like for example, if there is an excess in their product, they can powder it for preservation and sell it to others.

Hotel and Restaurant Management and Economics Students. This study could help them in their experimentation or laboratory projects. It could also enhance their entrepreneurial skills as well.

TLE Teachers. This could give them idea on what to teach their students regarding this study especially if it has a connection with vegetables. They could also use this as contested activity for the student during nutrition month.

Scope and Delimitation of the Study

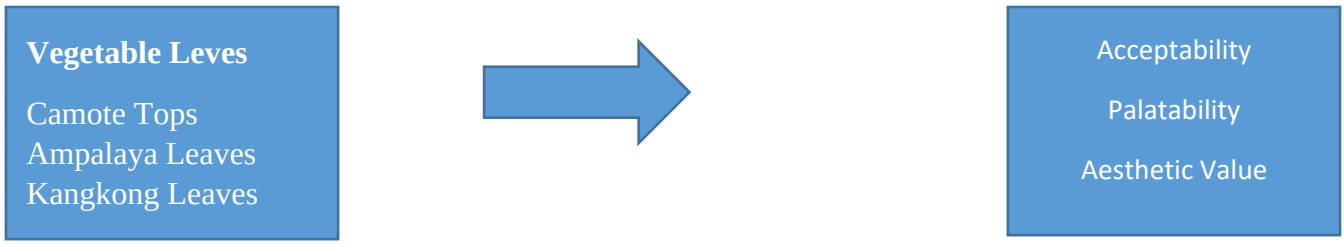
This study was conducted to determine the level of acceptability, palatability and aesthetic value of powdered vegetable leaves as food ingredients. The vegetable used was camote tops, kangkong leaves, and ampalaya leaves.

The study was conducted to the first year BTTE students for the school year 2022.

Conceptual and Theoretical Framework of the Study

As children grow into adolescent, they are more likely to eat frozen and meaty foods rather than healthy vegetables. That is why some researches are made to improve the way we view and eat vegetables. Some vegetables product such as chips, jams, jellies, candies, coffee, teas, and juices, dehydrated, powdered, and even supplements are made for easy use (Sundstorm, 2011).

These days, some vegetables and other fruits-mostly spices-like tomato, chili, pepper, and onion are made into powder for easy use. Vegetable powder can be added to juices or as a base for soups to make it more nutritious (Sundstorm,2011). It also provides value-added thickening for soups (Wilson, n.d.).



The figure above shows the study investigated on the level of acceptability, palatability and aesthetic value of the kind of vegetables leaves used like camote tops, ampalaya leaves, and kangkong leaves. It also

determines the difference in the acceptability, palatability and aesthetic value of the vegetables leaves as ingredients and the control group.

Operational Definition of Terms

For better understanding of this study, the following terms were defined:

Ampalaya leaves (Momordica Charantia). These are leaves of ampalaya plant which are also called bitter ground vine plant that have bitter taste.

Camete Tops (Ipomoea Batatas). These are excellent sources of antioxidative compounds, mainly polyphenolics, which may protect human body from oxidative stress that is associated with many diseases including cancer and cardiovascular diseases.

Kangkong (Ipomoea Acquatica). A semiacquatic, tropical plant grown as a vegetable for its tender shoots and leaves.

Palatability. Food that has a pleasant and acceptable taste to someone.

Powdered Vegetables Leaves. These are the product of the study which are a mixture of camote tops, ampalaya leaves and kangkong leaves.

Vegetable Leaves. Are also called potherbs, greens, vegetable greens, leafy greens, or salad greens, are plants eaten as a vegetable, sometimes accompanied by tender petioles and shoots. In the study it includes camote tops, ampalaya leaves and kangkong leaves.

CHAPTER II

Review of Related Literature and Studies

Camote Tops

The scientific name of potato is *Ipomoea Batatas*, a dicotyledonous plant that belongs to the family *Convolvulaceae.* According to the statement of North Atlantic Human Nutrition Research Center on Aging, camote is the world's healthiest food. It has high carbohydrate content and can replace rice in diet. The sweet potato is an excellent source of vitamin A, which is vital for healthy tissue and night vision. The stronger its color, the higher its vitamin A content. It is also an excellent source of potassium and contains vitamin B9 (or folic acid). Sweet potatoes are richer in starch than potatoes (up to 18% depending on the variety) but it also contains the same quality of carbohydrates. Camote is good for diabetic persons. It helps stabilize blood sugar level by increasing adiponectin, an important factor of insulin metabolism. It has moderate glycemic index of 50. High in dietary fiber and low-fat content. Good for the heart and tummy. Fibers helps reduce bad cholesterol and ease bowel movement. The deep colored yellow camote contains lutein and beta carotene. Antioxidants to prevent rapid aging and maintain good eyesight. Eat yellow camote instead of taking eye supplement. Camote have lots of essential minerals and vitamins. Manganese, copper, potassium, iron, Vitamin-E, C, B6, B2, and A. it's like a combination of rice and vegetables in a single package. It is also an effective detoxifying agent. It absorbs heavy metals such as lead, arsenic and mercury accumulate in our body due to our consumption of commercially processed foods and take it out of the system.

Camote is a root crop, often blamed for the flatulence one gets in excess because of the presence of trisaccharide. This does not undergo the usual process of digestion, instead it undergoes anaerobic reaction, thus gas is produced and expelled.

Sweet potato tops or camote tops or sweet potato leave are excellent source of antioxidative compounds, mainly polyphenolics, which may protect the human body from oxidative stress that is associated with

many diseases including cancer and cardiovascular diseases. It contains protein, dietary fiber, lipid, and essential minerals and nutrients such as calcium, phosphorous, magnesium, sodium sulfur, iron, copper, potassium, zinc, manganese, aluminum and boron. It lowers blood sugar and cholesterol, regulates good vowel movements and boost the immune system and thus helping to prevent infections and diseases. Among all the other plants, research studies had shown that camote tops maybe used as remedy for dengue fever. It is said to help increase platelet counts that would help recover from dengue. Camote tops can also be used to treat other diseases or sicknesses such as diabetes (type 2), heart disease, cancer (colon, stomach), problems on vowel movements, destroy bacteria and inhibit fungi, high blood pressure, high cholesterol, kidneys stones, boils and acne. Sweet potato leaves are packed full of great antioxidants and vitamin C making it great for fighting off free radicals thus preventing premature aging and disease. Camote tops are also recommended for anemic person since it is rich in iron. The leaves and the rest of the plant may work wonders for balancing out blood sugar making great for diabetics. It contains the substance FiBL that in studies done on mice did lower blood sugar levels. Crushed leaves are applied to boils and acne.

Aside from being easily accessible, cheap and delicious, sweet potatoes are loade with healthy vitamins, essential for maintaining good health. Fat-and cholesterol- free, sweet potatoes are high in vitamins B6, C and D, and contain sufficient sources of iron, potassium and magnesium. Like carrots they are also high in beta-carotene,the precursor for processing vitamin A within your body. Unliked regular potatoes, referred to us tubers, or underground stems,sweet potatoes are roots and are believe to also carry nutrients in their leaves. It was stated in Ready Nutrition.com that even though some studies have already confirmed that water-soluble vitamins exist in sweet potato roots and leaves, there has been limited information about how these vitamins are distributed in the plants.

Camote tops and sweet potato leaves are excellent source of antioxidative compounds, mainly polyphenolics, which may protect the human body from oxidative stress that is associated with many diseases including cancer and cardiovascular diseases. It contains fiber, dietary, lipids, protein, and essential minerals and nutrients such as magnesium, calcium, sodium, potassium, iron, phosphorous, sulfur, zinc, copper, aluminum, manganese and boron. Making a drink of the camote leaves really works wonders for distress, diarrhea, stomach aches, and nausea (Anonymous, 2013.)

Sweet potato roots are a good source of carbohydrates, while sweet potato tops (leaves and stems) contain additional nutritional components in much higher concentration that in many other commercial vegetables. Sweet potato leaves are cooked as a vegetable in many parts of the world. They are rich in vitamin B, βcarotene, calcium, zinc, iron, and protein, and the crop are more tolerant of diseases, pest and high moisture than many other leafy vegetables, grown in the tropics. Because sweet potato tops can be harvested several times a year, their annual yield is much higher than many other green vegetables. (Islam, 2006)

As a crop, sweet potato is more tolerant of diseases, pest and high moisture than many other leafy vegetables grown in the tropics. Sweet potato leaves are an excellent source of antioxidative polyphenolics, among them anthocyanins and phenolic acids such as caffeic, monocaffeoylquinic (chlorogenic), dicaffeoylquinic and tricaffeoylquinic acids, and are superior in this regard to other commercial vegetbles (Ishiguro et al., 2004).

Ampalaya Leaves

Ampalaya is also known as bitter melon is a tropical and subtropical vine of the Cucurbitaceae, widely

grown in the amazon, Carribean, South East Asia such as Philippines for its edible fruit. Ampalaya or bitter melon also known as bitter ground as the name implies has a bitter taste due to the presence of momordicin (A bitter alkaloid which is one of the active principles in elaterium and other extracts from the fruit of the balsam apple *Momordica charantia* and related plants) and is believed to be among the most bitter of all vegetables. Ampalaya is a climbing vine that grows to 5m, with tendrils up to 20 centimeters long. Ampalaya leaves are heart-shaped, 5-10 cm across, cut into 5-7 lobes. Each ampalaya plant bears separate yellow male and female flowers. Ampalya bears fleshy green fruit, oblong shaped with pointed ends, ribbed and wrinkled, bursting when mature to release seeds. Ampalaya seeds are flat with ruminated margins. Ampalaya has a long history of medical usage and has a long list of folkloric health benefits. Ampalaya can cure diabetes, analgesic, eye problems, respiratory ailments, hair and scalp problems, weight loss, stomach problems, hepatroprotection activity, skin problems, HIV virus, menopause, haemorrhiods, cholesterol control, it can also act as a contraceptive, source of energy, antioxidant, and boost our immune systems (Anonymous, 2011).

Young ampalaya leaves are popular as vegetable dish ingredients. It's more than just leaves; anyone can get more benefits out of these bitter commodities. The leaves are used as a stomachic, antipyretic, powerful emmenagogue, as a mild purgative and can be administered as an anthelmintic (Vicedo, 2009).

Taken orally, ampalaya leaves are cited as natural solution for conditions including chronic cough, diarrhea, fever, worms and parasites. Recommended preparation of these treatments vary, but include ingesting ampalaya leaves in tablet or capsule form, steeping dried leaves as tea or consuming freshly juiced leaves. The fruit and leaves may also be juiced and consumed together. (Balum, 2017)

Kangkong Leaves

Kangkong scientifically known as Ipomoea Aquatica is a smooth, widely spreading vine, with the stems trailing on mud or floating on water. Leaves are oblong ovate, 7 to 14 centimeters long, with a point tip and heart-shaped or arrow-shaped base, long petioled, the margins entire or angular, and sub lobed. Peduncles are erect, 2.5 to 5 centimeter-long, 1 or 2 flowers, borne in the axils of the leaves. Sepals are green, oblong, about 8 millimeters long. Corolla is narrowly bell-shaped, about 5 centimeters long, and purplish; limb nearly white or pale pink purple, about 5 centimeters in diameter, the tube deeper purple inside. Capsules are smooth and ovoid, about 1 centimeter long. It is distributed troughout the Philippines in stagnant streams, fresh –water swamps, and pools and the tropics of the Old World. It was also extensively cultivated in southern china.

Kangkong plants contains 1.6%, fat 0.2% and vitamins C3 and B2. Some major compounds from the plants are: nortropane alkaloids, calystegines B1; phenolic compounds N-cis-Feruloyltyramine, N-trans-feruloyltyramine, 3α,7β-O-D-diglycopyranosyl- dihydroquercetin and Isochlorogenic acid a, b and c. compositional analysis of leaves yielded moisture 90%, protein 3%, fiber 0.9%, fat 0.4%, carbohydrate 4.3%, mineral matter 2%, nicotinic acid 0.6 mg/100g, riboflavin 120mg/100g, vitamin C 137mg/100, vitamin E 11mg/100g, and ash 1.4%. Nutrient analysis of leaves (based on % dry weight) showed the leaves contained 3% protein, 4.5% total carbohydrate, 0.3% lipids, 78% moisture,1.6% ash, 1.4% fiber and gross energy value of 141.4Kj/g. Leaves yielded high amounts of essential amino acids (per 100g) 4765 mg: leucine 1365 mg/100g, tyrosine phenylalanine 1124 mg/100g, lysine 682 mg and threonine 606 mg. mineral (per 100 g) were potassium 444 mg, calcium 163, sodium 159.8 mg, phosphorus 86, magnesium 52 mg, copper 5.3 mg, zinc 4.1 mg, iron 3.2 mg, and manganese 2.3 mg. it is also considered purgative, diuretic, antiepileptic, CNS depressant, anti-inflamatory, hypolipidemic, antimicrobial,

anthelmintic, antidiabetic. The usual part used are the young leaves which may be eaten raw as salad or steamed and boiled like spinach and the young stem as achara (native pickles) ingredient. It is a good source of iron, calcium, vitamin B and C and amino acids.

The tops are mildly laxative. The purplish variety used for diabetes because of assumed insulin-like principle it contains. Dried latex is purgative. Poultice of buds used for ringworm. Used as laxative and sedative, used for piles, nervous conditions, headache, insomnia. In Burma, the juice is employed as an emetic in cases of arsenical or opium poisoning. In Cambodia, it is used as poultice for fever with delirium; buds applied to ringworm. In Ayurveda, extracts of leaves are used for jaundice and nervous debility. Juice used as emetic in opium and arsenic poisoning. In Sri Lanka, it is used for liver disease, eye problems, constipation. Leaves used as food for gourami fish and pigs. Fodder for animals; use limited by laxative effect (Stuart, 2026).

There are some studies made to prove the health effects of kangkong plant. One study evaluated the oral hypoglycemic activity of single and multiple does of *Ipomoea* Aquatica in healthy male wistar rats after a glucose challenge. Results showed significant reduction in glucose concentration in both single (33%, $p<00.02$) doses. Inhibitory effect of *Ipomoea Aquatica* extracts on glucose absorption using a perfused rat intestinal preparation. Study showed significant inhibitory effect in glocuse absorption. Furthermore, result suggest the inhibition of glucose absorption is not due to acceleration of intestinal transit. An oral consumption study showed the consumption of shredded, fresh, edible portion of *ipomoea aquatic* for one week, effectively reduce the fasting blood sugar of streptozotocin-induced diabetic rats. Study showed the water extract of stems had the highest antiproliferative activity. The ethanol extract of leaves had the highest number of flavonoids. Study on the diuretic activity of the methanol extract of *Ipomoea Aquatica* in Swiss albino mice showed good diuretic activity. In all cases, the excretion of electrolytes and urine volume increase was higher than the standard diuretic, furosemide. Study of a methanol extract yielded a compound (7-O-B-D-glucopyronosyl-dihydromquercetin-3-O-a-D-glucopyranoside) that exhibit antioxidant activity with an EC50 value of 83 and showed very strong lipid peroxidation-inhibitory activity in a liposome model system. Study investigating antimicrobial efficacy of the leaf extract of three herbs – A longifolia, I aquatic and E fluctuans – on four pathogenic bacteria strains (E coli, P aeruginosa, S aures and M luteus). *Ipomoea aquatica* extended the higher amount of antimicrobial activity against the bacterial strains, better than the two other herb extracts. Study in an aspirin-induced and ulcer model in rats found *Ipomoea aquatic* to possess potent anti-ulcerogenic and ulcer-healing properties and can act as a potent therapeutic agent and against peptic ulcer disease. Study isolated a purified bioactive compound from the leaf of ipomoea aquatic - 7-O-B-D-glucopyranosyl-dihydroquercetin-3-O-a-D-glucopyranoside (DHQG). Results showed DHQG showed cytotoxicity towards cancer cell lines tested. Study suggests that MEIA markedly improves brains ach level. MEIA treatment may be of value in reinforcing depressed cholinergic transmission in certain age-related memory disorders and to improve memory and learning in normal individuals. Study evaluated the anxiolytic activity of Ipomoea aquatic leaves. A methanol-ethanol extract significantly potentiated ketamine-induced sleep by reduction in latency to sleep and increase duration of sleep, suggesting the interaction of I. aquatic with CNS depressants. Study evaluated the hypoglycemic and antioxidant activity of methanolic extract of leaves in Swiss albino mice. Results showed potent hypoglycemic activity compared with control. Extract also showed potent free radical scavenging activity with vitamin C as standard. Study on various animal models evaluated the CNS depressant and antiepeliptic activities of a methanol extract of leaves of *Ipomoea aquatica*. Results showed dose-dependent and significant increases in onset to clonic and tonic convulsions or complete protection

against seizures induced by strychnine and picrotoxin. There was also dose-dependent prolongation of pentabarbitone sleeping time and suppression of exploratory behavior. Study evaluated the protective effects of ethanol extract of *Ipomoea aquatic* against live damage induced by thioacetamine in rats. Results showed a protective effect in TAA-induced liver damage probably by contributing to its modulation on detoxification enzymes, antioxidant, and free radical scavenger effects. Study was conducted to determine the concentrations of lead (Pb) and cadmium (Cd) in the top, middle, and bottom of edible portions of I. aquatica. Pb concentration showed a decreasing trend from the roots to the leaves, and from bottom to top section to shoot apex. The concentrations of Pb and Cd in the edible portions were far below the maximum tolerable daily intake for man set by the World Health Organization (WHO). The bottom of the edible portion of the plant should be removed to minimize Pb intake. Some major plant compound are: (1) Calystegines B1, a nortropane alkaloi, with patent inhibitory activity against rat lysosomal β-glucosidase, (2) N-cis-feruloyltyramine and N-trans-feruloyltyramine, phenolic compounds isolated from the roots, considered potent inhibitors prostaglandin synthesis, (3) 3α,7β-O-D-diglycopyranosyl-dihydroquercetin, a compound that has shown cytotoxicity against cancer cell lines viz. Hep-2 and A-549,and (4) Isochlorogenic acid a, b and c, phenolic compounds with collagenase inhibitory activity, antioxidant activity, anti-HIV activity. A study evaluated two aquatic vegetables, aqueous extract of *Ipomoea aquatica* and *Enhydra fluctuans*, traditionaly used against heavy metal toxicity in traditional medicine in India, for protective role against Cd-intoxication. Results booth extracts offered protection against Cd-induced toxicity by counteracting oxidative stress and ROS mediated apoptosis and/or promoting elimination of Cd by cheating. There is a study which evaluated the safety of a hydro alcoholic extract of *Ipomoea aquatic forsk*. Leaves in acute and sub-acute administration in a rodent model. Result showed no sign of toxicity during the study period-no change in general behavior, adverse effects and mortality. No significant changes were observed in organs weights histopathological exam showed not morphological alterations. Results suggest a wide margin of safety for therapeutic use of plant. Ethanolic extract of leaves exhibited good antioxidant activity with IC50 values of 0.387 and 0.394 mg/mL against DPPH and ABTS radicals respectively. Vitamin C content was 50 mg/100g and total phenolic content was 561 mg gallic acid equivalent per 100 g, both of which could be main contributors to the antioxidant capacity of the leaves. Study evaluated the nephroprotective effect of water spinach ethanol extract of leaves on gentamicin-induced nephrotoxic rats. Result showed significant decrease ($p<0.01$) in the elevated serum creatinine and urea levels compared to the gentamicin treated group (Stuart,2016).

Related Studies to Powdered Vegetable Leaves as a Food Ingredient

Alleaume (2016) stated that green powders are best used to supplement but never replace whole foods. Vegetable powders are used to “tuck more nutrition and flavor into the things people cook” (Willson, n. d.). He also said that it adds thickening for soups. According to Price, only 20% to 40% of vitamin A will retain if leaves are dried under direct sunlight, but that 50% to 70% will be retain only if leaves are dried in the shade. Fugile (2005) reported that 8 g serving of dried leaf powder will satisfy a child within ages 1-3 years with 14% of the protein,40% of the calcium, 23% of the iron, and nearly all vitamin A that a child need in a day.

A research, retention of nutrients in green leafy vegetable on dehydration by Gupta, et al., (2011) state the changes in the antinutritional factors was non-significant after blanching and dehydrating the green leafy vegetables. In that case, value addition of food products with dehydrated green leafy vegetables can be advocated as a feasible food-based approach to combat micronutrient malnutrition.

There is a study that aims to produce a powder that can be used for some food preparation by using the squash as the main material. It also aims to distinguish which food preparation is more suitable for the squash powder in terms of palatability, and also aims to determine which preservatives is better in terms of shelf-life for the product, (Anonymous, n. d.)

In Jubelag's study (2008) entitled "Carrot (*Caucus Carota*) Powder for various Food Preparation", it aims to determine the suitability or the acceptability of carrot in the form of powder for various food preparations. The researcher used table sugar as its preservatives but not table salt.

In this study, it was recommended to find a way for the powder not to affect the food taste, color and odor, and to find out the exact amount of preservative, to added to a given volume of the vagetable's extract that is to be powdered.

Another study from Ukraine by Ananieva, et al., (2016) is the research on the dry plant concentrates-ingredients of a food health improvement, it was concluded that micro- and macronutrients composition of vegetable powder obtain by activation drying has been investigated and samples have been analyzed with regards to the content of necessary nutrients.

A study by Zhang, Oxinos and Maher (2009), the effect of fruit and vegetable powder mix on hypertensive subjects was design to evaluate the effect of the fruit and vegetable powder on cardiovascular health as determined by blood pressure and heart rate variability (HRV) in a chiropratic college faculty and student population. It was concluded that taking the nutritional supplement for 90 days reduced blood pressure but not body weight in this group of subjects. The HRV was not affected by the supplement over the 3-month period.

A research of Nagai, et al., (2010), sweet potato (Ipomoea batatas L.) leaves suppressed oxidation of low density lipoprotein (LDL) in vitro and human subjects, investigated the inhibitory effect of sweet potato leaves on low-density lipoprotein oxidation in vitro and in human subjects. From comparing the antioxidant activity of 8 kinds of sweet potato leaves, the researcher found out that sweet potato leaves contained abundant polyphenol compounds and the radical scavenging activity and prolongation rate of lag time were highly correlated with total polyphenol content. This results, therefore, suggest that sweet potato leaves have antioxidant activity leading to the suppression of low-density lipoprotein oxidation.

Ampalaya is a vegetable which is beneficial to diabetic persons. It was concluded by Gines, et al., (2013) in their research entitled The effects of momordica charantia crude leaf extract on enzyme kinetics of porcine alpha amylase that the crude leaf extract of Momordica charantia on the activity of alpha amylase maybe valuable in the search for new therapeutic remedies for diabetes while another study by Lim, et al., (2010), the MOCHA DM study: the effect of momordica charantia tablets on glucose and insulin levels during the postprandial state among patients with type 2 diabetes mellitus, stated that momordica charantia tablet given as a single dose using the 100 mg/kg/day dose (12 tablets of 500 mg/ tab), showed an incremental dose effect and provided a more rapid (15minutes) and shorter-live (30 minutes) stimulation of insulin secretion than placebo, resulting in lower meal-related glucose excursions, therefore, ampalaya has the potential to be used for reducing post-meal hyperglycemia.

CHAPTER III
REASERCH METHODOLOGY

Research Design

The study used the descriptive inferential design. The descriptive method was used to determine the level of acceptability, palatability and aesthetic value of powdered vegetable leaves as food ingredient.

The inferential method was used to determine the significant difference in the level of acceptability, palatability and aesthetic value of powdered vegetable leaves as a food ingredient and the control group.

Time and Place of the Study

This study was conducted during the first semester 2022 at the Ifugao State University, Lagawe Campus particularly in the BTTE department –HE Laboratory.

Sample and Sampling Procedure

The study was conducted to conveniently selected first year students in BTTE (Bachelor Technical Teacher Education).

Research Instrument

This study made used of a survey questionnaire to determine the level of acceptability, palatability and aesthetic value of powdered vegetable as a food ingredient.

Data Gathering Procedure

A letter of permission for the conduct of the study was secured from the Dean. Upon approval, the students performed personally the powdering of the vegetable in the HE Laboratory Room found in the College of Education room. Checklist was distributed to conveniently selected first year BTTE students and Laboratory College of Advance Education Teachers.

Materials used:

- Try (for drying)
- Pounding materials
- Frying pan

Ingredients:

- 4 tsp. of powdered camote tops
- 4 tsp. of powdered ampalaya leaves
- 4 tsp. of powdered kangkong leaves
- 1 ½ kilo of chicken meat (slice into bite size)
- Garlic and onion
- ¼ kl Carrot (diced)
- ¼ kl potato(diced)
- Salt and pepper to taste

Preparation of the Powdered Vegetable Leaves:

Washed the vegetable leaves (camote tops, ampalaya leaves and kangkong leaves) thoroughly. The leaves were weighed and put into trays and sun dried into three (3) constant weights. Pulverize the vegetable leaves, set aside.

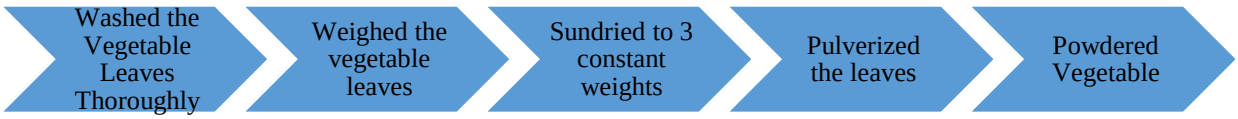


Figure 2: Schematic Diagram on the Preparation of Powdered Vegetable Leaves

Preparation of the Ginataang Manok: In a frying pan, sauté garlic and onion. Put the chicken and fry until it is cooked. Put the carrot and potato. When cooked, pour the coconut milk then add salt and pepper. When simmered, remove from the frying pan and distribute into three plates. Mix the powdered vegetable leaves individually into the dish. Present into the garnish then served. Figure 3 shows the process on the preparation of the Ginataang Manok.

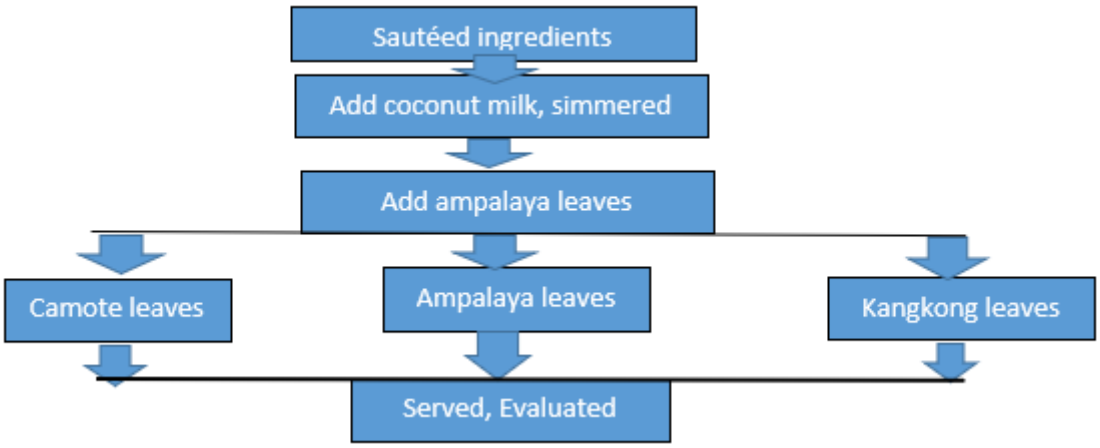


Figure 3: Schematic Diagram on the Preparation of Ginataang Manok

Two trials were conducted until the desire product was achieved. The selected BTTE-first year students evaluated the product and gave their suggestion for the improvement and enhancement of the product of the research for each trial. Trials ended until an acceptable product was achieved based on the evaluation of the selected BTTE-first year students and also with the suggestion of different critics.

Statistical Treatment and Data Analysis

The da was analyzed using descriptive and inferential statistics. The mean percentages and frequencies were used to describe the level of acceptability, palatability and aesthetic value of powdered vegetable as a food ingredient.

The paired t-test was used to test significant differences in the acceptability, palatability, and aesthetic value of the powdered vegetable as a food ingredient.

The scoring was as fallows in terms of acceptability, palatability, and aesthetic value.

4- Extremely desirable (taste is perfect)

3- Very desirable (taste is good)

2- Moderately desirable (the taste is not good enough but could satisfy appetite)

1-Slightly Desirable (needs improvement)

The qualitative description of the acceptability, palatability and esthetic value was as follows:

Palatability/ Acceptability/ Aesthetic value Qualitative Description (Q. D)

3.26-4.00	Extremely desirable
2.51-3.25	Very desirable
1.76-2.50	Moderately desirable
1.00-1.75	Slightly Desirable

CHAPTER IV
RESULTS AND DISCUSSION

Level of Acceptability, Palatability, Aesthetic Value of Powdered Vegetable Leaves (camote leaves, ampalaya leaves, and kangkong leaves) as a Food Ingredients.

This section displays and describe the level of desirability of the powdered vegetables leaves (camote leaves, ampalaya leaves and kangkong leaves) in terms of their acceptability, palatability, and aesthetic value to the respondents.

Table 1. Acceptability of powdered vegetable leaves.

Powdered Vegetables	Level of acceptability	F	Percentage (n=19)	Mean	SD	QD
Ampalaya	Extremely Desirable	6	31.58	3.00	.88	VD
	Very Desirable	8	42.11			
	Moderately Desirable	4	21.05			
	Slightly Desirable	1	5.26			
Camote	Extremely Desirable	10	52.63	3.37	.83	ED
	Very Desirable	7	36.64			
	Moderately Desirable	1	5.26			
	Slightly Desirable	1	5.26			
Kangkong	Extremely Desirable	9	47.37	3.37	.68	ED
	Very Desirable	8	42.10			
	Moderately Desirable	2	10.53			

Legend:
QD-Quantitative Description
ED- Extremely Desirable (3.26- 4.00)
VD- Very Desirable (2.15- 3.25)
MD- Moderately Desirable (1.76- 2.50)
SD- Slightly Desirable (1.00- 1.75)

Table I shows the different levels of acceptability of the powdered vegetable leaves according to the respondent's responses. Among the 19 respondents, 6 (31.58%) of the respondents said that powdered ampalaya leaves was *extremely desirable*, majority (8 or 42.11%) of the respondents said it was *very desirable*, 4 (21.05%) of the respondents it was *moderately desirable*, while one (5.26) of the respondents said it was *slightly desirable.* Powdered ampalaya leaves had a *mean desirability* of 3.00 which correspond to a qualitative description of *very desirable.*

In terms of the level of acceptability of powdered camote tops, majority of the respondents (10 or 52.63%) said it was *extremely desirable*, 7 (36.84%) of the respondents said it was *very desirable*, while the remaining respondents said powdered camote tops was *moderately desirable*, and *slightly desirable*, respectively. It was also shown in the table that the, mean acceptability of the powdered camote tops (mean= 3.37) was extremely desirable.

In addition, powdered kangkong leaves was *extremely desirable* according to 9 (47.37%) of the respondents, 8 (42.10%) of the respondents it was *very desirable*, while only 2 out of the 19 respondents said that kangkong leaves was *moderately desirable*. It can only be seen in the table that the mean acceptability of powdered ampalaya (mean=3.37) was *extremely desirable* to the respondents.

According to the respondent number one*" Msarap pero parang nasobrahan ng lagay ng ampalaya (012)"* (Delicious but 012 contains too much bitter ground.) and respondents number 5, *"045: Good job Masarap 012: Malalasahan ang ampalaya pero okay"* "(Good Job for the 45! It is delicious. I can taste the bitter ground in the dish 012 but it's still okay.)

Table 2 presents the frequency and percentage distribution of the level of palatability of powdered vegetable leaves (camote leaves, ampalaya leaves, and kangkong leaves).

Table 2. Palatability of powdered vegetable leaves.

Powdered Vegetables	**Level of palatability**	**F (n=19)**	**Percentage**	Mean	SD	QD
Ampalaya	Extremely Desirable	6	31.58	3.05	.85	VD
	Very Desirable	7	47.37			
	Moderately Desirable	3	15.79			
	Slightly Desirable	1	5.26			
Camote	Extremely Desirable	10	52.63	3.37	.83	ED
	Very Desirable	7	36.84			
	Moderately Desirable	1	5.26			
	Slightly Desirable	1	5.26			
Kangkong	Extremely Desirable	9	47.37	3.42	.61	ED
	Very Desirable	9	47.37			
	Moderately Desirable	1	5.26			

Legend:
QD-Quantitative Description
ED- Extremely Desirable (3.26- 4.00)
VD- Very Desirable (2.15- 3.25)
MD- Moderately Desirable (1.76- 2.50)
SD- Slightly Desirable (1.00- 1.75)

It can be seen in the table that according to 6(31.58%) of the total respondents, powdered ampalaya leaves was *extremely desirable* in terms of palatability, 7(47.37%) said it was *very desirable*, while 3(15.79%) and one (5.26) said it was *moderately desirable* and *slightly desirable*, respectively. It can also be seen in table 2 that the mean palatability level of powdered ampalaya leaves was equal to3,05 which was between 3.26- 4.00, which means that the powdered ampalaya leaves was *very desirable* to the respondents.

Table 2 displays that majority of the respondents (10 or 52.63%) said that powdered camote tops were *extremely desirable*, 7(36.84%) said it was *very desirable*, while the remaining respondents it was *moderately desirable*, and *slightly desirable*, respectively. In addition, its mean palatability level (mean=3.37) indicates that it was *extremely desirable*, to the respondents.

In terms of powdered kangkong leaves' palatability, 9(47.37%) of the respondents said it was *extremely desirable*, and the same number of respondents said powdered kangkong leaves was *very desirable*, while one (5.26) of the 19 respondents said that the powdered kangkong leaves was *moderately desirable.* It can also be gleaned that the mean palatability of powdered kangkong leaves, was equal to 3.42 which suggest that the powdered kangkong leaves was *extremely desirable* to the respondents.

It was said by the respondent's number 15 that the product was *"Tasty and yummy!"* (it is tasty and yummy!) while respondent number 1 said *"Masarap pero parang nasobrahan yung lagay ng ampalaya. (012)"* (it tastes good but it contained too much bitter gourd.)

Table 3 presents the frequency and percentage distribution of the level of aesthetic value of powdered vegetables.

It can be seen in table 3 that 6(31.58%) of the total respondents said hat powdered ampalaya leaves were very *extremely desirable* in terms of its aesthetic value,8(42.11%) said it was *very desirable*, 4(21.05%) said it was *moderately desirable,* while one (5.26%) of the respondents said powdered ampalaya leaves was *slightly desirable*. The mean evaluation of the respondents' response to the aesthetic value of powdered ampalaya leaves was equal to 3.00 which implied that ampalaya leaves is *very desirable* to the respondents.

Table 3. Aesthetic Value of powdered vegetable leaves.

Powdered Vegetables	**Level of aesthetic**	**F (n=19)**	**Percentage**	Mean	SD	QD
Ampalaya	Extremely Desirable	6	31.58	3.00	.88	VD
	Very Desirable	8	42.11			
	Moderately Desirable	4	21.05			
	Slightly Desirable	1	5.26			
Camote	Extremely Desirable	7	36.84	3.21	.79	ED
	Very Desirable	10	52.63			
	Moderately Desirable	1	5.26			
	Slightly Desirable	1	5.26			
Kangkong	Extremely Desirable	10	52.63	3.42	.69	ED
	Very Desirable	7	35.84			
	Moderately Desirable	2	10.53			

Legend:
QD-Quantitative Description
ED- Extremely Desirable (3.26- 4.00)
VD- Very Desirable (2.15- 3.25)
MD- Moderately Desirable (1.76- 2.50)
SD- Slightly Desirable (1.00- 1.75)

Table 3 also shows the result on the level of aesthetic value of powdered camote tops. Among the 19 respondents, 7(36.84%) said it was *extremely desirable,* 10 (52.63%) of the respondents said it was *very desirable*, while each of the remaining respondents said it was *moderately desirable* and *slightly desirable*. Overall, the mean level of aesthetic value of powdered camote tops (mean=3.21) indicate that it was *very desirable* to the respondents.

In terms of the level of aesthetic value of powdered kangkong leaves, table 3 shows that 10(52.63%) of the respondents said it was *extremely desirable*, 7(36.84%) said it was *very desirable*, while among the 19 respondents, 2(10.53%) said it was *moderately desirable*.

Table 3 also shows that the mean level of the aesthetic value of powdered kangkong leaves was equal to 3.42 with the corresponding qualitative description of *extremely desirable*. This indicates that in terms of its aesthetic value, powdered kangkong leaves was *extremely desirable.*

According to respondent number 4, *"masarap sya kaya lang ung appearance ang hindi maganda sa mata. 012 ang pait (012)"* (it taste good but it doesn't look pleasant and the ampalaya taste is bitter.) while respondent number 19 said*, "Yung 012 eh mapait, nasobrahan ng seasoning na dahon"* (the 012 is bitter. It contains too much powdered vegetable leaves.)

Table 4 present the mean desirability of each of the three powdered vegetable leaves.

Table 4. Averaged Desirability of each powdered vegetable leaves.

Powdered Vegetable	Mean Desirability	SD	QD
Ampalaya	3.02	.80	VD
Camote	3.32	.77	ED
zangkong	3.40	.58	ED

Legend:
QD – Quantitative Description
ED- Extremely Desirable (3.26- 4.00)
VD- Very Desirable (2.15- 3.25)
MD- Moderately Desirable (1.76- 2.50)
SD- Slightly Desirable (1.00- 1.75)

The mean desirability of the three powdered vegetable, powdered ampalaya leaves (3.02) appeared to be *very desirable*, while powdered camote tops (3.32) and powdered kangkong leaves (3.40) both appeared to be *extremely desirable* to the respondents.

According to respondent number 10, *"The product is very excellent. Aside hat it is healthy it is available anywhere and all year around."* (The product is very excellent. Aside from it is healthy, it is available anywhere and all year round.) and respondent number 18 also said *"Masarap, nalalasahan yung seasoning. Good health. Good job! (045) . . ."* (It is delicious and seasoning can be tasted. Good for the health and good job especially in 045 (control).)

Relationship of the Acceptability, Palatability, and Aesthetic Value of Powdered Vegetable Leaves as a Food Ingredient.

The result in testing whether there is significant difference on the level of acceptability, palatability, aesthetic value of the powdered vegetable and the overall desirability of each of the three powdered vegetable to the control group was presented and discussed in this section.

Table 5 shows that statistical analysis result when the level of acceptability, palatability, aesthetic value and overall desirability of powdered ampalaya and the control group.

Table 5. Comparison on the level of acceptability, palatability, aesthetic value, and overall desirability of powdered ampalaya leaves and the control group.

Outcomes	powdered Ampalaya		Control		T	Sig.
	M	SD	M	SD		
Acceptability	3.00	.88	3.95	.23	-5.30	.000
Palatability	3.05	.85	3.89	.32	-4.40	.020
Aesthetic value	3.00	.88	3.89	.32	-4.82	.000
Overall desirability	3.02	.80	3.91	.24	-5.48	.000

Acceptability of powdered ampalaya leaves and the control group

It can be seen in the table that the level of powdered ampalaya leaves (M=3.00, SD=0.88) was lower than the level of acceptability of the control (M=3.95, SD=0.23). The analysis found the difference to be significant, t (18) =-5.30, p<0.001. This only means that powdered ampalaya leaves were less desirable to the respondents that the control group in terms of their acceptability.

Palatability of powdered ampalaya leaves and the control group

The result of the analysis of when level of palatability of powdered ampalaya leaves was compared to the level of acceptability of the control group as displayed in table 5 shows that the palatability of powdered ampalaya leaves (M=3.05, SD=0.85) was lower than the palatability of the control group (M=3.89, SD 0.30). The repeated measure t-test found this difference to be significant, t (18) = -4.40, p=0.020. Together, this suggests that powdered ampalaya leaves was less desirable compared to the control group in terms of their palatability.

Aesthetic value of powdered ampalaya leaves and the control group.

Table 5 the analysis on the comparison of the level shows that the aesthetic value of powdered leaves and the control group. It shows that the level of aesthetic value of powdered ampalaya leaves (M=3.00, SD=0.88) was lower than the level of aesthetic value of the control group (m=3.89) and the difference was found to be significant, t (18) = -4.82, p<0,001. The result of the analysis implies that the level of aesthetic value of the control group, meaning powdered ampalaya leaves, was significantly lower than aesthetic value of the control group, meaning powdered ampalaya leaves was less desirable to the respondents in terms of it aesthetic value.

Overall desirability of powdered ampalaya leaves and the control group.

For the overall desirability of powdered ampalaya leaves and the control group, table 6 shows that the overall desirability of powdered ampalya leaves (M=3.02), SD=0.80) was lower than the overall level of desirability of the control group (M=3.91, SD=0.24). The analysis also showed that the difference was found to be significant, t(18) = -5.48, p<0.001. Together, this implies that the overall desirability of powdered ampalaya leaves was significantly lower than the overall desirability of the control group. This indicates that powdered ampalaya leaves was less desirable to the respondent than the control group in terms of their overall desirability.

Respondents number 12 said*," malalasahan yung pait ng ampalya. Masarap din siya (045)"* (The bitterness of the bitter gourd can be taste. 045 also tastes good.) and respondent number 8 also said" *Ang pait pero okay naman masarap. (012)"* (012) (ampalaya) is bitter but still good.)

Table 6 shows the statistical result when the level of acceptability, palatability, aesthetic value, and overall desirability of powdered camote tops and the control group.

Table 6. Comparison on the level of acceptability, palatability, aesthetic value, and overall desirability of powdered camote tops and the control group.

Outcomes	Powdered Camote		Control		T	Sig.
	M	SD	M	SD		
Acceptability	3.37	.83	3.95	.23	-3.64	.002
Palatability	3.37	.83	3.89	.32	-2.97	.008
Aesthetic value	3.21	.79	3.89	.32	-4.44	.000
Overall desirability	3.32	.77	3.91	.24	-4.04	.001

Acceptability of powdered camote tops and the control group.

The result of the analysis of the level of acceptability of powdered camote tops was compared to the level of acceptability of the control group as displayed in table 6 shows that the acceptability level of powdered camote tops (M=3.37, SD=0,83) was lower than the level of acceptability of the control group (M= 3.39, SD=0.23). The repeated measure t-test found this difference to be significant, t (18) = -3.64, p=0.002. Together this suggests that powdered camote tops was less desirable compared to the control group in terms of their acceptability.

Palatability of powdered camote tops and the control group.

Table 6 shows the analysis on the comparison of the level of palatability of powdered camote tops and the control group. It shows that the level of palatability of powdered camote tops (M=3.37, SD=0.83) was lower than the level of palatability of the control group (M=3.89, SD=0.32) and the difference was found to be significant, t (18) =-2.97, p=0.008. The result of analysis implies that the level of acceptability of powdered camote tops was significantly lower that the palatability of the control group, meaning powdered camote tops was desirable to the respondents in terms of its palatability.

Aesthetic value of powdered camote tops and the control group.

It can be seen in the table that the aesthetic value of powdered camote tops (M=3.21, SD=0.79) was lower than the aesthetic value of the control group (M=3.89, SD=0.32). The analysis found the difference to be significant, t (18) = -4.44, p<0.001. This only means that powdered camote tops was less desirable to the respondents than the control group in terms of their aesthetic value.

Overall desirability of powdered camote tops and the control group.

For the overall desirability of powdered camote tops and the control group, table 6 shows that the overall desirability of powdered camote tops (M=3.32, SD=0.77) was lower than the overall level of desirability of the control group (M=3.91, SD=0.24). The analysis also showed that the difference was found to be significant, t (18) = -4.04, p<0.001. Together, this implies that the overall desirability of powdered camote tops was significantly lower than the overall desirability of the control group. This indicates that powdered camote tops was less desirable to the respondents than the control group in terms of their overall desirability.

Respondents number 11 said *"Other powdered vegetable are bitter and spicy. I think you need to control thor vegetable seasoning as a food ingredient."* (Other powdered vegetables are bitter and spicy. I think you need to control the vegetable leaves seasoning as a food ingredient). Respondent number 2 said *"034,012 and 045, Medyo nasobrahan yung dahon tyaka nalalasahan pa yung lata niya. Pero sa control ang masarap at masarap din sa iba yun nga lang napadami ng dahoon 045… Good job!!!* "(043,023,012

the kangkong can, camote and ampalya leaves, respectively have too much powdered vegetable leaves and the sap is still present. But the control (045) is good, and others taste good too, yet they contained too much powdered vegetable leaves. Good job!)

Table 7 shows that statistical analysis result when the level of acceptability, palatability, aesthetic value, and overall desirability of powdered kangkong leaves and the control group.

Table 7 Comparison on the level of acceptability, palatability, aesthetic value, and overall desirability of powdered kangkong leaves and the control group.

Outcomes	**Powdered Kangkong**		**Control**		**t**	**Sig.**
	M	SD	M	SD		
Acceptability	3.37	.68	3.95	.23	-4.16	.001
Palatability	3.42	.61	3.89	.32	-4.03	.001
Aesthetic value	3.42	.69	3.89	.32	-3.36	.003
Overall desirability	3.40	.58	3.91	.24	-4.42	.000

Acceptability of powdered kangkong leaves and the control group.

Table 7 shows the comparison of powdered kangkong leaves to the acceptability of the control group. The table shows that the acceptability of powdered kangkong leaves was lower (M=337, SD=0.68) than the acceptability of the control group (M=3.95, SD=0.23). The analysis found the difference to be significant, t-(18) = -4.16, p=0.001. This indicates that the level of acceptability of powdered kangkong leaves was significantly lower than the level of acceptability of the control which further implies that the powdered kangkong leaves was less desirable to the respondents than the control group in terms of their acceptability.

Palatability of the powdered kangkong leaves and the control group.

The result of the analysis when the level of palatability of powdered kangkong leaves was compared to the level of palatability of the control group as displayed in table 7. It shows that the palatability level of powdered kangkong leaves (M=3.42, SD=0.61) was lower than the palatability of the control group (M=3.89, SD= 0.32). The repeated measure t- test found this difference to be significant, t (18) = -4.03, p=0.001. Together this suggests that the powdered kangkong leaves was less desirable compared to the control in terms of their palatability.

Aesthetic value of powdered kankong leaves and the control group.

It can be seen in the table that the aesthetic value of powdered kangkong leaves (M= 3.43, SD= 0.69) was lower than the level of acceptability of the control (M= 3.89, SD=o.32). The analysis found the difference to be significant, t (18) = -3.36, p=0.003. This only means that powdered kangkong leaves was less desirable to the respondents than the control group in terms of their acceptability.

Overall desirability if powdered Kangkong leaves and the control group.

For overall desirability of kangkong powdered leaves and the control group, table 6 shows that the overall desirability of powdered kangkong leaves (M= 3.40, SD= 0.58) was lower than the overall desirability of the control group (M=3.91, SD=0.24). The analysis showed that the difference was found to be significant, t (18) = -4.42, p<0.001. Together, this implies that the overall desirability of powdered kangkong leaves was significantly lower than the overall desirability of the control group. This indicates that the powdered

Kangkong leaves was less desirable to the respondent than the control group in terms of their overall desirability.

According to the respondent number 16*," masaraap yung mga seasoning na nilagay lalo na 045 at 034. Mammit!* (the seasoning added good especially the 045 (control) and)43 (kankong). Delicious!) While respondent number 9 said, *"034 medjo nasobrahan sa POWDERED VEGETABLE LEAVES"* (043 (kangkong) have too much powdered vegetable leaves.).

Chapter V
SUMMARY, CONCLUTION AND RECOMMENDATIONS

Summary

This study determined the level of acceptability, palatability, and aesthetic value of powdered vegetable leaves as a food ingredient and the significant difference in the acceptability, palatability, and aesthetic value of powdered vegetable leaves as a food ingredient in the control group.

The data was obtained from the checklist provided to 19 conveniently selected **BTTE** first year students from the College of Teacher Education, Ifugao State University, Lagawe Campus.

Descriptive statistics was utilized to determine the acceptability, palatability, and aesthetic value of powdered vegetable leaves as a food ingredient. In addition, the mean was computed to determine the qualitative description of the respondents on the product. Inferential statistics like t-test was used to examine the significant difference in the acceptability, palatability, and aesthetic value of powdered vegetable leaves as a food ingredient and the control group.

Based on the results of the study, the following summaries were obtained:

Acceptability of powdered vegetable leaves. 8 (42.11%) of the respondents said that the powdered ampalaya leaves was *very desirable* while powdered camote tops and powdered kangkong leaves with 10 (52.63%) and 9 (47.37%) respondents, respectively, said that both was *extremely desirable*.

Palatability of powdered vegetable leaves. Based on the data, powdered ampalaya leaves was again *very desirable* with 7 respondents (47.37%) greater than the number of respondents who said it was *extremely desirable* (6 or 31.58%). 10 (52.63%) of the respondents said that powdered camote tops was *extremely desirable* while the same number of respondents (9 or 47.37%) said that powdered kangkong leaves were both *extremely desirable and very desirable*.

Aesthetic value of powdered vegetable leaves. One of the respondents (5.226%) said that both powdered ampalaya leaves and powdered camote tops were *slightly desirable*.

Only 6 (31.58%) respondents said that the powdered ampalya leaves was *extremely desirable* but with a mean of 3.00 which implies that it was *very desirable*. Majority of the respondents in the powdered camote tops said that it was *very desirable* (10 or 52.63%), the same number of respondents who said that powdered kangkong leaves was *extremely desirable*.

Averaged desirability of each powdered vegetable leaves. Powdered ampalaya leaves (M=3.02) appeared to be *very desirable* while powdered kangkong leaves (m=3.40) both appeared to be *extremely desirable* to the respondents.

Comparison on the level of acceptability, palatability, aesthetic value, and overall desirability of powdered ampalaya leaves and the control group. The result of the analysis found that powdered ampalaya leaves was less desirable in all aspect (acceptability, palatability and aesthetic value) than the control group. The overall desirability of powdered ampalaya leaves (M= 3.02) and the control group (M=3.91) indicates that the powdered ampalaya leaves were significantly lower than the control group.

Comparison on the level of acceptability, palatability, aesthetic value, and overall desirability of powdered camote tops and the control group. The overall desirability of powdered camote tops (M=3.32, SD=0.77) was lower than the level of desirability of the control group (M=3.91, SD= 0.24). The analysis also showed that the difference was found to be significant, t (18)=-4.04, p<0.001. Together this implies that the overall desirability of powdered camote tops was significantly lower than the overall desirability of the control group.

Comparison on the level of acceptability, palatability, aesthetic value, and overall desirability of powdered kangkong leaves and the control group. The overall desirability of powdered kangkong leaves (M=3.40, SD=0.58) was lower than the overall level of desirability of the control group (M=3.91, SD= 0.24). The analysis also showed that the difference was found to be significant, t (18) = -4.42, p<0.001. Together this implies that the overall desirability of powdered kangkong leaves was significantly lower than the overall desirability of the control group.

Conclusion

Based on the results, the following conclusions had been made:

1. The powdered camote tops and powdered kangkong leaves were *extremely desirable* while ampalaya was *very desirable* in terms of its acceptability.
   Both powdered camote tops and powdered kangkong leaves were *extremely desirable,* while ampalaya leaves was *very desirable* in terms of palatability. Powdered kangkong leaves was more desirable than powdered ampalaya laves and powdered camote tops in terms of its aesthetic value. Majority of the respondents said that powdered camote tops and powdered kangkong leaves were *extremely desirable* but the powdered ampalaya leaves was *very desirable.*
2. The ampalaya was less desirable to the respondents since it was significantly lower than the overall desirability of the control group. The overall desirability of powdered camote tops was significantly lower than the overall desirability of the control group which indicates the powdered camote tops were less desirable to the respondent than the control group. The level of acceptability, palatability, aesthetic value, and overall desirability of powdered kangkong leaves was significantly lower than the control group.
   Therefore, we can conclude that there was a significant difference in the acceptability, palatability, and aesthetic value of all the powdered vegetable leaves with the control group.

Recommendation

In line with the conclusion generated from the study, the following recommendations are offered:

1. Control the amount of powdered vegetable leaves, especially the powdered ampalaya leaves in dishes to avoid bitterness and spiciness.
2. It is recommended to put the powdered vegetable leaves altogether in the dish.
3. It is recommended to put the powdered vegetable leaves in another dish.

LITERATURE CITED

1. Ananieva, et al., (2016). *The Research of Dry Plants Concentrates-Ingredients of the Food Health*
2. *Improvement*. Retived from the Http://dx.doi.org on April 1, 2017.

3. Anonymous, (2011). *Ampalaya/ Bitter Melon Herbal Medicine*. Retrieved from www.medicalhealthguide.com on April 17, 2017.
4. Anonymous, (n, d.). *Squash Powdered for Various Food Preparation*. Retrieved on April 18,2017 from http://www.scrib.com.
5. Anonymous, (2013). *Health Benefits of Sweet Potato or Camote*. Retrieved from belizeherbs.com on April 17,2017.
6. Balum, (2017). *Used of ampalaya leaves*. Retrieved on April 19,2017 from www.livestrong .com
7. Gines, et al., (2013). *The effects of momordica charantia crude leaf extract on the enzyme kinetics of porcine alpha amylase.* Retrieved on April 19,2017 from www.dlsu.edu.ph.
8. Gupta et al,.(2011). *Retention of nutrients in green leafy vegetables on dehydration*. Retrieved from www.ncbi.nlm.nih.gov on April 18, 2017.
9. Ishiguro, et al,. (2004). *Suioh, a New Sweet Potato Cultivar for Utilization in Vegetable Greens.* Retrieved from acta hortic637:339345 on April 19, 2017.
10. Islam, S. 2006. *Sweetpotato Leaf: it's Potential Effect on Human Health and Nutrition.* Retrieved from J. food Sci. 71: R13R21 on April 19, 2017.
11. Jubelag, (2008). *Carrot (Daucus Carota) Powdered for Various Preparation.* Retrieved from http://www.scrid.com on April 17, 2017.
12. Lim, et al., (2010). *The MOCHA DM study: the effect of momordica charantia tabletson glucose and insulin levels during the postprandial state among patients with type 2 diabetes mellitus.* Retrieved on April 19, 2017 from Philippine journal of internal medicine, volume 48, number 2, pages 19-25 in http://pcp.org.ph.
13. Nagai, et al., (2010). *Sweet potato (Ipomoea batatas L.) leaves suppressed oxidation of low density of lipoprotein (LDL) in vitro and in human subjects.* Retrieved on April 18, 2017, from the journal clinical biochemistry and nutrition.
14. Stuart, (2016). *Kangkong (Water Spinach)*. Retrieved from www.stuartxchange.org on April 17, 2017.
15. Vicedo, (2009). *The 12 Health of Ampalaya Leaves (Shoots).* Retrieved on April 18, 2017 From www.foodrecap.html.
16. Zhang, Oxinos and Maher, (2009). *The Effect of Fruit and Vegetable Powder Mix on Hypertensive Subjects.* Retrieved from http://www.ncbi.nlm.nih.gov on April 18,2017.

DUCUMENTATION

D1:Preparation of the product

D2:Cooking the product

D3:Setting up the table for the respondents to taste

D4:Respondents are tasting the product

Survey Questionnaire
Powdered Vegetable Leaves as a Food Ingredient

Name (Optional): _____ Date: _____

Rate the product according to its acceptability, palatability and aesthetic value.

Legend:

4- Extremely Desirable
3- very desirable
2- moderately Desirable
1- Slightly desirable

012- powdered ampalaya leaves
023 powdered camote leaves
034- powdered kangkong leaves
045- control

Acceptability of Powdered Leaves as a Food Ingredient

	4-Extremely Desirable	3-Very Desirable	2-Moderately Desirable	1-Sligthly Desirable
012				
023				
034				
045				

Palatability of Powdered Leaves as a Food Ingredient

	4-Extremely Desirable	3-Very Desirable	2-Moderately Desirable	1-Sligthly Desirable
012				
023				
034				
045				

Aesthetic Value of Powdered Vegetable Leaves as a Food Ingredient

	4-Extremely Desirable	3-Very Desirable	2-Moderately Desirable	1-Sligthly Desirable
012				
023				
034				
045				

What suggestions or recommendation can you give to improve the acceptability, palatability and aesthetic value of the product?