Orange peel as antioxidant

CHAPTER I THE RESEARCH PROBLEM BACKGROUND OF THE STUDY Now days, exporting is hard in the Philippines hence the country is not that good in means of transportation because of the gap between the islands and provinces; and not all places have good roads. This kind of problem could take hours for the exporters to export their goods to other places like the market, malls, and other cities along the country. And due to that kind of problem may lead to poor source of income for the exporters, for when the exported product reaches their destinations chances may, that some of those are already rotten.

One of the most exported goods in the Philippines is the countries very own national fruit, mango (Mangifera indica). Mango is a sweet fruit and succulent that’s why Filipinos just love to eat the fruit, but unfortunately it is not that cheap and buyers have to save, causing the fruits to be stocked and slowly by slowly rot and making the buyers refrain from buying. Another thing is people now a day’s tends to throw things that can still be recycled, and recycling is something that could lessen up the countries waste management. The Philippines for example is full of wastes, some citizens just don’t know how to recycle.

The richness of life is not only seeing life with wide open eyes, but knowing about the connections between things and how this knowledge would take part in letting one live a more convenient life just like the purpose of this research work. STATEMENT OF THE PROBLEM This study aims to extract antioxidants from orange peels to use as natural preservatives especially for mangoes. Specifically, this study attempted to answer the following question: 1. How could the extracted antioxidant help the mango preserve

its freshness? 2. Can the orange peels really be use as a alternative preservative for the mango?

RESEARCH HYPOTHESIS Ha: The extracted preservative from the orange peel has no effect on the mango. Ho: The extracted preservative from the orange peel has an effect on the mango causing it not to rot easily. SCOPE AND DELIMINATION This study started on July 2012. This study will focus on extracting antioxidants from the orange (Citrus sinensis) peels and apply and use it to preserve mangoes (Mangifera indica). The area of this study is in Ormoc City, Leyte, Philippines. Both oranges (Citrus sinensis) and mangoes (Mangifera indica) are bought from the city markets. SIGNIFICANCE OF THE STUDY

Antioxidants and antibacterial are important components for preserving fruits and preventing fruit spoilage. This study aims to help the following: A) COMMUNITY and HOUSEHOLDS it is easy to do and less expensive. People who love to eat oranges can make the preservatives to apply it on their own. B) ECONOMY This is good for economical purposes for they can sell the preservatives on a lower price and sell it to fruit vendors who sell mangoes. And to those who export mangoes they can use this preservative or they can even make the preservative themselves and apply it so that when they export mangoes it will not easily rot.

DEFINITION OF TERMS Antibacterial is a compound or substance that kills or slows down the growth of bacteria and play an important role for preserving substance. Antioxidant is a molecule that inhibits the oxidation of other molecules and plays and also plays an important role for preserving substance. Mango (Mangifera indica) is a fleshy stone fruit that is very sweet

and has a lot of vitamins. Orange (Citrus sinensis) is a type of citrus fruit which people often eat they are very good source of vitamins, especially vitamin C. Orange (Citrus sinensis) Peels are edible but not that delicious as of the orange.

Preservative are naturally occurring or synthetically produced substance that is added to products to prevent the decomposition by means of microbial growth that can cause undesirable chemical changes. CHAPTER II REVIEW OF RELATED LITERATURE Antioxidants Antioxidants are substances or nutrients in our foods which can prevent or slow the oxidative damage to our body. When our body cells use oxygen, they naturally produce free radicals (by-products) which can cause damage. Antioxidants act as " free radical scavengers" and hence prevent and repair damage done by these free radicals.

Healthproblems such as heart disease, macular degeneration, diabetes, cancer are all contributed by oxidative damage. Antioxidants may also enhance immune defense and therefore lower the risk of cancer and infection. (http://www. csiro. au). Well-known antioxidants include enzymes and other substances, such as vitamin C, vitamin E, and beta carotene, which are capable of counteracting the damaging effects of oxidation. Antioxidants are also commonly added tofoodproducts such as vegetable oils and prepared foods to prevent or delay their deterioration from the action of air (http://www. medterms. com).

It is impossible for us to avoid damage by free radicals . Free radicals arise from both inside (endogenous) and outside (exogenous) our bodies . Oxidants that develop from processes within our bodies form as a result of

normal aerobic respiration, metabolism , and inflammation . Exogenous free radicals form fromenvironmentfactors such aspollution, sunlight, strenuous exercise, X-rays, smokingand alcohol . Our antioxidant systems are not perfect , so as we age , cell parts damaged by oxidation accumulate Because they have one or more unpaired electrons , free radicals are highly unstable .

They scavenge your body to grab or donate electrons , thereby damaging cells , proteins , and DNA (genetic material) . The same oxidative process also causes oils to become rancid , peeled apples turn brown , and iron to rust . Antioxidants block the process of oxidation by neutralizing free radicals. In doing so, the antioxidants themselves become oxidized. That is why there is a constant need to replenish our antioxidant resources. How they work can be classified in one of two ways: Chain-breaking - When a free radical releases or steals an electron, a second radical is formed.

This molecule then turns around and does the same thing to a third molecule, continuing to generate more unstable products. The process continues until termination occurs -- either the radical is stabilized by a chain-breaking antioxidant such as beta-carotene and vitamins C and E, or it simply decays into a harmless product. Preventive - Antioxidant enzymes like superoxide dismutase, catalase and glutathione peroxidase prevent oxidation by reducing the rate of chain initiation. That is, by scavenging initiating radicals, such antioxidants can thwart an oxidation chain from ever setting in motion.

They can also prevent oxidation by stabilizing transition metal radicals such as copper and iron. The effectiveness of any given antioxidant in the body depends on which free radical is involved, how and where it is generated,

and where the target of damage is. Thus, while in one particular system an antioxidant may protect against free radicals, in other systems it could have no effect at all. Or, in certain circumstances, an antioxidant may even act as a " pro-oxidant" that generates toxic oxygen species. Since antioxidants counteract the harmful effects of free radicals , you would think that we should consume as much as them as possible .

The truth is , although there is little doubt that antioxidants are a necessary component for good health , it is not clear if supplements should be taken and , if so , how much . Once thought to be harmless , we now know that consuming mega-doses of antioxidants can be harmful due to their potential toxicity and interactions with medications . Antioxidants are found abundant in beans, grain products, fruits and vegetables. Look for fruits with bright color - lutein in some of the yellow pigments found in corn; orange in cantaloupe, butternut squash and mango; red from lycopene in tomatoes and watermelon, and purple and blue in berries.

So enjoy eating a variety of these products. It is best to obtain these antioxidants from foods instead of supplements. In addition, minimize the exposure of oxidativestresssuch as smoking and sunburn. Orange Nutrients in oranges are plentiful and diverse. The fruit is low in calories, contains no saturated fats or cholesterol, but is rich in dietary fiber, pectin, which is very effective in persons with excess body weight. Pectin, by its action as bulk laxative, helps to protect the mucous membrane of the colon by decreasing its exposure time to toxic substances as well as by binding to cancer causing chemicals in the colon.

Pectin has also been shown to reduce blood cholesterol levels by decreasing its re-absorption in the colon by binding to bile acids in the colon. Oranges, like other citrus fruits, is an excellent source of vitamin C (provides about 60% of DRI); Vitamin C is a powerful natural antioxidant. Consumption of foods rich in vitamin C helps body develop resistance against infectious agents and scavenge harmful, pro-inflammatory free radicals from the blood. Orange fruit contains a variety of phytochemicals. Hesperetin and Narigenin are flavonoids found in citrus fruits.

Naringenin is found to have a bio-active effect on human health as antioxidant, free radical scavenger, anti-inflammatory, and immune system modulator. This substance has also been shown to reduce oxidant injury to DNA in vitro studies. Oranges also contain very good levels of vitamin A, and other flavonoid antioxidants such as alpha andbeta-carotenes, beta-cryptoxanthin, zea-xanthin and lutein. These compounds are known to have antioxidant properties. Vitamin A is also required for maintaining healthy mucus membranes and skin and is essential for vision.

Consumption of natural fruits rich in flavonoids helps body to protect from lung and oral cavity cancers. It is also a very good source of B-complex vitamins such as thiamin, pyridoxine, and folates. These vitamins are essential in the sense that body requires them from external sources to replenish. Orange fruit also contains a very good amount of minerals like potassium and calcium. Potassium is an important component of cell and body fluids that helps control heart rate and blood pressure through countering sodium actions. Citrus fruits, as such, have long been valued for their wholesome nutritious and antioxidant properties (http://www. utrition-

and-you. com). Orange Peels When oranges were first cultivated, orange peels were highly valued. People extracted essential oils from the peels to use in medicines and remedies for indigestion and other illnesses. Orange peels are a source of health-promoting carbohydrates. Peels also contain healthy polymethoxylated flavones, which are plant pigment compounds present in all citrus fruits. The production of orange juice leaves large amounts of orange peels. They are processed into an essential oil which contains (+)-limonene as major component.

Every year about 50, 000 bis 75, 000 tons of this hydrocarbon accumulates in the citrus processing industry. Up to now it is regarded as residue and rarely used for the synthesis of valuable products (http://kwi. dechema. de). The orange peels contain an abundance of nutrients, including sugars, flavonoids, vitamins and antioxidants, with a variety of uses, including anti-inflammatory, anti-microbial and anti-carcinogenic properties. Orange peels are the main source of d-limonene, which is effective against breast and colon cancer, and squamous cell carcinoma (SCC) of the skin (http://onecoup. com).

The peel of Citrus fruits, like orange, is a rich source of flavanones and many polymethoxylated flavones (Ahmadetal. 2006), which are very rare in other plants. These compounds have commercial interest because of their multitude of applications in the food and pharmaceutical industries. There are studies that prove that orange peels may be used or substituted as antimicrobial. An antimicrobial is a substance that kills or inhibits the growth of microorganisms such as bacteria, fungi, or protozoans. Antimicrobial,

drugs either kill microbes (microbicidal) or prevent the growth of microbes (microbistatic).

Mango Mango fruit is rich in pre-biotic dietary fiber, vitamins, minerals, and polyphenolic flavonoid antioxidant compounds. According to new research study, mango fruit has been found to protect against colon, breast, leukemia and prostate cancers. Several trial studies suggest that polyphenolic anti-oxidant compounds in mango are known to offer protection against breast and colon cancers. Mango fruit is an excellent source of Vitamin-A and flavonoids like beta-carotene, alpha-carotene, and beta-cryptoxanthin. 100 g of fresh fruit provides 765 mg or 25% of recommended daily levels of vitamin A.

Together; these compounds are known to have antioxidant properties and are essential for vision. Vitamin A is also required for maintaining healthy mucus membranes and skin. Consumption of natural fruits rich in carotenes is known to protect body from lung and oral cavity cancers. Fresh mango is a very rich source of potassium. Potassium is an important component of cell and body fluids that helps controlling heart rate and blood pressure. It is also a very good source of vitamin-B6 (pyridoxine), vitamin-C and vitamin-E. Consumption of foods rich in vitamin C helps body develop esistance against infectious agents and scavenge harmful oxygen free radicals. Vitamin B-6 or pyridoxine is required for GABA hormone production in the brain. It also controls homocystiene levels in the blood, which may otherwise be harmful to blood vessels resulting in CAD and stroke. Copper is a co-factor for many vital enzymes, including cytochrome c-oxidase and superoxide dismutase (other minerals function as co-factors for this enzyme are manganese and

zinc). Copper is also required for the production of red blood cells (http://www. nutrition-and-you. com). Preservation

Food preservation is the process of treating and handling food to stop or slow down Food spoilage, loss of quality, edibility or nutritional value and thus allow for longer food storage storage. Preservation usually involves preventing the growth of bacteria, yeasts, fungi, and other micro-organisms (although some methods work by introducing benign bacteria, or fungi to the food), as well as retarding the oxidation of fats which cause rancidity. Food preservation can also include processes which inhibit visual deterioration, such as the enzymatic browning reaction in apples after they are cut, which can occur during food preparation.

Many processes designed to preserve food will involve a number of food preservation methods. Preserving fruit by turning it into jam, for example, involves boiling (to reduce the fruit’s moisture content and to kill bacteria, yeasts, etc.), sugaring (to prevent their re-growth) and sealing within an airtight jar (to prevent recontamination). Maintaining or creating nutritional value, texture and flavour is an important aspect of food preservation, although, historically, some methods drastically altered the character of the food being preserved (http://www. ikipedia. com) ORANGE (Citrus sinensis) PEELS ECOFRIENDLY, RECYCLE EASY TO MAKEAS ALTERNATIVES FOR COMMERCIALIZE PRESERVATIVES CHEAP PRESERVATIVES ANTIOXIDANTS Figure 1 The Conceptual Framework of the Study CHAPTER 3 METHODOLOGY * General Procedure Preparation for the mango (Mangifera indica) Mangoes (Mangifera indica) were bought by the researchers within the city market. After buying the fruit, it was then washed. Preparation for extraction of

Orange (Citrus sinensis) Peels extract Oranges (Citrus sinensis) were bought by the researchers within the city market.

After buying the fruit was washed. And then the peels were taken off then cut/slice to smaller peels. Distilled water was then added to obtain more extract, then the peels were blended by using a metallic blender and then the extraction of the peels was obtain by using a cheesecloth or face cloth/towel (lampi). Manual squeezing was done to recover most of the liquid. Further purification was done by means of filter paper. The final collected extract was measured using a graduated cylinder and were placed in a beaker. Application and controlling of the extracts

The researchers bought cotton balls (can be found on drug stores or groceries) and prepared it for the application. A control was then set by the researchers to further study the affectivity of the extracted substance to the substance to be applied (mango {Mangifera indica}). The cotton balls was used to hold the substance and applied, by means of wiping, at the upper part or at the stem of the fruit. Methodology Flowchart * Gathering of oranges (Citrus sinensis) General Procedure Washing of mango (Mangifera indica) Gathering of mango (Mangifera indica)

Slicing/ Cutting of the peels of the orange (Citrus sinensis) Peeling of the oranges (Citrus sinensis) Washing of orange (Citrus sinensis) Addition of Distilled water Application of preservatives Filtration Measuring of extract TRAIT TESTING Grinding/blending of the peels of the orange (Citrus sinensis) Extraction by means of cheesecloth or face towel (lampi) CHAPTER 4 PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA Table 1 presents

the masses of the mangoes on the first and 7th day FIG 3 Treatment| Mass (g) of replicates (day 1)| Mass (g) of replicates (day 2)| | 1| 2| 3| 1| 2| 3|

Mangoes with extract| 130| 120| 150| 128| 117| 147| Mango without extract (control)| 110| 160| 100| 105| 153| 93| Table no. 1 presentation of mass of mangoes Table No 2. shows the weight loss of the three replicated in each treatment obtained from days 1 and 7. It shows that in Treatment 1, replica 1 has a weight loss of 2g, replica 2 has 3g, and replica 3 has 3g. In Treatment 2, replica 1 has a weight loss of 5g, replica 2 has 7g, and replica 3 has 7g. It shows that the results of the untreated mangoes got the highest amount of weight loss. Its cause might be the fast spoilage of the fruit.

Treatment 1 implies that the Orange peel extract has affectivity on the fruit's preservation state. Weight Loss of Treatment 2 between Days 1 and 7 Grams Replicates Figure No. 4 Weight loss of Treatment 1 (below) and Treatment 2 (above) Figure No. 3 above shows the weight loss of the treated (Treatment 1 and the untreated mangoes.) 1. Statement of Null Hypothesis; The extracted preservative from the orange peel has an effect on the mango causing it not to rot easily. Ho: μA = μB or μA - μB = 0 2. Statement of Alternative Hypothesis; Ha: The extracted preservative from the orange peel has no effect on the mango.

The extracted preservative from the orange peel has no effect on the mango. Ha = μA ? μB or μA - μB ? 0 3. Level of Significance ? = 0. 05 4. Treatment| Deviation (D)| D2| | 1| 2| 3| 1| 2| 3| Mangoes with extract| 2| 3| 3| 4| 9| 9| Mango without extract (control)| 5| 7| 7| 25| 49| 49| ? D= 27? D2= 145 5. A. Sum of squares difference ? d2 = ? D2 – [(? D)2]N = 145 – [([(27)2 6)] = 23. 5 B. Standard error of the mean difference SD = ? d2

N(N-1) = 23. 530 = 23. 530 = 0. 7833 C. D D= ? DN = 236 = 4. 5 D. t. t = DSD = 4. 50. 7833 6. Tcrit = t0. 05 = 2. 571 7.

Since the computed/ calculated t is larger than tcrit , reject the Ho and accept Ha There is significant difference between the mean % particulate matter of the mango being extracted . CHAPTER V SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS Summary We love to eat oranges, its sweet or sour juice, and its rich in vitamin c, and yet we only throw the peels away. However, because of this study we can now make use of the peels that we usually throw away. Because of this study, the researchers attempted to find an alternative preservative for mangoes, which it is one of the highly distributed fruit on our country.

So to find an easier way and more healthy way to preserve mangoes orange peels come to a use. Testing of the Orange peels' antibacterial and preservative capability is the main goal of this research. It aims to compare if there is a significant difference between the spoilage life of a treated and untreated mango. Oranges were gathered from fruit stores. The peels was then obtained then cut into smaller pieces then placed on a grinder, but before grinding, small amount of distilled water was added, then the grinding of peels took place.

By means of cheesecloth, manual squeezing was done to extract the oil, and filtration took place for further purification. Two treatments were prepared with three replicates respectively. First treatment was the mangoes which were treated with the extracts, and the second treatment was the control. Weighing was done during the 1st day of which mango was applied with the extract and after the 7th day from the application. Findings During

theobservationof the 7 days affectivity of extract, treatment two had rotten and spoiled faster than treatment 1, for spots was already seen.

The researchers then weighed and the mass of the mangoes, under treatment 2 , the mass started reducing slowly while treatment 1 still remained constant with its mass. By the 7th day of observation, treatment two was already very rot and spoiled, while treatment one was still giving signs of spoilage but not yet totally spoiled. Conclusions 1. The concentration of the oil extracted from the Orange peels is not that strong hence only small amount was only used. But yet still effective. 2. Mangoes when left untreated and left to be spoiled decreases its weight faster than those which are treated. . Orange peels are effective as preservative for mangoes. Recommendations After the research was made and after observations was gathered. This are the following recommendations the researchers made: 1. Orange peels are effective in preserving mango but yet one can still look for a stronger affectivity of preservation, which can preserve mangoes for a longer period of time. 2. If one wants a better result, he/she should use a ratio between more peels and lesser but enough distilled water to get a strong concentration.