Effect of sweet acorn flour of common oak (*Quercus aegilops L.*) on locally Iraqi pastry (kulicha) products.

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Abstract:

To develop a plant based biomaterial source the physiochemical, rheological characteristics and sensory characteristics of flour from acorn of oak tree in Hawraman Region; Kurdistan of Iraq were investigated. The flour was isolated from seeds using steeping and boiling methods; the fruit had high content of carbohydrate 73.5%, fat 10.5% with low content of protein which was 2.9%. The rheological tests for Farinograph were showed significant differences between treatments in term of water absorption for T0, T1, T2, and T3 were 63.6FU, 67 FU, 71FU and 77FU respectively, and Amylographic viscosity tests were shown significant different between treatments comparing to the control 748AU, 668.6AU, 360AU and 256AU.

Keywords: Acorn; Pastary (kulich a) product; Sensory evaluation; Rheology properties

I. Introduction:

Sweet acorns provide a good amount of vegetable protein, up to seven percent by weight in some varieties. Acorn fruit provides a good source of energy. Black Oak acorns contain 31.40% water, 3.44% protein, 13.55% fats, 8.60% fiber, and 41.81% carbohydrates. According to Edible and Useful Plants of California, by Charlotte Clark, "people who use acorns today agree that they resemble other nuts in oiliness and flavor. In general, acorn flour contains significant quantities of calcium, magnesium, phosphorus, potassium, sulfur, fat and protein. They are especially good in cookies, breads and pastries [1]. Acorn is the fruit of oak trees acorn is an important source of carbohydrate, lipid and protein. Acorns have been used as food by human for thousands of years some have good flavor and could be used in place of other nuts. Acorn starch had limited gelatinization at 61-68^{o}C. Acorns contain bitter-tasting tannins, which consider us an antioxidant, vitamin, fatty acids and amino acids that have an important role for human health [2]. Acorns served an important role in early human history and were a source of food for many cultures around the world. For instance, the poorer would eat acorns in their food and in past [3]. The objective of this study was to: (1) Establish whether acorn flour influences some cereal products quality. (2) Evaluate the effects of various concentrations of acorn flour and determine the best concentration and use it

commercially. (3) Find a replacing food staff instead of wheat flour with the same nutritional value.

II. Materials and Methods:

A. Acorn floure

Sweet acorn seed from common oak trees (*Quercus aegilops* L.) were obtained from Hawraman region in Kurdistan of Iraq after ripening stage and then acorn fruit were then collected by hand and then prepared for this study to make acorn flour. Acorn were used in this study milled by locally manufacture laboratory mill then the flour was used alone and mixed with different percentages 15, 30 and 45% as a partial replacement with cake wheat flour from turkey (Beshler Trade Mark), which was purchase from local market.

- Pastary (Kulicha) recipe

The famous local Iraqi sweet baked goods named (kulicha). Kulicha recipe requires 100% flour, 1.8 %salt, 2%yeast, 20% fat (margarine), 12% nut, 28% milled sugar, 4% Cardamom, 4% cinnamon, 4% kulicha flavor.

- Acorn flour preparation and Acorn layers weight.

The following steps were used for prepare the acorn flour, first stage the acorns cleaned and turned to a 10 litters capacity stockpot and filled with three-quarters of cool tap water then transfer the acorns into the pot then the floating acorns taken out because these typically contain weevils then acorns gently stirred with a wooden spoon and then the nuts Pour into a colander and rinse under the tap. The acorns soaked and Refill the large stockpot three-quarters full of cold tap water the nuts poured into the pot and let them soak for 1 hour to soften the shells then the acorns drained in the colander for dry and then the acorn cutting with knifes to small slices and leach acorns to draw out the tannins. Second the nuts cooked at boiling temperature for 2hr then the water replaced every time it turns light brown .Then the sliced acorn dried in oven at (150^{o}C for 3 hours and then the acorn were milled by laboratory made miller and then sieved with 710 nanometer sieve and then resulting acorn flour used partially with wheat flour to make (kulicha) product. The weight of the whole acorn layers of five whole oak seeds where collected randomly then every single part was weighted separately.

B. Kulicha Dough Preparation

The processing steps were dough mixing to optimum dough development, bulk fermentation 30min, dividing and rounding (20g/pieces) sheeting and then filling with the filling ingredients which were nut, milling sugar and (kulicha) flavors to make the famous Iraqi sweet baked goods. The dough pieces were baked in electric oven at 220^{o}C for 15min. And then the kulicha baked goods parameters and sensory evaluation characteristics like taste, texture, color and odor were evaluated according to AACC method 10-12.01 baking guidelines for scoring experimental [4]. Different percentages of sweet acorn flour were used in order to

know which percentage is the best (kulicha), (Table I).

Table.I: Different treatments used in the study.

T0 Control	100% bread flour
T1	15% acorn flour + 85% wheat flour
T2	30% acorn flour + 70% wheat flour
T3	45% acorn flour + 55% wheat flour

- Rheological Characteristics of Dough

Amylograph procedure was used for rheological characteristics according to AACC methods 61-01.01 Amylograph Method for Milled Rice was performed using a 60g of sample were put in Farinograph container by mixing 300g of flour with water according to AACC Method No.54-21.02 Rheological Behavior of Flour by Farinograph; Constant Flour Weight Procedure [5].

C. Chemical Composition of acorn and wheat flour

The following methods were used for flour analysis, AACC method 08-21.01 Prediction of Ash Content in Wheat Flour Near-Infrared Method [6], Near-Infrared Reflectance Method 39-10.01 for Protein Determination in Small Grains [7], AACC method Grains 0-10.01 Crude Fat in Flour, Bread, and Baked Cereal Products [8], AACC method 44-01.01 Calculation of Percent Moisture [9], AACC method76-13.01 Total Starch Assay Procedure Megazyme Amyloglucosidase / Alpha-Amylase Method [10].

D. Method of Statistical Analysis

The statistical analysis SPSS software, version 18, was used to find variance analysis and (LSD) test for studied samples.

III. Results and Discussion:

Acorn flour contain 2.8% ash, 10.2 moisture, 10.5 fat, 2.9 protein and 73.5 total carbohydrate as a comparison to wheat flour which contain 1.4% ash, 12.8% moisture, 13.6%protein and 69.3% carbohydrate that mean acorn flour contain higher amounts of fat with lower amounts of protein (Table II).

Table.II: Proximate composition of acorn and wheat flour.

Chemical composition	Ash	Moisture	Fat	Protein	Carbohydrate
Acorn flour	2.8	10.2	10.5	2.9	73.5
Wheat flour	1.4	12.8	2.9	13.6	69.3

Data in (Table III) refer to the weight of the whole acorn layers 19.6 g

whole acorn fruit, 16.3g seed oak and 5.0g hull.

Table.III: Acorn layers weight (%).

Whole oak seed /g	Seed oak/ g	Hull/g
19.6a	16.3b	5.0c

The results of Farinogram and Amylograph showed that there were significant difference between all treatments as a comparison with the control in term of flour water absorption, Developing time, Stability time, Time to break down, Tolerance index and Amylographic (Table IV).

Table.IV: Rheological properties of treatments.

Parameters	100% wheat flour	15% acorn flour	30% acorn flour	45% acorn flour
Water absorption (%)	63.6 c	67.0 b c	71.0 b	77.3 a
Developing time (min)	5.80 a	4.50 b	3.20 c	0.60 d
Stability time (min)	11.3 a	10.0 b	5.30 c	0.80 d
Mixing time (FU)	76.0 a	67.0 b	47.0 c	8.0 d
maximum viscosity(AU)	748.3 a	668. 6b	360. 0c	256. 6d

FU= Farinograph Unit, AU= Amylograph Unit, min= Minutes

Data in (Table V, Figure I) indicate that the sweet acorn flour had a positive role on (kulicha) sweet baked product for sensory characteristics in term of taste, texture, color and odor. The best results were obtained by using 15% of acorn flour in contrast with the control in term of taste, color and odor.

Table.V: Sensory evaluation for kulicha product.

Treatments	Taste (40)	Texture (20)	Color (20)	Odor (20)
To	37.3a	17.6a	14.5b	14.5a
T1	35.3ab	16.5ab	13.6b	16.0a
T2	32.5b	14.3b	15.3a	18.0a

Fig. I: Different levels of sweet acorn in Kulicha.

IV. Conclusion:

The most important finding in the present study was that acorn flour can be used to make baked goods and be the replacer of wheat flour in the presence

study was using 15% as a replacement with wheat flour. Acorn four improved baking quality in term of sensory characteristics quality. Acorn flour in kulicha sweet baked goods has a natural flavor enhancer that can be used to other baked products. It is also a ‘‘natural’’ preservative that precludes or limits the use of additives It was concluded that (tannin is most effective to inhibit microbial spoilage which found in a large amounts in acorn flour and this leads to extended the shelf life of baked goods). Acorn flour affected sensory characteristics. However, the key differences between control and sweet kulicha baked goods were observed in sensory characteristics like odor, taste and flavor.

Recommendations

A. We highly recommend bakers to use acorn flour in other baked goods like biscuits, cakes and pastries.

B. Breeding oak tree in dry arias instead of cutting them because oak tree dose not need to irrigation and provide big amounts of starch, it could be life saver one day and be use instead of wheat flour like the past, which saved many of life’s in great world famine.

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