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Edibility Assessment of Homemade Mayonnaise from Avocado Pear Oil and Guinea Fowl Egg as Emulsifier

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Abstract

This study evaluated the edibility assessment of homemade mayonnaise from avocado pear oil and guinea fowl egg as emulsifier. The appearance, aroma, texture, taste, mouth feel and acceptability of the homemade mayonnaise were examined by 20 panelists selected randomly among students of Department of Home Economics. The percent of oil yield of 25.20% was from avocado pear through the hot press extraction process. The value obtained was lower than the value (34.09%) obtained from African pear pulp oil via Soxhlet extraction method with n-hexane solvent. Quality attributes of the mayonnaise were scored with the aid of a 9-point Hedonic scale. The sensory result showed a good and appealing appearance to the panelist, having a range of scores 5 – 9, with a higher rating when compared to commercial mayonnaise. The findings of the sensory evaluation indicated that the homemade mayonnaise was highly favored by the public and appropriate for people with diabetes.

Keywords: *Mayonnaise, Homemade, Avocado pear, Emulsifier, Extraction*

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Background to the Study

Mayonnaise is one of the most traditional and widely used condiments in the culinary world, it is made by carefully combining egg yolk, vinegar, oil, salt, and spices (particularly mustard) to preserve a dense foam of oil droplets (Zaouadi *et al.,* 2015). Dietary mayonnaise has oil in water as an emulsion ingredient. 60–80% of mayonnaise's content is made of fat. It may also contain optional ingredients like sugar, cholesterol, and salt (Saget *et al.,* 2021). Mayonnaise is a significant source of protein and is necessary in diets to support development, reproduction, and overall health. With the addition of eggs and vegetable oil, it also contains vitamins A, E, D, and K. (Al-Aubadi, 2021). Its ability to resist microorganisms is as a result of low pH and high fat content (Fenandesa and Salas-Mellado, 2018). The amount of oil and eggs added during the making of mayonnaise affects not only the preparation technique used with other additives, but also the texture and viscosity of the final emulsion (Al-Aubadi, 2021).

Eggs are a popular choice for emulsifying mayonnaise, because of their ideal emulsifying qualities for mayonnaise production. Egg yolk works as necessary supplement in emulsion stabilization and sensory enhancing (Swaran *et al.,* 2003). In commercial and homemade mayonnaise production, eggs are a common recipe used as emulsifier. Because of their high nutritional content and many uses, such as flavor, emulsification, coagulation, and foaming, eggs are regarded as a high-profile ingredient. Egg yolk serves as the emulsifier, water serves as the continuous phase, and oil serves as the dispersed phase in the formulation of mayonnaise (Movahhed *et al.,* 2020).

The guinea-fowl species is distinguished by its intense egg-laying behavior. (Ivanova *et al.*, 2020). Ranging from 70 to 220 eggs, guinea fowl egg production varies widely depending on the breeding level and rearing system (Arabi, 2013). The eggs from guinea fowl are high in protein, fat, calcium and sodium with high proportion of sodium, potassium and iron. The egg is advised for newborns and young children to support healthy growth and bone formation (Oluwafemi and Udeh, 2016).

Phospholipids and high- and low-density lipoproteins (LDL and LDL) are primarily responsible for the emulsifying properties of egg yolks. It is crucial to understand the rheological characteristics of these food materials in order to ensure good control of quality in production of the mayonnaise with a specific viscosity and consistency, storage and transportation of the mayonnaise to the required destination (Primacella *et al.,* 2019).

This kind of oil/water emulsion is made possible in large part by edible vegetable oil, which is the primary ingredient in mayonnaise and which specifically influences taste, appearance, texture, and oxidative stability. The yield strength, storage strategy, loss modulus, and rheological characteristics (properties) of mayonnaise are all significantly impacted by its oil content. The rheological characteristics and stability of the mayonnaise produced by high pressure homogenization and rotor-stator homogenization are influenced by the oil content (Alvarez-Sabatel *et al.,* 2018).

Avocado oil is beneficial to human health, particularly in preventing various cardiovascular diseases owing to its richness in omega fatty acids. Using avocado oil in food for humans is thought to be a good idea. Nonetheless, because avocado oil has regenerative epidermal potential, a tiny amount of it is utilized in its raw form; mostly the unsaponifiable fraction, by the cosmetics and pharmaceutical industries (Schaffer *et al.,* 2013). The amount of oil in the mesocarp of avocado fruit is used as a maturity index, indicating both the firmness and quality of the fruit. (Galvao *et al.,* 2014). It is devoid of cholesterol and rich in naturally occurring antioxidants like vitamin E and phytosterols, as well as non-essential unsaturated omega 3, 6, and 9 fatty acids that reduce blood cholesterol levels. (Rodríguez-Carpena *et al.,* 2012).

Some people believe that handmade products represent the maker's passion for both the product and the process of manufacturing (Fuchs *et al.,* 2015). They tend to appreciate and accept the product because it was created and handled by someone who is passionate about it. Additionally, the product bears the producer's face or personality thanks to the handmade label. (Johnston and Baumann, 2007). It's possible that the product embodies the maker's unique style of production. (Kreuzbauer *et al.,* 2015). This study aims at producing edible mayonnaise using avocado pear oil and guinea fowl egg as emulsifiers at optimal concentration.

Objectives of the Study

The general purpose of the study is to edibility assessment of homemade mayonnaise from avocado pear oil and guinea fowl egg as emulsifier. This study aims to:
Evaluate the edibility of homemade mayonnaise from avocado pear oil.

Literature Review

Mayonnaise is an oil in water emulsion and egg components are its emulsifier. Egg contributes to the emulsification, stabilization, flavour and color of mayonnaise. Egg possesses high nutritional value and is comprised of 75% water, 12.5% protein, 12% fat, and a small proportion of carbohydrate (Guerin *et al.,* 2003). Huang *et al.,* (2016) characterized the differences between mayonnaises containing fresh and frozen egg yolks. They reported that the frozen egg yolk decreased the products thermal stability. Also, the gelation transition temperature, an indicator of change from elastic to viscose structure, decreased due to denaturation and transformation of hydrophobic sites inside the egg yolk proteins.

Generally, some polysaccharides (e.g., starch) in their natural state have some disadvantages such as weak acidic condition tolerance, temperature intolerance and high shear sensitivity, therefore, using chemically or physically modified forms of them is inevitable (Sikora *et al.,* 2008). High fat mayonnaise (70% w/w oil) formulated with modified starch as stabilizer possessed the highest coordination number (z), means existence of high level of interaction, compared with additive-free mayonnaise samples. The authors mentioned that addition of starch in formulation was the determining factor (Laca *et al.,* 2010).

Sun *et al.,* (2018) used MWP-pectin complex to produce low-fat mayonnaise; this partially suppressed the viscoelasticity reduction (substitution of fat up to 40% was acceptable). The

decrease of fat up to 20%, 40%, 60%, and 80% reduced the caloric values up to 17.6%, 35.4%, 53.1%, and 71.4%, respectively. The full-fat mimetic product showed the lowest value of calorie (%0 oil, 83.52 kcal/100 g) with nearly 90.0% decrease at the caloric value. Sensory evaluations, like-wise, demonstrated that MWP-pectin complexes have the merit to replace 40% of lipid in order to make a low-fat mayonnaise with the color, texture, appearance, odor, and taste similar to full-fat mayonnaise, but containing lower calorie.

In another study, Mun *et al.,* (2009) showed that the mayonnaise lipid can be moderately substituted (50%) by the 4-glucanotransfer-ase (4GTase)-treated starch blended with xanthan gum. The results indicated that 4GTase could modify the polymers of starch and produce thermo-reversible gels through decreasing the amylose structure as well as modifying the amylopectin side chains. Sørensen, *et al.,* (2010) acclaimed that the type of emulsifier is another substantial factor in mayonnaise oxidation. They investigated the stability of mayonnaise enriched with fish oil (40% oil) against oxidation as well as the influence of egg yolk and milk protein-based emulsifier. In the mayonnaise recipe, egg yolk is the most vital part for the stability of the emulation (Nikzade *et al.,* 2012). Egg yolk has wonderful quality for forming the mayonnaise emulsion and for preventing the flocculation to form an appropriate texture (Depree and Savage, 2001). Furthermore, the high emulsifying potential of egg yolk is related to the LDL (low-density lipoprotein), HDL (high-density lipoprotein), phospholipids, and non-bonded proteins (phosvitin and livetin) (Laca *et al.,* 2010; Moros *et al.,* 2002).

Materials and Method

Research Design

Experimental research design was adopted in order to achieve the objective of the study. The survey research method involves the collection of information through survey questions (Check and Schutt, 2012). The design was considered suitable since this study solicited information from respondent.

Study Area

The experiment was undertaken in the Department of Home Economics, College of Applied Food Sciences and Tourism, Michael Okpara University of Agriculture, Umudike, Abia State. Michael Okpara University of Agriculture, Umudike (MOUAU) is located Abia State along the Umuahia – Ikot Ekpene road which is ten (10) kilometers from the capital city of Abia State - Umuahia

Materials

The avocado pear oil and guinea fowl eggs used for the study was purchased from my mini backyard farm and Ubani Market in Umuahia metropolis respectively. Other materials such as salt, sugar, lime, was also purchased from markets within Abia State, Nigeria. The materials were scrutinized to ensure that they are in good form and quality. They were collected in plastic containers and preserved at room temperature. The instrument required for the production of the homemade mayonnaise include; blender for homogenous mixing of the mayonnaise ingredients, air tight plastic containers for storing the homemade mayonnaise for further analysis. The production process was carried out in the food laboratory of the

Department of Home Economics at the College of Applied Food Science and Tourism, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

Sample Preparation

The homemade mayonnaise sample was processed using the method described by Ghulam *et al.,* (2013). The recipe utilized for the production process is presented in Table 2.1. The process was carried out with the mixture of salt and sugar. Lime was added to the mixture and stirred for homogeneity for about 2 minutes. Vegetable oil was added gently to the mixture with continuous stirring for an additional 5 minutes. The mayonnaise formed were placed in air-tight plastic containers and stored in a refrigerator (4-8°C) before analysis.

Table 1: Recipe for the Homemade Mayonnaise

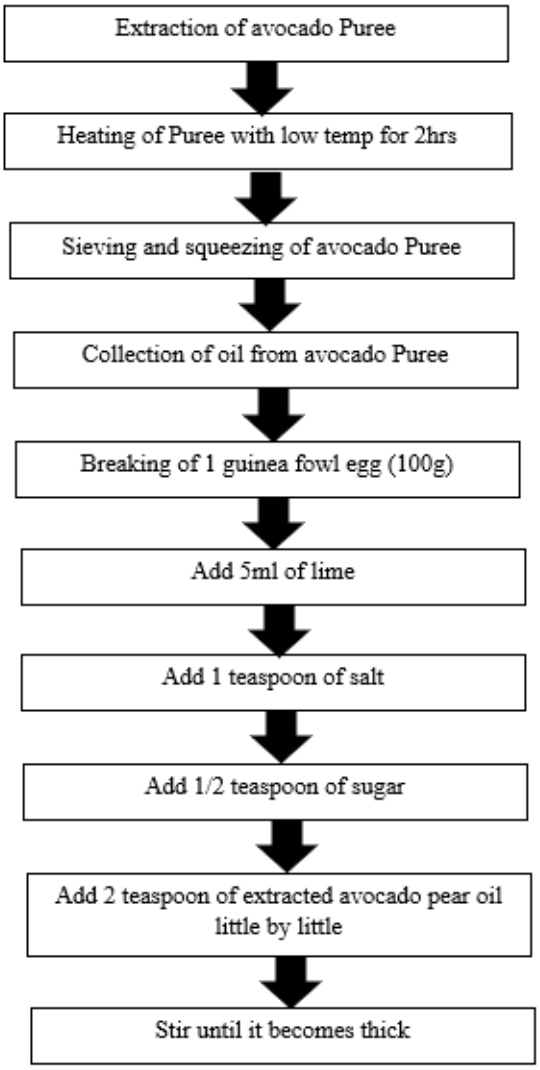
Ingredients	Value (g)
Avocado oil	70
Guinea fowl egg	5
Salt	2
Sugar	1.5
Lime	11
Water	3.5

Sensory Analysis

The sensory method described by Iwe (2014), was used in evaluation of the sensory qualities of the mayonnaise. The appearance, aroma, texture, taste, mouth feel and general acceptability of the homemade mayonnaise were examined by 20 panelists selected randomly among the students of Department of Home Science, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. The semi-trained panelists were instructed on the evaluation method to measure the sensory attributes of the homemade mayonnaise prior to the exercise. The samples were presented labeled with appropriate codes based on the recipe used for the production. Portable water was used by the panelist in rinsing out their mouths after tasting each sample in order not to avoid the interference of one sample taste against another.

Quality attributes of the mayonnaise were scored with the aid of a 9-point Hedonic scale. The degree of likeness using the point Hedonic scale was expressed in the following way: like extremely (9), like very much (8), like moderately (7), like slightly (6), neither like nor dislike (5), dislike slightly (4), dislike moderately (3), dislike very much (2), dislike extremely (1). Like extremely to like slightly constitute good while dislike slightly to dislike extremely constitutes poor. The point for neither like nor dislike shows that the mayonnaise was neither good nor bad.

Figure 1: Preparation of Homemade Mayonnaise Flowchart



Results and Discussion

Avocado Pear Oil Yield

The percent of oil yield which was extracted from avocado pear oil through the hot press extraction is 25.20%. The value obtained was lower than the value (34.09%) obtained from African pear pulp oil via Soxhlet extraction method with n-hexane solvent by Onwuzuruike *et al.,* (2020). However, the value was greater than the report of Arrisson *et al.,* (2019) (18.28%) for the extraction of oil from African pear pulp using solvent extraction method with petroleum ether as solvent. The high value could be as a result of the traditional extraction process used. Soxhlet extraction technique could provide better oil yield than hot water (traditional) and hot press extraction methods that have been studied (Onwuzuruike *et al.,* 2022). Furthermore, the milling of the seed oil prior to the extraction process tends to increase the surface area of the seed, thereby allowing better penetration of the solvent for adequate oil

leaching. Also increase in the extraction temperature and time during Soxhlet extraction process allows the dissolution of the fat globules of the oil which improves extraction process (Onwuzuruike *et al.,* 2022).

Sensory Evaluation

Evaluation of the sensory attributes has a vital function in determining customer acceptability of food product (Hari *et al.,* 2021). The result showed a good and appealing appearance to the panelist for the product, having a range of scores 5 – 9, with a higher rating when compared to the purchased mayonnaise. The appearance of a product is one of the basic organoleptic characteristics of the product. Consumers evaluate products first with their eyes thereby predicting the quality via its appearance before making a purchase, making appearance a crucial sensory attribute of any food product as it affects acceptability (Patrícia *et al.,* 2020).

Taste is the sensation of flavour perceived in the mouth and throat on contact with a substance. It is also a property that consumers look out for in mayonnaise (Onwuzuruike *et al.,* 2022). The taste score for the produced mayonnaise ranged from 4 – 9 (dislike slightly – like extremely), with most of the panelist preferring the conventional mayonnaise to the produced one on the taste bases, this being due to the fact that people prefer sweet taste foods to tasteless ones. The low score indicated that the taste of the blend of both oils seemed strange and unfamiliar to the panelist taste buds (Laura *et al.,* 2018) which suggests that the product could serve more and be used for diabetic patients. The texture score ranged from 4 – 9, with one person having a very of the product. The texture recounts the thickness or viscosity of the liquid or semi-solid product. It is also a quality that consumers' watch out for in mayonnaise, as they would desire a mayonnaise product with no lumps, uniformly consistent and has good flowing ability (Onwuzuruike *et al.,* 2022). The increasing viscosity of the mayonnaise samples produced from the oil blends may have negatively influenced the consistency scores. High score of the texture could be as a result of the lighter viscosity that was preferred by the panelist. The general acceptability score ranged from 4 – 9 with most of the panelist having a rating of the texture from 7 – 9 (like moderately – like extremely), the high score could be attributed to the initial high records for all the other sensory parameters, particularly appearance and taste. This view was in line with the reports of Ojinnaka and Nnorom (2015), who stated that although a food's appearance elicits an initial response, its taste ultimately determines whether it is accepted or rejected.

Conclusion

Homemade mayonnaise is made with fresher ingredients like egg yolk and freshly squeezed lemon juice, it has a stronger flavor than store-bought varieties. The ingredients used in the production of homemade mayonnaise has a unique role, and the increase or decrease of this ingredient will cause the alteration in texture and sensory attributes of the product. Furthermore, homemade mayonnaise has a creamy, velvety texture rather than a squelchy, gelatinous one because it contains neither stabilizers nor preservatives. It can also be made with healthier oils, reducing saturated fat content. The results of the panelists' sensory evaluation (appearance, texture, taste, and overall acceptability) revealed that the homemade mayonnaise was highly favored by the public and appropriate for people with diabetes.

Mayonnaise made at home allows individual control of ingredient freshness, ensuring a better taste and texture. Making homemade mayonnaise can be more cost-effective than purchasing store-bought mayonnaise, especially for large families, and providing a convenient condiment for frequent users.

Recommendation

Specific recommendations for this research work include;

1. A more efficient extraction method should be adopted in the extraction of plant oil to enable more efficient extraction process and better yield of oil.
2. Avocado pear oil and guinea fowl egg should be utilized as an important ingredient and dietary source for food products like mayonnaise for family consumption.

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