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Approach to nutritional security potentials through home scale food process-fermentation.

Ogori Akama.F
Faculty of Agriculture, Department of Home science and Management, Federal University Gashua Yobe State
*Corresponding author: *ogorifaraday@gmail.com.*

Abstract

The approach of time process- fermentation at home on pre and post made food, un-mealed andmealedfoodscould increase nutritional potentials on matrix nutrients. Foodpreparation at home isdynamically changing with more attention on aesthetic values of food rather than foodnutrients.Food preparation by its methods normally targets doneness, parasitic level against nutrient quality and quantity which may not allow nutrient synergy to be reached duringcriticalphase's process- fermentation steps such as roasting. millingbaking ,cooking extrusion ,malting , steeping , germination , kilning , mashing , boiling andfermentation. Certain microorganism manifest expertise in culinary transformation for variedfavour andpleasant treats especially in wine ,chocolates ,tuber fermentation and certain cereal and vegetable foods. vegetable fermentation such as sauerkraut ,cabbage ,fruits such as apple grapes cereals such as sorghum ,rice legumes such as beans ,soybean, tubers such as yam ,cassava .Bulbs such as onion and nut such as date , dairy produce ,fruits to wine ,left over soup and other food material are being carried out at homes.This work seeks to alert home scale foodmakers, chiefs and matron on the importance and critical advantages in allowing home scale time fermentation for optimal nutritional security during food preparation.

Keywords: Potential ,Home scale, Time, Fermentation, Nutritional security.

Introduction

Culinary approach and food preparation at home is dynamically varying with home makes taking no cognizance of nutritional potential to healthy living .The interest of culinary operators and cooks are being change to aesthetic technology or values leaving behind the state of nutrient moiety that can promote the health of the family Ogori and Utim (2013).Cooking of food preparation approaches either by heat ,microwaving ,coldstorage approach only target donnes and parasitic eradication against nutrient quantity and quality .taking cognizance of the former nutrient synergy may not be reached hence the approach of time scale fermentation which could be help achieve home stead potential nutrient security of macro an micro nutrition .Genetic code an messenger signals from nutrient biosynthesisfrom free DNA and mobile RNAs revelations are not coherent ,maybe from imbalance from nutrient moiety (Tenan 2016). The major benefit of fermentation is foodpreservation, production of volatiles for example alcohols. Lactic acid an acetic acids which also help in aesthetic values .vegetables, fruits, milk, fish and meat are highly perishable hence requires constant home scale fermentation. Eating fermented food incredibly helps the health of the body, the value of probiotics help digestive tract, mix culture microorganism also help control digestive diseases. Thereare several foods that could be allowed to undergo either solid or non-solid state fermentation, culture or starter culture fermentation to allow liberation of entrapped nutrient and bioactive build up, reduction of anti-nutritional and inhibitorsin food matrix which may poss security treat to mucosal nutrition Ogori and Omoniyi (2016)

Process-fermentable foods.

Fermentation

Fermentation is the "slow decomposition process of organic substances induced by micro-organisms, or by complex nitrogenous substances (enzymes) of plant or animal origin" (Walker, 1988). It can be described as a biochemical redox change, which is brought about by the anaerobic or partially anaerobic oxidation of carbohydrates by either micro-organisms or enzyme andnot putrefaction, which is the degradation of protein materials (Grant et al 2003). Fermentation is a relatively efficient, low energy preservation process, which increases the shelf life and decreases the need for refrigeration or other form of food preservation technology. It is therefore a highly appropriate technique for use in developing countries and remote areas where access to sophisticated equipment is limited.Fermentable food could range from vegetable through fruits, cereal, legumes, tubers rhizome to nut. The simple approach is to increase the matrix or food surface area by processing .Work on vegetable fermentation such as sauerkraut ,cabbage ,fruits such as apple grapes cereals such as sorghum ,rice legumes such as beans ,soybean, tubers such as yam ,cassava .Bulbs such as onion and nut such as date ,dairy produce ,fruits to wine ,left over soup and other food materials Sandor (2003)

Fruits

Fruit is defines as "The edible product of a plant or tree, consisting of the seed and its envelope. The scientific definition of a fruit is "The structure that develops from the ovary of an angiosperm as the seeds mature, with (false fruit) or (true fruit) and associated structures" (Walker, 1988)

In terms of food processing, fruits are nearly all acidic and are therefore called ‘high acid’ foods. The acidity naturally controls the type of organism that can grow in fruits, with yeasts and molds being the only spoilage organisms likely to be found on fruit products. The acidity level of tropical fruits, such as banana, mango and papaya, decreases as the fruit ripens (Anon, 1993).

Vegetables

A vegetable is "a plant cultivated for food, especially an edible herb or root used for human consumption. In general, vegetables tend to be less sweeter than fruits and often require some form of processing to increase their edibility.Vegetables are classified as ‘low acid’ foods due to their lower levels of acidity. Low acid foods are more prone to deterioration by micro-organisms and can in fact provide an ideal substrate for food poisoning organisms when in a moist environment (Adenuga, 2010). Low acid foods can be safely preserved by making them more acidic, either through pickling or salting or drying (Anon, 1993).

The benefits of fermenting fruits and vegetables

Improving food security.

Food security was viewed mainly in terms of food supply at the global and national levels. Since then there has been a major shift in understanding of food security with more emphasis on access to food rather than purely on production. The Food and Agriculture Organization of the United Nations (FAO), amongst other influential organizations, has recognizedthe problem of food security cannot be tackled in isolation. Moreover that it is an integral component of other development issues. FAO highlights the fact that the world food insecurity problem is a result of undemocratic and inequitable distribution of and access to resources rather than a problem of global food production (Anon, 1995), (Anon, 1996).

Fermentation technologies play an important role in ensuring the food security of millions of people around the world, particularly marginalized and vulnerable groups. This is achieved through improved food preservation, increasing the range of raw materials that can be used to produce edible food products and removing anti- nutritional factors to make food safe to eat.

Food preservation

Fermentation is a cheap and energy efficient means of preserving perishable raw materials. When harvested, fruit and vegetables undergo rapid deterioration, especially in the humid tropics where the prevailing environmental conditions accelerate the process of decomposition. There are several options for preserving fresh fruit and vegetables including drying, freezing, canning and pickling. However many of these are inappropriate for use on the small-scale in developing countries. For instance the canning of vegetables at the small-scale has serious food safety implications and contamination with botulism. Freezing of fruits and vegetables is not economically viable at the small-scale. Fermentation requires very little sophisticated equipment, either to carry out the fermentation or for subsequent storage of the fermented product. It is a technique that has been employed for generations to preserve food for consumption at a later date and to improve food security.

Removal of anti-nutritional factors

Many fruits and vegetables contain naturally occurring toxins and anti-nutritional compounds. These can be removed or detoxified by the action of micro-organisms during fermentation. For instance the fermentation process that produces the Sudanese product called *Kawal* removes the toxins from the leaves of *Cassia obtusifolia* and fermentation is an important step in ensuring that cassava is safe to eat.

Salvaging waste foods

Fermentation can salvage waste food which otherwise would not be usable as food by changing the consistency of the product and making it digestible. This increases the range of raw materials available as food. Bone and hids,range of "waste" products are fermented to produce edible food products in Sudan. Variety of waste products can be fermented to produce nutritious food products.*Tempe-bongrek* is a protein rich food made in Indonesia by fermenting peanut and coconut press-cake, remaining after oil extraction.*Ontjom* is produced from waste groundnut press cake, tapioca waste and the solid waste of *tahu*. *Ontjom* is prepared using a mixed culture of micro-organisms with *Rhizopus* or *Neurospora* species predominating. *Ontjom* is mainly produced in west Java where it is consumed as a side dish in the form of deep fried slices.

Left over food or rechuaffee food, such as soup, stew, ballslurries can be fermented andor rechuaffee into a new meals like meat pie and steamed kind of food.
A considerable amount of the fruit can be wasted in the peeling and preparation such as from water melon, pineapples orange chaffs, and fruits straws. A product can be produced from the peelings, that would otherwise have been discarded.

Culturally and Economically Importance of Fermented foods

Fermentation is relatively efficient requiring low energy preservation process which increases the shelf life and decreases the need for refrigeration or other form of food preservation technology especially in rural homes. It is therefore a highly appropriate technique for use in developing countries and remote areas where access to sophisticated equipment is limited. Fermented foods are popular throughout the world and in some regions making significant contribution to the diet of millions of individuals. Thisis widespread tradition in Asia . The fermented products supply protein, minerals and other nutrients that add variety and nutritional fortification to otherwise starchy, bland diets. In Africa fermented cassava products (like *gari* and *fufu*) are a major component of the diet of more than 800 million people and in some areas these products constitute over 50% of the diet(Achi , 2005)

Critical phases during processing steps to entrap or release nutrient moeities

Processing

Various food processing techniques and additives have the potential to enhance the nutrient bioavailability, nutrient density, food safety, storage stability, palatability, and convenience of supplemental foods suitable for weaning mixtures or to promote nutrition repletion following diarrheal episodes. Some of these are applicable for use at home, while others require the equipment and skills available in a small-or medium-scale food factory (Bressani et al., 1984)

ROASTING

Roasting increases nutrient density , pleasant toasted flavor that improves palatability and inactivates enzymes and anti -nutritional factors but also denatures heat-labile vitamins.

Milling

Milling, a spectrum of processes. Reduces food size. Lowering of fiber and bulk, it's also lower vitamin and mineral content in the remaining food or flour.Also removes insect, anti –nutritionals and microbiological contamination of raw materials.

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BAKING Baking produces nutritionally concentrated fat, sugar, proteins.

COOKING Affect digestibility . When heated, the starch granules readily permit water absorption, a gelatinization process hence softening effects

Drying Water and water activities promotes spore germination, microbial growth, and toxin production. Drying and the addition of solutes, such as NaCl or sucrose, to the food depresses the water activity (a_w)

Extrusion . Mechanical disruption of the cell walls and starch of plant products, facilitating digestion and absorption.

Critical phases during fermentation steps to entrap or release nutrient moeities

MALTING Promotes the development of hydrolytic enzymes

↓

STEEPING Modification of the endosperm structure for diastatic power, especially β- amylase activity .surface area increase for enzyme –substrate interaction

↓

GERMINATION Germination involves the outgrowth of the plumule and radicle of the seedling until suitable enzymes endosperm-degrading enzymes such as α-amylase, protease, pentosanases and endo-beta-glucanase .phase nutrient growth

↓

KILNING Kilning has the objective of stopping embryo growth and enzyme activity, while minimizing enzyme denaturation and the process develops flavor and color (melanoidin compounds). Here vegetative nutrient can be trapped

↓

MASHING Extracts into solution, fermentable sugars, amino acids, vitamins, from malt and sufficient enzymes to generate well-balanced fermentation medium slurry past

↓

Boiling Help inhibit certain spoilage bacteria and maintain foam stability or consistency.

↓

Fermentation. Yeast converts sugars in the wort into ethyl alcohol.

Use of starter cultures

In order to produce sauerkraut of consistent quality, starter cultures (similar to those used in the dairy industry) have been recommended. Not only do starter cultures ensure consistency between batches, they speed up the fermentation process as there is no time lag while the relevant microflora colonise the sample. Because the starter cultures used are acidic, they also inhibit the undesirable micro-organisms. It is possible to add starters traditionally used for milk fermentation, such as *Streptococcus lactis,* without adverse effect on final quality. Because these organisms only survive for a short time (long enough to initiate the acidification process) in the kraut medium, they do not disturb the natural sequence of micro-organisms. On the other hand, if *Leuconostoc mesenteroides* is added in the early stages, it gives a good flavour to the final product, but alters the sequence of subsequent bacterial growth and results in a product that is incompletely fermented. If gas producing rods (for example *L pentoaceticus)* are added to the sauerkraut, this disturbs the balance between acetic and lactic acids - more acetic acid and less lactic acid are produced than normal - and the fermentation never reaches completion. If lactic acid, non-gas producing *rods (L. Cucumeris)* is used as a starter, again the kraut is not completely fermented and the resulting product is bitter and more susceptible to spoilage by yeasts.Sandor (2003)

It is possible to use the juice from a previous fermented fruits for fermentation as a starter culture for subsequent fermentationsSandor (2003). The efficacy of using old juice depends largely on the types of organisms present in the juice and its acidity. If the starter juice has an acidity of percentage or more, it results in poor quality ferments. If the starter juice has an acidity of 0.25 for krauts or less, the kraut produced is normal, but there do not appear to be any beneficial effects of adding this juice , except for certain sensorial qualities. Often, the use of old juice produces sauerkraut which has a softer texture than normal.Sandor (2003)

Conclusion

There is tremendous scope and potential for the use of timed fermentation and the use of timed micro-organisms either natural or cultured towards meeting the growing world demand for food at home and for efficient use of food by utilization of available natural foods, bioavailable nutrient moieties and the transformation of waste materials. With the tremendous important role in natural and culture fermentation processesindigenous timed fermentation of fruits and vegetables could play foodpreservation role and their potentials to contribute to the growing food or nutrient needs of the world. There is a danger that the introduction of 'western foods' with their glamorous image is depleting our natural rich trado-fermented home foods.

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