

# Efficiency of Coconut Water as an Alternative Vinegar

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## Abstract

This study aims to determine the efficiency of coconut water as an alternative vinegar and attempted to know its differences in common vinegar in terms of seasonings and food preservatives. An experimental research design was utilized in this study, and a survey questionnaire (Likert scale) that is used in this study were distributed to the respondents using a purposive sampling technique. This study was participated by twenty-five (25) household members that lives in Dolores, Quezon and was conducted on 1st Semester of S.Y. 2022-2023. This study employed mean, standard deviation, and T-test. The data showed a significant relationship between common vinegar and coconut water as an alternative vinegar in terms of seasonings and food preservatives.

The results of the data that have gathered from the perceptions of the respondents have a significant difference in terms of seasonings and food preservatives. Findings reveals that both vinegars have a little different characteristic to each other that makes them significant different to each other. Both vinegars have a great characteristic that excel in different fields and can be used for different kind of meals like in salad dressings, in sauces or in marinades etc. that gives little extra kick and treat diseases.

**Keywords:** coconut water vinegar, common vinegar, alternative vinegar, seasonings, food preservatives

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## 1. Introduction

Vinegar has been used for a long time ago worldwide. It is widely used in seasoning in preparation of foods, cooking dishes, food preservative, for dipping, and also it is use as a remedies in many illness .It is defined as a sour liquid that is made usually by a two-step fermentation process that contain starch and sugar or wine, converting simple sugars to ethanol using yeast, and ethanol to acetic acid by acetic acid bacteria, also it is a liquid fit for human consumption and contains a specified amount of acetic acid and water (University, 2019).

According to Malaysian Food Act 1983 and Food regulation 1985, vinegar typically contains 5-8 % acetic acid by volume shall contain not less than 4% w/v of acetic acid and shall not contain any mineral acid. The acetic acid in vinegar elicits beneficial effects by altering metabolic processes in the gastrointestinal tract and in the liver (Watson, 2009). Acetic acid has many benefits that have been studied. Some of the biggest is that it helps control blood sugar, lowers blood pressure and inflammation (Link, 2022).

On the other hand, coconut water is a clear liquid found in the centre of a young, green coconut. The coconut water is low in calories and fat. It acts as a natural energy or a sports drink, as it is rich in mineral contents, vitamins, sugars, proteins, free amino acids, antioxidants, and growth promoting factors (Dini, 2019). It typically comes from young coconuts about 6–7 months of age, though it's also found in mature fruit. An

average green coconut provides about 1/2–1 cup of coconut water (RDN, 2021). Its electrolyte-filled, and natural beverage that contain several nutrients that can cure many diseases (Spritzler, 2021). In tropical regions, coconut water has long been a part of diets and healthcare practices.

Due to many coconuts, coconut water is either discharged directly into the soil or drained without any treatment from most of the small/ medium-scale copra processing units. This in turn results in soil contamination, groundwater leaching problems and emission of bad odours (Pawels, 2021).

Coconut water vinegar is a natural vinegar that is made from fermented coconut water. It is rich in essential amino acids, especially phenylalanine. However, the production of natural vinegar is unfavourable among the manufacturers because many of the producers refuse to produce natural vinegar due to several reasons such as the availability of the substrates and long fermentation time or 6-8 weeks (OTHAMAN, 2014).

The compounds with high OAVs in aged coconut water vinegar were phenylethyl acetate, isoamyl acetate and benzaldehyde, with almond, banana, or pear-like aromas. Coconut water vinegar was rich in essential amino acids, especially phenylalanine. Through pathway analysis, seventeen key metabolic pathways and three key metabolic substrates (aspartate, glutamate, and pyruvate) were found (Xu et al., 2022). According to (Buddies, 2013), the aged vinegar tastes better. Coconut water vinegar is delicious and nutritious, so reprocessing mature coconut water into vinegar is an appropriate way to reuse waste coconut water. Therefore, the objective of this study is to investigate the efficiency of coconut water to become an alternative vinegar.

## 2. Literature Review

### 2.1. Coconut Water

Faculty (2020) defined coconut water as the clear liquid found inside immature coconuts (*Cocos nucifera*). As the coconut matures, the water is replaced by coconut meat. It is sometimes called green coconut water because immature coconuts are green. They sum up several benefits of coconut water: it is rich in carbohydrates and electrolytes such as minerals, potassium, sodium, and magnesium. Because of these electrolytes, there's a lot of interest in using coconut water to treat and prevent dehydration.

Katherine (2020) states that as a casual beverage, coconut water is considered safe. Coconut water does have calories — 45 to 60 calories in an 8-ounce serving. Weighing the pros and cons, plain water is still the smart choice. Pak (2023) stated that young coconuts have higher sugar levels and total phenolic contents than mature coconuts. While mature coconuts have higher protein levels and pH values than young coconuts, the amount of minerals can also vary between young and mature coconuts. For example, the amount of potassium in coconut water increases as the coconut matures.

Bandalan & Galvez (2016) found that coconut water can be processed into a fermented beverage through the addition of *Lactobacillus acidophilus* as starter culture, sugar, and pineapple juice as flavoring. The beverage produced was concluded to be acceptable and through the process of sensory evaluation the products formulation and fermentation condition can be optimized. The beverage with 30% sugar, 20% starter culture and 15% pineapple juice were concluded to be the optimum formulation of the product which is stable for 15 days at refrigerated condition. Fermentation therefore can be used as a method for the production and preservation of coconut water.

Lima et al. (2015) suggested that coconut extracts can be used to control gastrointestinal nematodes and that more studies are needed to evaluate their use in humans. *Cocos nucifera* is a widely dispersed plant that has important pharmacological effects with low toxicity. Furthermore, medicinal use of *C. nucifera* has an environmental appeal since this plant is widely used in the food industry and use of discarded plant parts will reduce waste and pollution. The pharmacological effects of the plant differ according to the part of the plant or fruit used. Antioxidant activity predominated in the constituents of the endocarp and coconut water. In addition, the fiber showed antibacterial, antiparasitic, and anti-inflammatory activities. It reveals that coconut water

seems to have protective effects, e.g., on the kidney and heart, and antioxidant activity, as well as a hypoglycemic effect.

Pulsed light treatment, according to Mishra (2022) caused insignificant change in pH, and TSS. A significant decrease was observed in total sugars, reducing sugars, and microbial load. The non-reducing sugar content, however, reduced insignificantly with voltage. Due to these findings, pulsed light treatment could be a more effective means of controlling microbial growth in mature coconut water than thermal treatment. On the findings that Anjitha et al. (2022) have got on their study, it reveals that total Soluble solids (TSS) content of fresh mature coconut water was 5 °Bx and the TSS of pulsed light treated samples showed an insignificant change. The effect of pulsed light treatment on TSS of the present study agrees with Pala and Toklucu (2013) for orange juice and for black carrot juice. There was no significant change ( $p > 0.01$ ) in the pH of mature coconut water after pulsed light treatment. The pH of fresh mature coconut water was 4.85 and is slightly reduced to 4.83 after treatment with 1000V for 90 sec.

Pawwels & Sreedharan (2020) conducted waste coconut water is either discharged directly into the soil or drained without any treatment from most of the small/ medium-scale copra processing units. This results in soil contamination, groundwater leaching problems and emission of bad odors. The present study evaluates the potential of a three-chambered MDC: Microbial Desalination cell (MDC) is a Bio electrochemical system that simultaneously generates electricity from the biodegradation of organic compounds and desalinate saline water using the electric potential created, to reduce the organic strength of coconut water in a sustainable manner with production of bioenergy. Owing to discontinuous and high-strength discharges, the installation of complex wastewater treatment plants to handle their effluents is not economically feasible. MDC, being a zero-energy system with electricity generation from high strength effluent, is a sustainable way to handle wastewater. Therefore, MDC is a feasible and economical solution for reducing pollution issues related to different coconut processing industries.

Central (2022) said the viscosity of the crude LSEP solution exhibited a non-Newtonian flow behavior and good thermal stability. In addition, the effect of pH and the concentrations of NaCl and CaCl<sub>2</sub> on the apparent viscosity of the crude LESP solution was studied, suggesting that the viscosity reached a peak value at pH 7. In addition, the viscosity of crude LSEP solutions was proportion to the concentration of CaCl<sub>2</sub> in the range of 0–0.4%, while approaching the peak level when the concentration of NaCl was 0.1%. The results of QCM-D illustrated that crude LSEP can form a viscoelastic multilayer on the MCT–water interface. The lowest slope of K1 at the concentration of 0.4% indicated that the interfacial film was the most rigid. This study indicated that crude LESP may have potential application value as a good stabilizer and thickener in the food industry and pharmacy.

Baibua & Kanjanapongkul (2021) reveals that coconut water is a food material with a high electrical conductivity, making it suitable for the ohmic-heating process. PPO was more heat-stable than POD. The ohmic heating process completely inactivated POD at 90 °C for 3 min while about 10% of PPO activity was still detectable. The results showed that PPO in coconut water comprised two groups, with the first group in the majority being heat-sensitive and inactivated rapidly at 90 °C. In contrast, the second group was heat stable.

## **2.2. Coconut Water Vinegar**

Katiboina (2022) defined coconut vinegar as having a strong acidic flavor and a whiff of yeast, coconut vinegar is white and hazy in appearance. The benefit of it is as follows; Positive effect on weight, Fights infection, provides essential amino acids, provides digestive comfort, and has a low glycemic index.

Suazo (2019) stated that coconut vinegar is similarly related to apple cider vinegar, but it has a lighter, sweeter flavor than apple cider vinegar, and you can easily substitute it in recipes that call for ACV.

While according to the study of Mohamad & al (2019), in vivo, coconut water vinegar delayed 4T1 breast cancer progression in mice by inducing apoptosis and delaying metastasis. Furthermore, coconut water vinegar also promoted immune cell cytotoxicity and production of anticancer cytokines.

Based on the study of Malakul & al (2022), novel coconut vinegar is the source of antioxidants, and daily supplementation of coconut vinegar was found to attenuate dyslipidemia-induced hepatic and vascular oxidative stress by protective against cellular lipid peroxidation. The website of (company T. c., 2022) states that coconut vinegar can help protect against type II diabetes. Vinegar in general may help to improve insulin sensitivity, a significant problem for those living with the disease.

Keong (2020) stated that coconut water vinegar according to approximately, (0.08 and 2 ml/kg body weight) was fed to the obese mice from early in week 24 to the end of week 33 Faecal samples from the untreated and coconut water vinegar-treated mice (2 ml/kg body weight) were subjected to 16S met genomic analysis to compare their gut microbial. The oral intake of coconut water vinegar significantly ( $p < 0.05$ ) reduced the body weight, fat-pad weight, and serum lipid profile of the HFD-induced obese mice in a dose-dependent manner. We also observed up-regulation of adiponectin and down-regulation of sterol regulatory element-binding protein-1, retinol-binding protein-4, and resist in expression. Coconut water vinegar also reduced obesity.

While the potential of coconut water as a vinegar according to Padayao (2019) is it can really alternative in terms of converting into vinegar, In the experiment it is proven that all the methods and process are indeed needed to be implemented to make individuals know the essential of having a useful experiment that can be benefited for themselves Having an 320 ml coconut vinegar as the outcome that has pH scale of 3.50, 44,8mg potassium and 5% acidity of the said experiment. It is evidence that coconut water is potential in converting vinegar. In this experiment it is safer to use the coconut vinegar on the ground that it is naturally fermented coconut vinegar is rich in minerals and vitamins such as beta carotene, calcium, iron, magnesium phosphorus, potassium and sodium and is healthier alternative to synthetic vinegar. In addition, mature coconut water is a suitable alternative substrate for vinegar production.

Coconut vinegar is a low-cost vinegar that you can save money. Gunathilake (2017) found that vinegar generator accelerates the conversion of alcohol to acetic acid within 5 cycles or runs. It takes about 32 hours to obtain the 4% acetic level. Sensory evaluation was done to determine the acceptability of the product using 30 untrained panelists. Sensory evaluation revealed that coconut toddy vinegar and coconut water vinegar were highly acceptable for aroma, taste, color, appearance, and overall acceptability. Mature coconut water can be used to produce vinegar with the aid of vinegar generator for accelerating the production process.

Beegum et al. (2018) reveals that acetic acid fermentation in the sap was faster and the concentration of acid produced in sap-based vinegar was significantly higher than mature coconut water (5.87% and 4.20% respectively).

(Tan, The untapped potential of coconut sap vinegar, 20221), recommended to her report that consumers can learn to appreciate local vinegars suggest being an informed buyer, by informing through any media platforms like ads, social and interviews. One best way is through the label of the products. It said that coconut water vinegar is a natural vinegar that has many benefits and has many processes unlike synthetic vinegar that there's no fermentation process. However, it also means that there is a huge market waiting to be tapped, especially since it's been discovered that coconut water vinegar has properties like apple cider vinegar.

### 3. Methodology

The main purpose of the study is to determine the efficiency of using coconut water as an alternative vinegar in terms of using it as a seasoning and food preservatives.

Ranganathan (2018) defined research design as a model or an action plan upon which the entire study is built; dictates the way a study is conducted and provides the road map of a study in terms of the sample, data collection instruments and analysis procedure. Approaches on the other hand, are paradigms, research frameworks, which may be either quantitative or qualitative or both mixed approach, research design provides the glue that holds the research project together. This study used quantitative method as defined by Gray (2017), quantitative methods emphasize objective measurements and the statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys, or by manipulating pre-existing statistical data using computational techniques. This study used experimental design in which it is defined by (McIntosh, 2017) as the process of carrying out research in an objective and controlled fashion so that precision is maximized, and specific conclusions can be drawn regarding a hypothesis statement. Generally, the purpose is to establish the effect that a factor or independent variable has on a dependent variable. The sampling technique used is a purposive sampling technique. According to (Business Research Methodology, 2012) purposive sampling is a non-probability sampling method and it occurs when “elements selected for the sample are chosen by the judgment of the researcher. The respondents are 25 household members or individuals that are limited in Dolores, Quezon only, who used coconut water vinegar. The study was conducted on the 1st Semester of S.Y. 2022-2023.

After determining the respondents of the study, the researchers found where the pH level of the vinegar will be tested and ensured the requirements and details for the testing. After it, the researchers made the vinegar and fermented it for 4 months. After the fermentation process, the vinegar was tested by a professional tester. And when it is done, the researchers give the right amount of vinegar to the respondents where they used it and test it for 1 week. After 1 week, the researchers given the Likert scale to the respondents for them to answer it based on their experience of using it.

To find out if there is a significant difference between common vinegar and coconut water vinegar in terms of seasoning and food preservatives, T-test is used. It is a type of inferential statistics and used to determine if coconut water vinegar is effective in terms of seasoning and food preservatives.

After gathering the data, the researchers tallied, analysed, and interpreted the data that was collected.

## 4. Results and Discussion

This chapter includes the tables that present the findings of this study and the interpretation and analysis of the data gathered.

**Table 1. Perceptions of the household members in using Common Vinegar in terms of Seasonings**

| Indicators                                                                                             | Mean        | SD          | Interpretation  |
|--------------------------------------------------------------------------------------------------------|-------------|-------------|-----------------|
| 1. Common vinegar gives natural taste to my dishes.                                                    | 3.24        | 0.72        | Accepted        |
| 2. Common vinegar is compatible to any of my dishes.                                                   | 3.00        | 0.91        | Accepted        |
| 3. Common vinegar can be used as an alternative spice.                                                 | 3.12        | 0.78        | Accepted        |
| 4. Common vinegar is a great flavouring in my dishes.                                                  | 3.00        | 0.70        | Accepted        |
| 5. Common vinegar is good for dipping.                                                                 | 3.12        | 0.60        | Accepted        |
| 6. Common vinegar, in terms of marinating, gives more nutrients, and good taste to my dishes or foods. | 3.24        | 0.66        | Accepted        |
| 7. Common vinegar can be use in dressing of my foods.                                                  | 2.88        | 0.78        | Accepted        |
| <b>Overall</b>                                                                                         | <b>3.08</b> | <b>0.46</b> | <b>Accepted</b> |

**Legend:** 3.26-4.00-Highly Accepted; 2.51-3.25-Accepted; 1.76-2.50-Slightly Accepted; 1.00-1.75-Not Accepted

Table 1 shows the perceptions of the household members in using common vinegar in terms of seasonings. Both indicator 1 which states that “Common vinegar gives natural taste to my dishes” with the standard

deviation of 0.72 and with the interpretation of “accepted”; and indicator 6 which states “Common vinegar, in terms of marinating, gives more nutrients, and good taste to my dishes or foods” with the standard deviation of 0.66 and with the interpretation of “accepted” obtained the highest mean of 3.24. It is related to the website of webstaurantstore (2022) which states that white vinegar has a strong flavor, so it's best used in small doses to add a touch of acidity to recipes. While, indicator 7 which states that “Common vinegar can be use in dressing of my foods” obtained the lowest score of 2.88 and having the standard deviation of 0.78 with an interpretation of “accepted”.

Taken the perceptions of the household members in using common vinegar in terms of seasonings has a mean of 3.08 and a standard deviation of 0.46 with an interpretation of “accepted”. Since the overall interpretation on the perceptions of the household members in using common vinegar in terms of seasonings is “accepted”, it can be implied that using of common vinegar is accepted to be use as a seasoning and have a big involvement in using it as a seasoning in food preparations.

**Table 2. Perceptions of the household members in using common vinegar in terms of food preservatives.**

| Indicators                                                                                         | Mean        | SD          | Interpretation  |
|----------------------------------------------------------------------------------------------------|-------------|-------------|-----------------|
| 1. Common vinegar preserves my foods.                                                              | 3.20        | 0.70        | Accepted        |
| 2. Common vinegar prolongs the shelf life of my perishable foods.                                  | 3.04        | 0.67        | Accepted        |
| 3. Common vinegar extends the shelf life of my condiments.                                         | 3.32        | 0.62        | Accepted        |
| 4. Common vinegar extends the shelf life of my fish.                                               | 3.32        | 0.47        | Accepted        |
| 5. Common vinegar works effectively in enhances the flavour or taste of my preserved foods.        | 3.40        | 0.64        | Accepted        |
| 6. Common vinegar can be able to removes unwanted smell of my food after the preservation process. | 3.12        | 0.66        | Accepted        |
| 7. Common vinegar can be use in creating pickle foods.                                             | 2.72        | 0.73        | Accepted        |
| <b>Overall</b>                                                                                     | <b>3.15</b> | <b>0.39</b> | <b>Accepted</b> |

**Legend:** 3.26-4.00-Highly Accepted; 2.51-3.25-Accepted; 1.76-2.50-Slightly Accepted; 1.00-1.75-Not Accepted

Table 2 shows the perceptions of the household members in using common vinegar in terms of preservatives. Indicator 5 which states that “Common vinegar works effectively in enhancing the flavor or taste of my preserved foods” with the standard deviation of 0.64 and with an interpretation of “accepted” obtained the highest mean of 3.40. It is related to the website of Brightland (2022) which said that it is by far the most common choice for pickling because it is high in acetic acid, yet it will not change the color of your food. It is also a favorite for things like DIY weed killer and cleaning products. While indicator 7 which states that “Common vinegar can be used in creating pickle foods” obtained the lowest score of 2.72 and having the standard deviation of 0.73 with an interpretation of “accepted”.

Taken as a whole, the perception of the household members in using common vinegar in terms of preservatives has a mean of 3.15 and a standard deviation of 0.39 with an interpretation of “accepted”. Since the overall interpretation on the perceptions of the household members in using coconut water vinegar in terms of preservatives is “accepted”, it can be implied that using of coconut water vinegar is accepted to be use as a preservative and have a big involvement in preserving of foods.

**Table 3. Perceptions of the household members in using Coconut Water Vinegar in terms Seasonings**

| Indicators                                                                                                    | Mean        | SD          | Interpretation  |
|---------------------------------------------------------------------------------------------------------------|-------------|-------------|-----------------|
| 1. Coconut water vinegar gives natural taste to my dishes.                                                    | 3.36        | 0.63        | Accepted        |
| 2. Coconut water vinegar is compatible to any of my dishes.                                                   | 2.88        | 0.72        | Accepted        |
| 3. Coconut water vinegar can be used as an alternative spice.                                                 | 2.92        | 0.49        | Accepted        |
| 4. Coconut water vinegar is a great flavouring in my dishes.                                                  | 3.12        | 0.66        | Accepted        |
| 5. Coconut water vinegar is good for dipping.                                                                 | 3.24        | 0.52        | Accepted        |
| 6. Coconut water vinegar, in terms of marinating, gives more nutrients, and good taste to my dishes or foods. | 2.76        | 0.59        | Accepted        |
| 7. Coconut water can be used as vinegar in creating pickle foods.                                             | 2.72        | 0.84        | Accepted        |
| <b>Overall</b>                                                                                                | <b>2.99</b> | <b>0.39</b> | <b>Accepted</b> |

**Legend:** 3.26-4.00-Highly Accepted; 2.51-3.25-Accepted; 1.76-2.50-Slightly Accepted; 1.00-1.75-Not Accepted

Table 3 shows the perceptions of the household members in using coconut water vinegar as an alternative vinegar in terms of seasonings. Indicator 1 which states that “Coconut water vinegar gives natural taste to my dishes” with the standard deviation of 0.63 and with an interpretation of “accepted” got the highest mean of 3.36. It is related to the (nnc.gov.ph, 2022), said that may use to sweeten salad dressings, marinades, soups, and warm foods. While indicator 7, which states that “Common vinegar can be use in creating pickle foods” got the lowest score of 2.72 and having the standard deviation of 0.84 with an interpretation of “slightly accepted”.

Taken as a whole, the perception of the household members in using common vinegar in terms of seasonings has a mean of 2.99 and a standard deviation of 0.39 with an interpretation of “accepted”. Since the overall interpretation on the perceptions of the household members in using coconut water vinegar in terms of seasonings is “accepted”, it can be implied that using of coconut water vinegar can be accepted to be use as a seasoning and have a big involvement in using it as a seasoning in food preparations.

**Table 4. Perceptions of the household members in using Coconut Water Vinegar in terms Food Preservatives**

| Indicators                                                                                                | Mean        | SD          | Interpretation  |
|-----------------------------------------------------------------------------------------------------------|-------------|-------------|-----------------|
| 1. Coconut water vinegar preserves my foods.                                                              | 2.96        | 0.61        | Accepted        |
| 2. Coconut water vinegar prolongs the shelf life of my perishable foods.                                  | 2.76        | 0.66        | Accepted        |
| 3. Coconut water vinegar extends the shelf life of my condiments.                                         | 3.00        | 0.64        | Accepted        |
| 4. Coconut water vinegar extends the shelf life of my fish.                                               | 3.04        | 0.35        | Accepted        |
| 5. Coconut water vinegar works effectively in enhances the flavour or taste of my preserved foods.        | 3.12        | 0.52        | Accepted        |
| 6. Coconut water vinegar can be able to removes unwanted smell of my food after the preservation process. | 3.12        | 0.60        | Accepted        |
| 7. Coconut water vinegar can be use in creating pickle foods.                                             | 2.60        | 0.70        | Accepted        |
| <b>Overall</b>                                                                                            | <b>2.94</b> | <b>0.34</b> | <b>Accepted</b> |

**Legend:** 3.26-4.00-Highly Accepted; 2.51-3.25-Accepted; 1.76-2.50-Slightly Accepted; 1.00-1.75-Not Accepted

Table 4 shows the perceptions of the household members in using coconut water vinegar as an alternative vinegar in terms of preservatives. Both, Indicator 5 which states that “Coconut water vinegar works effectively in enhances the flavor or taste of my preserved foods” with the standard deviation of 0.52 and with an interpretation of “accepted”; and indicator 6 which states that “Coconut water vinegar can be able to removes

unwanted smell of my food after the preservation process” with the standard deviation of 0.60 and with an interpretation of “accepted” got the highest score of 3.12. While indicator 7, which states “Coconut water vinegar can be used in creating pickle foods” got the lowest score of 2.60 and having the standard deviation of 0.70 with an interpretation of “accepted”.

Taken as a whole, the perception of the household members in using common vinegar in terms of preservatives has a mean of 2.94 and a standard deviation of 0.34 with an interpretation of “accepted”. Since the overall interpretation on the perceptions of the household members in using coconut water vinegar in terms of preservatives is “accepted”, it can be implied that using of coconut water vinegar can be accepted to be use as a preservative and have a big involvement in preserving of foods.

**Table 5. Perceptions of the household members on how efficient is common vinegar as a Condiments**

| Indicators                                                              | Mean        | SD          | Interpretation  |
|-------------------------------------------------------------------------|-------------|-------------|-----------------|
| 1. I save money in using common vinegar.                                | 3.16        | 0.68        | Accepted        |
| 2. I can create common vinegar easily.                                  | 1.88        | 0.78        | Accepted        |
| 3. I can find the ingredients of common vinegar in the public market.   | 2.60        | 0.95        | Accepted        |
| 4. I can find and buy the common vinegar in the public market.          | 3.24        | 0.66        | Accepted        |
| 5. I can say that common vinegar is a delicious vinegar.                | 3.12        | 0.72        | Accepted        |
| 6. I can say that common vinegar has many beneficial effects.           | 2.80        | 0.70        | Accepted        |
| 7. I can say that common vinegar has many uses in my food preparations. | 3.16        | 0.62        | Accepted        |
| <b>Overall</b>                                                          | <b>2.85</b> | <b>0.42</b> | <b>Accepted</b> |

**Legend:** 3.26-4.00-Highly Accepted; 2.51-3.25-Accepted; 1.76-2.50-Slightly Accepted; 1.00-1.75-Not Accepted

Table 5 shows the perceptions of the household members in using common vinegar as a condiment. Indicator 4 which states that “I can find and buy the common vinegar in the public market” with the standard deviation of 0.72 and with an interpretation of “accepted” obtained the highest mean of 3.24. Global vinegar market is being driven by a rising demand within the food business similarly as increasing application within the potable, healthcare, cleaning, agricultural and industrial sectors (alliedmarketresearch, 2023). It’s conjointly finding uses as a preservative and fixings agent. While indicator 7 which states that “I can create common vinegar easily” obtained the lowest score of 1.88 and having the standard deviation of 0.78 with an interpretation of “accepted”.

Taken as a whole, the perception of the household members in using common vinegar as a condiment has a mean of 2.85 and a standard deviation of 0.42 with an interpretation of “accepted”. Since the overall interpretation on the perceptions of the household members in using common vinegar as a condiment is “accepted”, it can be implied that using of coconut water vinegar can be accepted to be use as a condiment and have a big involvement in preparation of foods.

**Table 6. Perceptions of the household members on how efficient coconut water vinegar as a condiment.**

| Indicators                                                                     | Mean        | SD          | Interpretation |
|--------------------------------------------------------------------------------|-------------|-------------|----------------|
| 1. I save money in using coconut water vinegar.                                | 2.88        | 0.78        | Agree          |
| 2. I can create coconut water vinegar easily.                                  | 2.64        | 0.75        | Agree          |
| 3. I can find the ingredients of coconut water vinegar in public market.       | 2.96        | 0.45        | Agree          |
| 4. I can find and buy the coconut water vinegar in the public market.          | 3.12        | 0.52        | Agree          |
| 5. I can say that coconut water vinegar is a delicious vinegar.                | 2.88        | 0.72        | Agree          |
| 6. I can say that coconut water vinegar has many beneficial effects.           | 2.80        | 0.70        | Agree          |
| 7. I can say that coconut water vinegar has many uses in my food preparations. | 3.20        | 0.64        | Agree          |
| <b>Overall</b>                                                                 | <b>2.92</b> | <b>0.28</b> | <b>Agree</b>   |

**Legend:** 3.26-4.00-Highly Accepted; 2.51-3.25-Accepted; 1.76-2.50-Slightly Accepted; 1.00-1.75-Not Accepted

Table 6 shows the perceptions of the household members in using coconut water vinegar as a condiment. Indicator 7 which states that “I can say that coconut water vinegar have many uses in my food preparations” with the standard deviation of 0.64 and with an interpretation of “accepted” got the highest mean of 3.20. Coconut vinegar is murky and white in appearance, with a milder flavor than apple cider vinegar (nnc.gov.ph, 2022). It may be used to sweeten salad dressings, marinades, soups, and warm foods. While indicator 2 which states that “I can create coconut water vinegar easily” got the lowest score of 2.64 and having the standard deviation of 0.75 with an interpretation of “accepted”.

Taken as a whole, the perception of the household members in using coconut water vinegar as a condiment has a mean of 2.92 and a standard deviation of 0.28 with an interpretation of “accepted”. Since the overall interpretation on the perceptions of the household members in using coconut water vinegar as a condiment is “accepted”, it can be implied that using of coconut water vinegar can be accepted to be use as a condiment and have a big involvement in preparation of foods.

**Table 7. Test of Difference between household perceptions in common vinegar and coconut water vinegar in terms of Seasonings**

| <b>Independent Samples Test</b> |                         |                       |      |                              |    |                 |                 |                                           |       |       |
|---------------------------------|-------------------------|-----------------------|------|------------------------------|----|-----------------|-----------------|-------------------------------------------|-------|-------|
|                                 |                         | Equality of Variances |      | t-test for Equality of Means |    |                 |                 |                                           |       |       |
|                                 |                         |                       |      |                              |    |                 |                 | 95% Confidence Interval of the Difference |       |       |
|                                 |                         | F                     | Sig. | t                            | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference                     | Lower | Upper |
| <b>Seasonings</b>               | Equal variances assumed | 1.29                  | .261 | -.710                        | 48 | .481            | -.086           | .122                                      | -.331 | .158  |

**Legend:**  $p < 0.05$  – significant;  $p > 0.05$ -Not Significant

Table 7 shows the test of difference between the household perceptions in common vinegar and coconut water vinegar in terms of seasonings. It is shown here that the results of the data that have gathered from the perceptions of the respondents have no significant difference with a p-value of 0.481 in terms of seasonings. Through the given table, it reveals that both vinegars have a little different characteristic to each other that makes them significantly different. Shariat (2023) said that coconut vinegar has a pleasant, natural taste and is the perfect alternative to apple cider vinegar. It can be used for so many different meals like in salad dressings, in sauces or in marinades that give a little extra kick.

**Table 8. Test of Difference between household perceptions in common vinegar and coconut water vinegar in terms of Food Preservatives**

| <b>Independent Samples Test</b> |                         |                       |      |                              |    |                 |                 |                       |                                           |        |
|---------------------------------|-------------------------|-----------------------|------|------------------------------|----|-----------------|-----------------|-----------------------|-------------------------------------------|--------|
|                                 |                         | Equality of Variances |      | t-test for Equality of Means |    |                 |                 |                       |                                           |        |
|                                 |                         |                       |      |                              |    | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |        |
|                                 |                         | F                     | Sig. | t                            | df |                 |                 |                       | Lower                                     | Upper  |
| Food Preservatives              | Equal variances assumed | 1.234                 | .272 | 2.051                        | 48 | .046            | -.21720         | .10587                | -.43007                                   | .00433 |

**Legend:**  $p < 0.05$  – significant;  $p > 0.05$  – Not Significant

Table 8 shows the test of difference between household perceptions in common vinegar and coconut water vinegar in terms of preservatives. It shows here that the results of the data that have gathered from the perceptions of the respondents have a significant difference with the p-value of 0.046 in terms of preservatives. Through the given table, it reveals that both vinegars have a little different characteristic to each other that makes them significantly different. The result of this study is related to the website that stated coconut vinegar is preserving food without any nasty synthetic additives and preservatives (company, 2019).

## 5. Conclusion

The main purpose this study is to know the efficiency of using coconut water as an alternative vinegar. The findings of this study shows that there is no significant difference between the coconut water vinegar and common vinegar in terms of seasonings with the p-value of 0.481 but it is noticeable that their mean is not that far from each other. This means that coconut water vinegar can also be substituted to a common vinegar. On the other hand, there is a significant difference in terms of food preservatives with a p-value of 0.046. Thus, coconut water vinegar is efficient to be used in household.

The result of this study recommends that manufacturers should pay more attention in improving the quality of their vinegar. Additionally, they should use white sugar in making a coconut water vinegar and add more weeks or months of fermentation to increase more the acidity it will contain, and they should encourage their customers to buy their product. It is also recommend changing the coconut water vinegar bottle into attractive packaging. To the copra industries, they should give an attention in making coconut water vinegar that will help them to have another income to support their families and revitalize the coconut industry. Additionally, they can also help to lessen the number of coconut water that is being wasted and resulting to soil contamination, groundwater leaching problems and emission of bad odours. While to the coconut farmers, this

study recommends continuing the farming of coconuts to improve the livelihoods of the coconut farmers who abandoning their farms. By preserving and promoting coconut water vinegar it will helps them to increased revenue from the coconut water vinegar and will allow the coconut farmers to support their families. While for the costumers, they should try to buy and use coconut water vinegar in their food preparations in order them to taste and its goods effects and taste. To the other institutions or other product manufacturers, it is recommended to add the coconut water vinegar to their other product ingredients, or they can sell it to the market to help the coconut water vinegar to grow and be known. And lastly, for the future researchers, they should do the experiment for remedies in order them to see the effects and results of using coconut water vinegar. This study may serve as a reference and will help the future researchers in conducting a new study and this study will help them to develop their future research.

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