

Production and Sensory Evaluation of Cookies from a Combination of Wheat and Almond Fruit Seed

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Abstract

The study investigated the production and sensory evaluation of cookies from a combination of wheat and almond fruit seed. The study adopted experimental design method. The sensory characteristics, colour, texture, taste, aroma, mouth feel and general acceptability were analyzed. Twenty (20) panelists were used to determine the sensory characteristics of the samples which consisted of wheat and almond flour blends. Data from the study on sensory evaluation were subjected to analysis of variance (ANOVA), the means were separated by Duncan's Multiple Range Test. Significance was accepted at $p < 0.05$. Results showed that there were no significant differences at ($P < 0.05$) in texture, aroma, taste and mouth feel of all the samples. The control sample CWF2 (100% wheat flour) which was rated highest in terms of colour (6.45 ± 1.19) differed significantly from the rest of the other samples. Results also indicated that the highest score (5.95 ± 1.23) in terms of general acceptability was recorded for sample CWA5 (70% wheat flour: 30% almond seed flour). However, the scores differed significantly from ($P < 0.05$) the scores of other samples. Therefore, almond seed flour used in combination with wheat flour possess good sensory qualities that can help reduce over dependence on wheat flour in cookies production.

Keywords: *Production, Evaluation, Cookies, Wheat, Almond seed.*

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Background to the Study

The use of vegetable proteins, especially from underutilized or neglected seeds, oil seeds and legumes, as enrichment for ready-to-eat snack foods has been identified as a viable alternative for raising the nutritional level of teeming millions in different parts of the world. This is due to widespread shortage of animal proteins and malnutrition occasioned by a high population growth rate and poverty (Enuyingha and Ayodele-Oni, 2003; Jahanban, Achinewhu, and Ibaakee, 2009; Adeniji, 2007).

Almond (*Prunus amygdalus L.*) fruit characteristics have been documented by Etienne (2017). The peach-like edible almonds fruit (*Prunus amygdalus*) have three distinct parts: the inner kernel or meat, the middle shell portion, and an outer green shell cover or hull. Almond varieties vary in shell texture; therefore, they are termed hard or soft shelled. The harvesting procedure starts when the almonds are partly dried on the trees (Etienne, 2017). In addition, the sweet almond is a stone fruit which have several unique features. It is commercially cultivated where there are long, hot, and Mediterranean like summers, such as those in Spain, Morocco, Armenia, Iran, Italy, California (USA), and Australia.

An almond fruit is unique. This is owing to the fact that unlike others in its botanical family (such as peach, apricot and plum) where the flesh (mesocarp) of the fruit is eaten and the seed within its shell, or stone (endocarp) is discarded, the reverse is true for the almond early in its maturation cycle, for a period of a few weeks, the entire fruit (seed, endocarp and mesocarp) can be, and is, eaten, in several parts of the world. The hull splits open as the maturation cycle continues. When dry, it may be readily separated from the shell. The almond pit, containing a kernel or edible seed, is the nut of commerce, the endocarp (shell), and mesocarp are separated for low value uses, such as cat litter and animal feed (Rabinowitz, 2002; Rabinowitz, 2004). Shelled almonds may be sold as whole natural almonds or processed into various almond forms. The whole natural almonds have their shells removed but still retain their brown skins; blanched whole almonds have both their shells and skins removed. Usually, the removed skins are discarded (Chen *et al.*, 2005; Lapsley *et al.*, 2002; Rosen *et al.*, 2002).

Almond seeds are valued for their sweet taste and crunchy texture. The Almond Board of California (ABC) report the majority (50%) of consumed almond seeds are used as an ingredient in manufactured goods such as candy, cereal, ice cream and cookies. The remainder are purchased as snacks, used in-home baking and cooking (25%) or consumed at the food service level (25%) (Almond Board of California, 2012). Almond seeds are a common ingredient in cookies such as macarons, ice cream, butters, snacks (mixed nuts, roasted and/or salted) and as a topping for desserts, salads, and vegetables.

Almond seeds contain approximately 51% lipid, 21% protein, 20% carbohydrate and 12% fiber (USDA, 2007). The majority of lipids are monounsaturated (67%) and polyunsaturated (25%) fatty acids (MUFA and PUFA, respectively) (USDA, 2007). Previous studies indicate the MUFAs from almond seeds may reduce total cholesterol and low-density lipoproteins (LDL, “bad cholesterol”) while maintaining healthy high-density lipoproteins (HDL, “good cholesterol”) levels (Jenkins *et al.*, 2002; Hyson *et al.*, 2002; Sabate *et al.*, 2003; Griel and Kris-Etherton, 2006).

Almond seeds are good sources of proteins, phosphorus, calcium, potassium, magnesium, manganese, copper, zinc, and iron (USDA, 2007; Akpabio, 2012; Akpakpan and Akpabio, 2012). Epidemiological studies have been remarkably consistent in showing an association between nut consumption and a reduced risk of cardiovascular disease (Sabate' and Ang, 2009). Almond seeds are rich in nutrients; therefore, this research determined the production and sensory evaluation of cookies made from a combination of wheat and almond fruit seed. This is a measure towards reducing over dependence on imported wheat flour for producing confectionaries.

Objectives of the Study

The study investigated the production and sensory evaluation of cookies made from a combination of wheat and almond fruit seed flours. Specifically, the study

- i. Produced almond seed flour.
- ii. Formulated composite flour mixtures using various ratios of combinations of wheat and almond fruit seed.
- iii. Produced cookies from the composite flour mixtures.
- iv. Determined the sensory properties of the cookies.
- v. Evaluated the general acceptability of the cookies.

Materials and Methods

Design of the Study

Experimental research design was used for this study.

Sample Collection

The almond fruit seeds were collected from Michael Okpara University of Agriculture Umudike, Abia State and National Root Crop Research Institute Umudike, Abia State.

Sample Preparation

Preparation of almond fruit seed flour

The dried fruits were cracked using a nut cracker. The seeds extracted were sun dried for 4-6 days, milled into flour and sieved and stored in polythene bags till use.

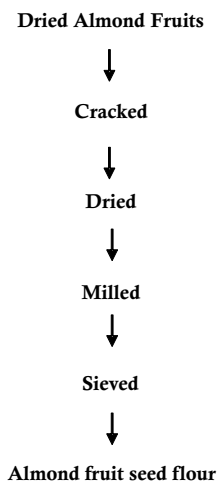


Figure 1: Flow diagram from the processing of dried almond fruit seed to flour.

Preparation of Flour Blends

Proportions of the flour blends or composites used for the production of the baked samples

Table 1: Sample proportion of flour blends

Sample 101	Sample 102	Sample 103	Sample 104
70% - 30%	50% - 50%	70% - 30%	100%
Almond fruit flour – wheat flour	Almond fruit flour – wheat flour	Wheat flour– Almond fruit flour	Wheat flour

Preparation of Baked Sample

Cookies Production

The cookies samples were produced with various proportions of the composites flours.

Sample Recipe

Flour	100g
Margarine	30g
Sugar	25g
Bicarbonate of soda	2.5g
Water	1/8cup
Egg	1
Milk	1tsp

Method

1. Put the flour, sugar, milk and bicarbonate of soda into a mixing bowl.
2. Rub in the margarine into the ingredients in the bowl until the mixture resembles breadcrumbs. Whisk the egg and add to the mixture.

3. Roll on the board and ct into desired shape.
4. Place on a greased baking sheet.
5. Bake for 20 minutes at 175°C or until attractively brown.

Sensory Evaluation

The texture, flavor (aroma), taste, colour and general acceptability were evaluated by twenty undergraduates of Michael Okpara University of Agriculture, Umudike, Abia State who served as panelists. The panelists rated their preferences for each attribute using the 7- point Hedonic scale.

Statistical Analysis

Data from the study on sensory evaluation were subjected to analysis of variance (ANOVA), the means were separated by Duncan's Multiple Range Test (SPSS version 20). Significance was accepted at $p < 0.05$.

Result and Discussion

Table 2: Sensory Characteristics of the Cookies

Cookies sample	Color	Texture	Taste	Aroma	Mouth feel	General Acceptability
CAF1	4.80 ^b ±1.70	5.05 ^a ±1.61	4.80 ^a ±1.58	4.65 ^a ±1.66	4.80 ^a ±1.77	5.35 ^{ab} ±1.27
CWF2	6.45 ^a ±1.19	5.90 ^a ±1.07	5.60 ^a ±1.47	5.55 ^a ±1.32	5.55 ^a ±1.54	5.70 ^{ab} ±1.03
CAW3	5.10 ^b ±1.45	5.15 ^a ±1.46	5.40 ^a ±1.60	5.00 ^a ±1.65	5.30 ^a ±1.59	5.30 ^{ab} ±1.34
CWA4	5.15 ^b ±1.46	5.05 ^a ±1.57	4.85 ^a ±1.72	4.95 ^a ±1.43	4.80 ^a ±1.67	4.85 ^b ±1.50
CWA5	5.60 ^{ab} ±1.31	5.55 ^a ±1.54	5.55 ^a ±1.39	5.60 ^a ±1.47	5.30 ^a ±1.56	5.95 ^a ±1.23

Values are means ± standard deviation of the responses of 20 panelists. ^{a-b} means with same superscripts in the same column are not significantly different.

Key:

CWA5 = 70:30 wheat flour : almond seed flour

CAW3 = 50:50 wheat flour : almond seed flour

CWA4 = 30:70 wheat flour : almond seed flour

CWF2 = 100 wheat flour

CAF1 = 100 almond seed flour

Table 2 revealed sensory characteristics of the cookies, Result showed that there were no significant differences at ($P < 0.05$) in texture, aroma, taste and mouth feel of all the samples. The control sample CWF2 (100% wheat flour) which was rated highest in terms of colour (6.45±1.19) differed significantly from the rest of the other samples. Comparable values in terms of colour were recorded for samples CAF1 (4.80±1.70), CAW3 (5.10±1.45 and CWA4 (5.15±1.46). Also, CWA5 (5.60±1.31) differed significantly from the other samples of cookies in terms of colour.

Results also indicated that the highest score (5.95 ± 1.23) in terms of general acceptability was recorded for sample CWA5 (70% wheat flour : 30% almond seed flour). However, the scores differed significantly from ($P < 0.05$) the scores of other samples. The least score for general acceptability was obtained in sample CWA4 (4.85 ± 1.50) (30% wheat flour: 70% almond seed flour) and differed significantly from the other samples. Comparable values were recorded for samples CAF1 (5.35 ± 1.27), CWF2 (5.70 ± 1.03) and CAW3 (5.30 ± 1.34) in general acceptability of the cookies. Research results indicated that enriched cookies with almond seed flour have been more generally accepted than the cookies prepared with wheat flour, The findings of this study confirms the work of Yao *et al* (2014) and Esteller *et al* (2004).

Conclusion

The study demonstrated the potentials of almond seed and wheat flours in the production of cookies. Research result indicated that blending wheat flour with almond seed flour CWA5 (70% wheat flour: 30% almond seed flour) enriched the cookies and were highly acceptable (in terms of taste, aroma and mouth feel of the cookies samples) compared to 100% almond seed flour cookies. Therefore, almond seed flourished in combination with wheat flour possess good sensory qualities that can help reduce over dependence on wheat flour in cookies production.

Recommendation

Based on the findings of the study, the use of almond seed flouring combination with wheat flour for cookies production at a commercial level should be exploited.

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