

Effects of whole egg powder of different ages on organoleptic indices of cakes and biscuits

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Target Audience: Poultry egg producing farmers; Large commercial egg farms; Food processing companies; Confectionary industries

Abstract

This experiment investigated how the age of eggs (1, 7, 14, and 21 days old) affects the taste and sensory attributes of cakes and biscuits made using dehydrated whole egg powder. The process involved reconstituting of the egg powders from all age groups and incorporating the egg as part of the recipes for making the cakes and biscuits. Subsequently, the organoleptic properties of the cakes and biscuits such as the colour, flavour, taste, texture, and general acceptability of the resulting cakes and biscuits, were assessed. The findings indicated that there were no significant differences in colour, flavour, taste, or general acceptability among the cakes, colour, texture, taste and general acceptability had no significant difference biscuits regardless of the egg age ($p > 0.05$). However, when it came to texture, the cakes produced from eggs aged 7, 14, and 21 days received higher ratings. However, the colour of the biscuits made with 21-day-old eggs was significantly different from those made with eggs aged 1, 7, and 14 days, with day 1 exhibiting the lowest color value ($p < 0.05$). Flavour for days 1 and 7 were significantly ($P < 0.05$) lower than day 21, while day 14 was significantly neutral to all the days for biscuits. In conclusion, this study suggests that poultry egg farmers can potentially sell eggs that are 21 days old to egg powder producers at discounted rates. Furthermore, the use of dehydrated whole egg powder from these older eggs in the confectionery industry does not appear to have negative effects on the final product's quality.

Keywords: Whole egg powder; egg age; dehydrator; cakes; biscuit

Description of Problem

Agriculture in Nigeria has over the last few years received increased attention with both Federal and State Governments encouraging the Nigerian populace especially the youth to embrace agriculture as a profession and a means out of the current recession (1,2). Eggs are sources of vitamins A, D, B-vitamin-thiamin (3), low in saturated fats and are good sources of high-quality protein hence them being termed as a nutritional powerhouse. They are one of the cornerstones of baked foods and cooking with breads, cakes, bakery mixes, and an

assortment of desserts owing much of their unique texture, taste, and moisture to the egg. However, eggs are extremely perishable and must be kept refrigerated as they have a relatively short shelf life. Batraas quoted by (4), reported that the shelf life of an unrefrigerated egg ranges between 7 to 10 days and for refrigerated 30 to 45days. In Nigeria, the inconsistent power supply is another challenge that farmers are encounter coupled with adequate storage devices (freezer/refrigerator) that can conveniently serve their capacity in producing and storing of powdered eggs for industrial uses.

Meanwhile, powdered, dried eggs are solution to bulkiness and fragility of fresh eggs as well as storage challenges as they can be stored up to a year or longer under proper storage conditions, (5). For bakers, powdered egg products provide consistency from batch to batch and are always ready. Egg solids blend well with other dry ingredients and can be used immediately without cracking or thawing (6) and when it comes to using eggs as a source of protein for dietary supplement or muscle gain, eggs rate as the cheapest source of high-quality protein and egg powder further reduce this cost (7). Cakes and cookies are predominantly popular and connected in the mind of consumers. Most important ingredients used in making these snacks are egg, sugar, fat and flour and each plays an excellent purposeful role in the eating and structural quality of the food products (8). Cake baking leads to an aerated and light structured product, as well as a large amount of volatile compound formation, which plays a significant role information of its characteristic flavor. These compounds are basically the final product of the maillard reaction, which takes place between the amino group of amino acids and reducing sugars, proteins, and peptides (9). Cookies/Biscuits are nutritive snacks obtained from single or composite dough which has been transformed into digestible and more appetizing products through the action of heat in the oven (10). In the United Kingdom, biscuits (cookies) are known as a type of biscuits and regarded as confection-food with low moisture content (11).

Seasonal egg glut occurs over a period in Nigeria yearly due to the inconsistencies in the demand and supply ratio resulting in a compromise of egg quality (deterioration and spoilage) as farmers have been bedeviled with a major setback in the management of eggs after production. The attempt to transport excess eggs from one location to

another in times of glut has its attendant problem of egg breakage and deterioration of the internal quality thereby enhancing micro-organism penetration hence, this study evaluated the use of whole egg powder from eggs of varied storage ages on the organoleptic perceptions of cakes and biscuits.

Materials and method

Study Area

The experimental site was the Animal Products Laboratory, Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Samaru, Zaria.

Production of Egg powder

Raw fresh eggs were purchased from a commercial farm, cleaned, and subdivided into a group of four labelled as days 1, 7, 14 and 21 and kept at room temperature. The eggs groups were unshelled, blended to achieve uniform consistency, and dried with the aid of a dehydrator for 19 hours at 62.8°C to produce egg crumbs. The crumbs were grinded to powder with a blender and neatly packaged into separate Ziploc bags for efficient storage. This process was repeated for eggs of each group (Weeks 1 to 4). The powders were reconstituted with water according to (12) method for the cake and biscuit production.

Production of Cake

Cakes were made using the reconstituted powders and other standard ingredients used in baking. Uniformity across the preparatory process was ensured for the four whole egg powder samples. After cooling, the cakes were cut in a square shape of 2cmX2cm and served to the panelists to evaluate as explained for un-spiced fried eggs above.

Production of Biscuits

Biscuits were also made from

reconstituted egg powders obtained from the various egg age groups and labelled as samples 1, 2, 3 and 4 respectively. Each sample was blended with other baking ingredients in a mixer and hand mixed into consistent dough. The resulting dough was cut into uniform sizes and passed through a series of moulding, shaping, and stamping. The stamped doughs were baked in the oven for 45min at 260°C, the products allowed to cool and were subsequently packed in Ziploc bags. The cake and biscuit samples were independently subjected to sensory evaluation using a 9 hedonic scale questionnaire.

Sensory Analysis

Two major whole egg products namely cakes, and biscuit were used to assess the quality of the whole egg powder samples. The consumer panel composed of thirty (30) semi trained members seated apart to minimize interaction. Clean water, liquid detergent and serviette for hand cleaning were provided to the entire panelists prior to the evaluation process. A sachet of water for mouth-rinsing after tasting each sample was also provided.

An organoleptic assessment was done using a 9-hedonic scale score sheet that was

given to each panelist to record their perception and observation. The processed cakes and biscuit samples were labelled with codes only known to the researcher and served in a covered petri-dish.

Data Analysis

Data obtained were analyzed using one-way Analysis of Variance (ANOVA) statistical model. The means and mean differences were separated using Duncans multiple range tests, SAS 9.0 (13).

Results and Discussion

Effect of egg age on organoleptic evaluation of cakes

The effect of egg age on cakes made from the whole egg powders is shown in Table 1. There were no significant differences ($P>0.05$) among the cakes in terms of, flavour, texture, taste, and general acceptability. However, the colour and textures of cakes produced from eggs of 7, 14 and 21 days were highly rated numerically than day 1 eggs. The general results obtained however point to the fact that egg age did not negatively affect the outcome of the cake products.

Table 1: Effect of egg age on the organoleptic properties of cakes

Parameters	Day0	Day7	Day14	Day21	SEM
Colour	5.10 ^b	5.57 ^a	5.27 ^{ab}	5.17 ^{ab}	0.89
Flavour	4.53	4.73	5.07	5.07	1.19
Texture	4.40 ^b	5.57 ^{ab}	5.20 ^{ab}	5.47 ^a	1.08
Taste	6.43	6.23	6.40	6.70	1.01
Acceptability	7.07	6.83	7.10	7.20	0.93

^{ab} Means with different superscripts within rows differ significantly ($P<0.05$), SEM= Standard mean of error

The effect of egg age on biscuits made from their whole egg powders is revealed in Table 2. There were no significant ($P<0.05$) differences in biscuits made from egg powders of the varied ages in terms of

texture, taste, and general acceptability. However, for colour, day 21 based biscuits had significantly ($P<0.05$) highest value (6.10) as compared today 1 which had the significantly ($P<0.05$) lowest value (4.97)

while days 7 and 14 biscuits were ($P < 0.05$) similar to day 1. Flavour had the highest value at day 21 (3.90) while day 1, 7 and 14 had significantly ($P < 0.05$) lower values as compared to day 21. The significant ($P < 0.05$) difference in colour was probably based on its appeal; the panelists showed preference for

the lighter colour of day 21. Browning in the cookie samples could have been due to Maillard-type reactions (14) resulting from the presence of reducing sugars, proteins and amino acids and caramelization because of severe heating during processing (15) which is also like (16) results.

Table 2: Effect of egg age on the organoleptic properties of biscuits

Parameters	Day0	Day7	Day14	Day21	SEM
Colour	4.97 ^b	5.33 ^{ab}	5.50 ^{ab}	6.1 ^a	0.89
Flavour	3.27 ^b	3.27 ^b	3.53 ^{ab}	3.90 ^a	0.99
Texture	6.40	6.50	6.37	6.87	1.04
Taste	4.33	3.63	4.33	4.30	1.17
Acceptability	4.33	4.17	4.47	4.63	1.06

^{ab} Means with different superscripts within rows differ significantly ($P < 0.05$), SEM = Standard error of mean

Conclusion and Applications

1. Whole egg powder made from 3 weeks old eggs can be used in the production of cakes and biscuits with no discrimination in its acceptability.
2. Farmers experiencing egg glut can opt to selling their eggs to egg powder producers after three weeks at discounted prices instead of total revenue losses.

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