QUALITY IMPROVEMENT OF ARABIC BREAD FORTIFIED WITH OMEGA-3 PUFA AND JACKFRUIT USING SUPERHEATED-STEAM TECHNIQUE

by

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LIST OF ABBREVIATIONS

Abbreviation

BCO	Arabic bread (control) using normal oven
BCS	Arabic bread (control) using superheated steam
BJO	Arabic bread with 50% Jackfruit juice using normal oven
BJOO	Arabic bread with 50% Jackfruit juice and Omega-3 using normal oven
BJOS	Arabic bread with 50% Jackfruit juice and Omega-3 using superheated steam
BJS	Arabic bread with 50% Jackfruit juice using superheated steam
BOO	Arabic bread with Omega-3 using normal oven
BOS	Arabic bread with Omega-3 using superheated steam
DHA	Docosahexaenoic acid
DPPH	2, 2-diphenyl-1- picrylhydrazyl
EANS	European Academy of Nutritional Sciences
EPA	Eicosapentaenoic acid
HLB	Lipophile balance
PAV	*p*-anisidine value
POV	Peroxide value
PUFA	Polyunsaturated fatty acids
SMS	Sodium meta-bisulphite
SSL	Sodium stearoyl-2-lactylate
WI	Whiteness index

ABSTRAK

Roti adalah nutrien lama yang merangkumi sebahagian besar panduan piramid makanan. Secara umumnya, roti segar muncul dengan kerak coklat, bau yang bagus, lembut, elastik dan serbuk halus yang menyegarkan. Dalam kajian ini, roti kawalan yang diperkayakan telah disediak melalui teknik superheated steam dan konvensional pada 160˚C selama 25 min. Terdapat lapan roti, kawalan disediakan dengan ketuhar biasa (BCO), roti kawalan menggunakan stim panas (BCS), roti mengandungi 50% jus buah nangka menggunakan ketuhar biasa (BJO), roti mengandungi 50% jus buah nangka menggunakan superheated steam (BJS), roti mengandungi omega-3 menggunakan ketuhar biasa (BOO), roti mengandungi omega-3 menggunakan stim panas (BOS), roti mengandungi 50% jus buah nangka dan omega-3 menggunakan ketuhar biasa (BJOO) dan roti mengandungi 50% jus buah nangka dan omega-3 menggunakan stim panas (BJOS). Selepas penyediaan, sampel roti dinilai untuk sifat fizikal dan antioksidan mereka dan perbandingan dengan kedua-dua kaedah pembakar panas yang panas dan Oven biasa. Selepas membuat sampel roti dikenakan ukuran parameter fizikal (Warna, pH dan profil Tekstur). Analisis fizikal menunjukkan bahawa stim stim panas memberikan hasil terbaik dalam mengekalkan sifat fizikal (warna, pH dan tekstur) produk skor adalah perbezaan yang signifikan ($p < 0.05$). Penyelidikan ini menyediakan maklumat asas mengenai penambahan buah nangka dan Omega-3 sebagai bahan tambah nilai dalam penyediaan roti arab menggunakan ketuhar konveksi dan kaedah bakar stim panas. Ujian kimia, akan menunjukkan terdapat pengaruh signifikan kaedah memasak pada komposisi proksim (kelembapan, protein, lipid, dan abu). Ketuhar wap superheated menunjukkan kandungan lipid yang jauh lebih rendah daripada kaedah ketuhar konveksi. Hasilnya mendedahkan bahawa aktiviti antioksidan tinggi yang dilihat di dalam roti Arab dengan 50% jus buah nangka dan Omega-3 menggunakan sampel panas yang terlalu panas (BJOS) daripada sampel lain. Roti yang dibakar oleh ketuhar stim berapi panas menunjukkan dengan ketara ($p < 0.05$) nilai oksidatif yang lebih rendah dibandingkan dengan roti yang dibakar dari ketuhar biasa konvensional. Berdasarkan hasil analisis, disimpulkan bahwa roti yang dibuat jus buah buah dengan Omega-3yang dibakar menggunakan steam superheated (BJOS) adalah kualitas unggul dalam hal aktivitas fiziko-kimia dan antioksidan dibandingkan dengan roti lain.

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ABSTRACT

Bread is an old nutrient that includes a large part of the food pyramid guide. Generally, fresh bread appears with brown crust, nice smell, soft, elastic and moist crumbs mouthful. In this study, control and fortified breads were prepared and baked in the superheated steam mode and conventional mode at 160ºC for 25 min. There were eight breads; control using normal oven (BCO), bread control using superheated steam (BCS), bread with 50% Jackfruit juice using normal oven (BJO), bread with 50% Jackfruit juice using superheated steam (BJS), bread with Omega-3 using normal oven (BOO), bread with Omega-3 using superheated steam (BOS), bread with 50% Jackfruit juice with Omega-3 using normal oven (BJOO) and bread with 50% Jackfruit juice with Omega-3 using superheated steam (BJOS). After preparation, the bread samples were evaluated to their physical-chemical and antioxidant properties and comparison with both baking methods superheated steam and normal Oven. After bread making the samples were subjected to measure the physical parameters (Color, pH and Texture profiles). Physical analysis showed that the bread of superheated steam gave the best results in maintaining the physical properties (color, pH and texture properties) product the score was significant differences ($p<0.05$). This research provides basic information regarding adding of Jackfruit and Omega-3 as a value added ingredients in the preparation of Arabic bread using convection oven and superheated steam baked methods. Chemical tests, will showed there were significant influences of cooking methods on proximate composition (moisture, protein, lipid, and ash). The superheated steam oven showed significantly lower lipid content than convection oven method. The results exposed that the high antioxidant activity observed in the Arabic bread with 50% Jackfruit juice and Omega-3 using superheated steam (BJOS) sample than other samples. Bread baked by superheated steam oven showed significantly ($p<0.05$) lower oxidative value as compared to the bread baked from the normal conventional oven. Based on the analysis results, it is concluded that bread made Jackfruit juice with Omega-3 using superheated steam (BJOS) was superior quality in term of physico-chemical and antioxidant activity as compared to other breads.

CHAPTER 1: INTRODUCTION

1.1 Background Information

The required bakery products are of great importance in diets as they contain natural nutrients and enjoy good taste as well as competitive production cost. Around the world, bread has been an important component of the diet of most of the population since antiquity. For example, bread gives more than 30% of calories in the daily consumption of humans(Xiao et al. 2014). Arab bread protein is the main food for consumers in the Middle East, most African countries and Gulf countries. Arab bread consists of two circles, thickness of 1-2 mm. Arabic bread consists of two circular layers, thickness of 1-2 mm, arab bread consumed in the middle east gountries inparticular arab countries (Uthayakumaran &Wrigley, 2010). The most important factors that influenced on arab bread quality were baking time and temperature and flour type determined based on the time and temperature used in wheat flour baking used, the technique used and the quality of the baking process not crack on rolling. Softness; free of pimples on the upper crust; thick equal layers(Monteiro &Cannon, 2012).These changes have been improved within the framework of specialized business practices where the objective was to produce desirable quality under specific circumstances. The treatment conditions selected in the bakeries differ from the commercial production of Arab bread. For example, the largely consumer, desire of the thickness is constaints technical by the temperature baking system and time created (Uthayakumaran & Wrigley, 2010).While the thickness of the dough thickness was more than 24-6.0 mm, the differences in time / temperature were not examined. When the bread is baked at 380°C for 46 seconds

and 460 °C for 90 seconds, the bread is made in shorter time and higher temperature than high quality.Arabic bread containing enhanced dietary food content like pectin polysaccharides (Sivam, 2011). as well as phenolic antioxidants, such as caffeic acid, quercetin, procyanidin and anthocyanins (Dai &Mumper,2010) may be of high consumer demand. Therefore, it is necessary to study the evolution of the production of bread formulas to unify the nutritional value of the improvements to the use of these food products. These fortified nutrients can include omega-3 fatty acids, vitamins, minerals, fibers and proteins (Moroni & Bello, 2009).

Omega 3 unsaturated fatty acids were found in sea sources such as mussels, oysters and shrimp but primarily cold water fish, as well as found in plants such as nuts (Friedman& moya, 2006).Several recent studies have indicated that omega-3 fatty acids can Preventive and curedisease cardiovascular (Swerdlow & Harris, 2008). These fatty acids have the potential to treatment of some forms of cancer and diseases that prevent ulcers (Tim & Jacobsen, 2003) and have some beneficial effects against neurodegenerative diseases such as gloom and Alzheimer's disease (Makkai& Willis, 2003). In addition, omega-3 fatty acids play an important role in the protection and growth of the brain as well as the outgrowth of the nervous system of fetuses and infants (Adaram-Vega &Shink, 2014). Previous studies have shown that supplements with DA and EPA have a positive effect on lipid properties in women (Lidlau & Holop, 2003).Omega 3 can not create unsaturated fatty acids in the human body so it is necessary to get them through nutrition. Since the main source of omega-3 fatty acids (EPA and DHA) is fish oil, it is useful to consume up to three fish time per week, which may accumulate 200-400 mg of EPA and one day. With the optimum level of consumption is much higher, the fate can be to reach 0.8-1.4 g. But this is a problem with those who do not want to feed on fish several times,

(Goodman& Gillman, 2011). Interestingly, there is currently a wide range of omega-3 fatty acids in the forms of oil and powders available to immunize food in markets in countries such as the United Kingdom, Korea and Taiwan (Lu &Norzhia, 2010). Japan and Europe have taken measures to manufacture infant formula with Omega-6 essential fatty acids and omega 3. However, the application of fish oil to enrich food or fortification is limited due to unwanted high oxidation. This oxidation can spoil the taste, smell, and the extension of the shelf life of food fortified. thus allowing, to ensure good quality levels are adequately rich, the, to ensure good quality levels are adequately rich, the life span of conservation and the addition of antioxidants need serious and integrated study. recent studies have achieved several oxidation stability and sensory stability of omega-3 fatty acids(Let, 2007).Bread is the perfect ocean to incorporate Omega-3 fatty acids due to carbon dioxide contained in insulation and baking protects the acids from oxidation while baking is exposed to higher temperatures.One of the most important local products in Malaysia is jackfruit, which has many uses in most fortified food industries. Food products of jackfruit variety, for example. Cocoa slices, fresh cocoa beans and cocoa puree. The average fruit weight is 3.6 to 15 kg and sometimes the fruit may reach 25 kg. There are two main types of jackfruit: one small, levy, fresh, sweet, sweet granules, with a texture like other raw oysters the brand is crisp and crunchy, but not too sweet (Feili & Yang, 2013). At present, advanced food products flying and supporting health benefits are becoming increasingly consumed. "Functional food" is an interesting area of research in the food producing industry. Many international and occupational health and functional food organizations have identified functional food as food by providing additional functionality by fortification new or more existing ingredients that provide physiological or health benefits (Carocho & Ferreira, 2013). There is a

great interest at present, in the scientific community in the health and nutritional properties of cocoa (anti-cancer, antioxidant, dermatological or anti-inflammatory diseases) and its derivatives such as seed flour, peel and so on. Cocoa can be seen in functional foods because it contains compounds of great nutritional value in different parts of the fruit that show medicinal and functional effects. The concept of food itself changes from the previous focus on health maintenance to the optimal and proper use of food to raise the level of health better for the prevention of chronic diseases. "Functional foods" are those foods that combine health and nutrition that provide more benefits than simple nutrition; they offer many therapeutic and physiological benefits as well as other benefits to the consumer. Food habits vary greatly from region to another region. Studying how to prevent disease and knowledge of functional micronutrients in international diets is very important. Indian food ingredients such as seasoning, as well as pharmaceutical plants with increased levels of vitamins and essential nutrients (such as vitamin E, lycopene, phenolic compounds, vitamin C, bioflavonoids, and adyoxy), and giving a rich exporter of compounds such as antioxidants and other substances (Devasagayam, & Lele, 2004).I agree with (Lansky &Newman, 2007) who indicated that much a studyinvestigation into this rapidly growing field is required to appreciate the overall value and safety of jackfruit as an intact fruit or various extracts derived from jackfruit components.Baking bread is a deep process in the knot. During the baking process, the structure and physical properties of baking change, in this process the semi-solid dough is converted into bread and there is an internal vacuum with the top of the outer shell. Producing good quality bread is a great challenge in the baking process. Bread baking process is irreversible, any product should be ignored, be high-cost. Many changes occur in the physico-chemical and biological properties

during the baking process. These changes occur simultaneously, which include formation of water evaporation, veneer, starch gelatinization, expanded volume, surface browning, protein smearing, browning surface, etc. Basically, temperature is the effect on all the physico-chemical changes associated with baking in the normal oven(Chhanwal&Anandharamakrishnan,2012).This type of device works on hot air flow and sends heat to food so it eliminates moisture, so fresh air should replace wet air. During drying, food enters with oxygen in the air furnace and is likely to be exposed to high temperatures for a long time. This exposure to heat reduces the valuable content of some food ingredients ingredients that are easily subject to oxidation at elevated temperature(Bórquez & Neveu, 2008).Therefore, with increasing attention about high food quality and shortening drying time, alternative technology is essential. This method used water vapor for baking in drying instead of hot air furnace. It is created by adding a logical temperature to the water, which in turn leads to a rise in boil over temperature and thus increases the saturation temperature at a specified pressure. However, a drop in temperature (When applying roasted steam).Steam condensation does not occur as the temperature is higher than the temperature saturation at a certain pressure (Zzaman& yang, 2013). This technique may also improve the porosity, reduce shrinkage, and increase retention of vitamin C. As well, it reduces energy consumption and emission process, also eliminates the risk of fire and explosion due to the degradation of oxygen and nitrogen (Borquez&eveu, 2008).Results for dried cubes using steamed technology were shown for a product with very low loss of omega-3 fatty acids value compared with hot air oven(Bórquez& Neveu,2008). The aim of the present research was to improve of Arabic bread fortified with omega-3 pufa and jack fruit using superheated steam technique. Temperature effects on all physical and chemical

changes associated with baking in the normal oven due to food touch with oxygen in the air oven, prospect exposed to high temperatures for a long time (Chanwal *et al*., 2012). It is common knowledge that the exposure of the product to the high temperature affects the content of some food ingredients that are easily subject to oxidation at that level (Burkes et al., 2008). So that, need an alternative technique for higher food quality with shortening drying time such as Superheated steam.

1.2 Problem statement

Arabic bread made from wheat flour with some antioxidant is easily oxidized during storage at room temperature.Its nutritional properties are limited, which are mostly affected by the baking process in the normal oven. Insufficiency flavor that makes it less acceptable to consumers.Therefore, there is a need to add antioxidant from natural sources to improve the nutritional value and make as a functional food. In addition, add the natural flavor to improve the taste and texture.So that, need an alternative technique for higher food quality with shortening drying time such as Superheated steam.

1.3 Research objectives

The specific objectives of this research were:

1) To formulate Arabic bread incorporated with Omega-3 and Jackfruit juice and baked by superheated steam and normal oven.
2) To analysethe physico-chemical,antioxidant activity and lipid oxidation of the prepared Arabic bread sample.

3) To evaluate sensory attributesfor Arabic bread (control) and Arabic bread incorporated with Omega-3 and Jackfruit.

1.4 Research scope

It can be used for this type of omega-3 and a mixture of fruits to wheat flour for the production of Arabic bread improve texture and sensory properties, nutrition, quality, health, flavor and antioxidants to produce bread. Added Omega 3 to bread to improve the antioxidant, while added jackfruit flavor, but the result will be high and the production of healthy nutrition. At the same time we are using superheated steam technique to bake toasted pita bread. You can maintain nutrition and health characteristics because this technique when baking bread is the absence of oxygen

CHAPTER 2 : LITERATURE REVIEW

2.1 History of bread

Bread is an ancient nutrient that includes a large part of the food pyramid guide. Generally, fresh bread appears with brown crust, nice smell, soft, elastic and moist crumbs mouthful (Singh& Goyal, 2011). Bread is the essential food for most people and is consumed daily and bread is comprises of two layers in the most popular bread in Jordan and adjoining countries such as Lebanon, Syria and Iraq. However, as a result of differences in dietary habits from one region to another, can find other types and forms of bread as in the form of Western bread, where demand is increasing in the Syrian market. Baking is usually done in small bakeries using local flour (Saleh& Brennan, 2012). Around the world, there are more than 60 types of flat bread that vary from one child to another and still are considered as bread. Flour, salt, yeast and water are the main ingredients of bread. There are other typesof bread made from flour such as cassava, maize, barley and oats roots such as rye (Letter& olive, 2012).

2.1.1 Wheat flour

Bread is a product of flour on a large scale. Wheat farming thrives in temperate regions of the world, but is vulnerable to diseases in hot and humid tropics.The development and the development of good properties of gluten, a compound of proteins gives a viscosity that allows various foods such as biscuits production and makes the most important wheat crop in the world. There are also significant differences in the same types of wheat in terms of classification and

composition, both qualitative and quantitative differences can be made appropriate or not suitable for a particular type of bread or food (Dalkor, &Lagrange, 2012).

2.1.2 Nutrition value of wheat flour

Bread is prepared by cooking the dough of flour, salt, yeast and water, often with extra ingredients such as sugar and fat. The main component of wheat flour are gluadins, glutinates, glutin and proteins, which make up between 80% and 90% of total flour proteins. Aluminum and globulin occur in small quantities (Sifam &Pereira, 2011). Gliadins and Glutenins play a very active role in the functional properties of gluten (Hager et al., 2012). with Gladens providing viscosity for the development of dough and glutenin transfer of strength and elasticity (Barak et al., 2014).Gliadins and Glutenins are also involved in chemical reactions and physical interactions such ascaramelization reactions Gelatinization through the development of the dough and baking bread (Sivam et al., 2011&Delchur et al., 2012.)

2.1.3 Quality of bread

Although there are 60 types of breads are made world- formulations differ from countryto country, but there are staple foods for many the basic ingredients are water, flour, salt and yeast. However, due to changes in the food habits of nature can be found on the types and other forms of bread, such as bread, Western-style, in the Syrian market and consumption is increasing. Usually Western types of bread are made in small bakeries using local flour (Goodman&Gilmans, 2012).The form of Arabic bread is two classes round. Flat bread particularly consumed in the Middle East, traditionally baked manually and it is increasingly being produced in fully automated furnace.

2.2. Arabic bread

2.2.1 Quality of Arabic bread

The style of the Arabic bread is a tour bread with two mesotainin layers in the Middle East (Othiakumaran& Wrigley, 2010). which are hand-made more fully automated in the bakery. The latter are popular in regions outside the Middle East and demand for consistent bakery machines requires quality better understanding of the exact characteristics and processing needed to manufacture high quality agents. In order to confirm the product that affects the quality of Arabic bread in experimental and commercial contexts, the necessary variables Descriptiona number of assessment method have been evaluated for quality assessment bread (Hager et al., 2012). In order to determine Bread quality, there are criteria that have been determined based on the lack of cracking on the rolling and folding softness and release of pimples on the upper crust. Both layers are thick and permanently round the loaf. Scoring three systems indicate that some of the methods of bread and put the Arab bread to allow for rapid assessment of the components and processing variables. This method (Head& Henderson, 2011) is designed to suit local treatment conditions in Syria, Lebanon and Jordan and is effective in supporting wheat breeding programs in these countries, but does not address the improvement of product quality required by fully automated stations. Method of studying therapeutic variables as occurs in automated production. These variables have improved within the constraints of commercial practice where the objective is to produce consistent quality under specific circumstances.Flat bread are divides into two types leavened and unleavened bread in Middle East. They include whipped cream products pita bread or the Middle East, Kmaj, Tanora, Barbary, and the advice of Ivasc. Products include non-covered traditional sticks,Chapati, Baratha, shark and At'zaji as

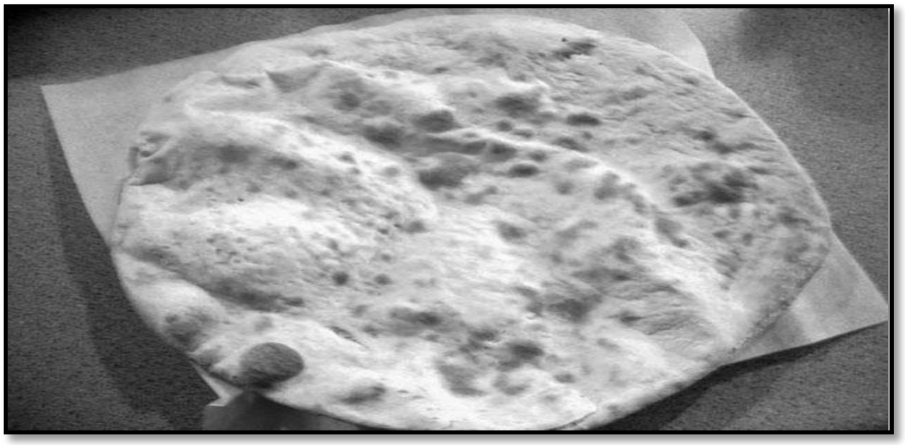

Figure 2.1: Al-Mashrouh flat bread

2.2.2 Classification of Arabic bread

The flat bread classified into two main groups:The first group is a single layer and the process of preparing a short dough and baking does not require a long time to set up the product consists of a single flat layer. The second group of the bread of two layers composed and pass the preparation of the dough process, and then give the dough a rest and then cut into small balls and press to be small paste in the form of a disk and then left for more than 20 minutes to relax the dough dough to be baked two layers due to give time to rest a paste (Hagaret al., 2012).

2.2.3 Effect the baking process on Arabic bread

Baking bread is an irreversible and should be thrown away any manufacturing acceptable, affecting the economy of this process. Through bread, structure, structure and physical properties of the changes in the baking process, where the dough semi-solid converted into bread crumbs with smooth inner and

outer shell crispy. Conversion occurs through baking bread. This conversion is done together, which involves the formation of the crust and the evaporation of water, starch, gluten,The size and breadth of protein denatured, brown surface. Basically, the temperature, humidity and high volume are responsible for all material changes connecting with bread. Bread baking process modeling is not invincible because of the rise in one time and mass heat transfer (Chanwal, 2012)Increase the heat to start the evaporation of water and emissions of carbon dioxide, is necessary to start baking oven during the initial stage. Carbon dioxide emissions, and the keys to push the upper crust and the evolution of the crumbs together, followed by the development of the crust color. Structural change also occurs during the bread baking process and consists of hardness and expansion. Network like bread crumbs is especially because of the structure of the protein denatured starch respectively with gelatin. Glutathione protein gluten occurs under temperature effect, which changes the gel to gluten Koagula (Cauvin, 2003; Zhou Thalthaa, 2007).During the process of baking bread, prevail heat transfer and mass by intensifying evaporation process technology. Technical intensification of evaporation, heat transfer very quickly and the formation of cortical areas and bread crumbs in (Thorvdezon & Ganstad, 1999; Perls & 2009 Salvador; Chanwal et al., 2012). Many observers prefer to bake bread by intermediary evaporation technology - intensify mixing (Thorvdezon & Ganestad, 1999; Perls & Salvador, 2009, Hanwal et al., 2011;Perls, 2012; Tank et al., 2014). In general, the production of good bread is great obstacles in the baking process. Thus, temperature control and process time is very important for the production of good bread.