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Soyabean Processing, Utilization and Health Benefits

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Abstract: Acceptance of soyabean seems to increase. Soyabean proves to be the most popular means of relief from Protein Calorie Malnutrition (PCM) as protein from animals is beyond the cost many people can afford. To bridge the widening gap between protein requirement and availability soyabean is expected to constitute the main source of protein for the future. Although a lot has been achieved, a lot still has to be done in processing. The relatively recent discovery that soyabean may prevent a number of diseases may result in increased acceptance of soyabean if there is adequate awareness. Many authors have reported the nutritional value of soyabean. The quality of soyabean has actually been underestimated until recently. It is now concluded that the quality of soyabean protein is comparable to that of animal protein sources such as milk and beef. Soyabean produces high quality oil about 20% of its content and protein about 40% of the bean. Its protein content is superior, with substantial levels of most essential amino acids. Consumption of foods containing soyabean and soyabean products has been associated with improved heart disease risk factors, reduced osteoporosis, alleviation of menopausal symptoms, reduced cancer risk and in a limited number of studies reduced diabetes and helps people to stay lean and has no cholesterol. The degree of milling soyabean influences the palatability and digestibility. High protein yield is ensured at the end of processing as well as maintenance of texture. There is the need for increased utilization and awareness bout its health benefits.

Key words: Soyabean, protein calorie malnutrition, health benefits

Introduction

Soyabean is a stable food of great nutritional value. Its importance ranges from milk production, oil processing livestock feeds, industrial uses and human consumption of soyabean (Addo and Oguntona, 1993). Soyabean has been recognized to be an ideal grain for meeting protein and energy requirement of both man and animal. Soyabean is probably the world's most valuable crop, used as feed by billions of livestock, as a source of dietary protein and oil by millions of people, and in the industrial manufacture of thousands of products. Soyabean is such an extremely rich source of protein and fat, and such a good source of energy, vitamins and minerals (Nwokolo, 1996) with an average production cycle of 90-110 days from planting to harvesting.

Complete utilization of soyabean includes in addition to post-production aspects, the application of a range of technologies and including food processing technology, food science and nutrition, food technology, commercial soya foods production, marketing, and nutritional and health factors. When the pressing needs to alleviate poverty and malnutrition and to improve the welfare of poor people are considered, issues relating to high quality protein food, greater income opportunities for male and female are of paramount importance. Protein content is approximately 40% and fat 20% (Glami, 2002) with considerable variations depending on the cultivars. Soyabean is regarded as equal in protein to animal foods. It has been found to be excellent for a number of different conditions such as high blood pressure, diabetes – related diseases and many others (WHF, 2004). Osho and Dashiell (1998) reported that soyabean which has less purchase cost has about 40% protein, 30% carbohydrates, 20% oil and 10% mineral. It is very useful in improving the menu of malnourished children and revitalizing heart and breast cancer patients and has no cholesterol. According to Faryna (1987) and Enwere (1998) soyabean can be as a nutritional supplement for pregnant women, lactating mothers and children. The household use of soyabean is targeted to suit local dishes for Nigerians and communities all over the country. About 140 soyabean products are now available (Enwere, 1998; Osho and Dashiell, 1998; Okoruwa, 2002).

A key problem associated with soyabean is that it contains some anti-nutritional factors, which inhibit the availability of the desirable elements such as protein. Fortunately most of these anti-nutritional factors can be destroyed through processing and boiling (Loo, 1978; NAERLS, 1989; Enwere, 1998; Osho and Dashiell, 1998). Major processing of these products includes cleaning, soaking, dehusking, milling, sieving, boiling, roasting and fermentation. Further processing depends on the type of products to be produced. Owolabi *et al*.

Soya flour processing: There are 3 types:
1. Raw soya flour 2. Partially processed i.e. flour 3.Roasted soya flour

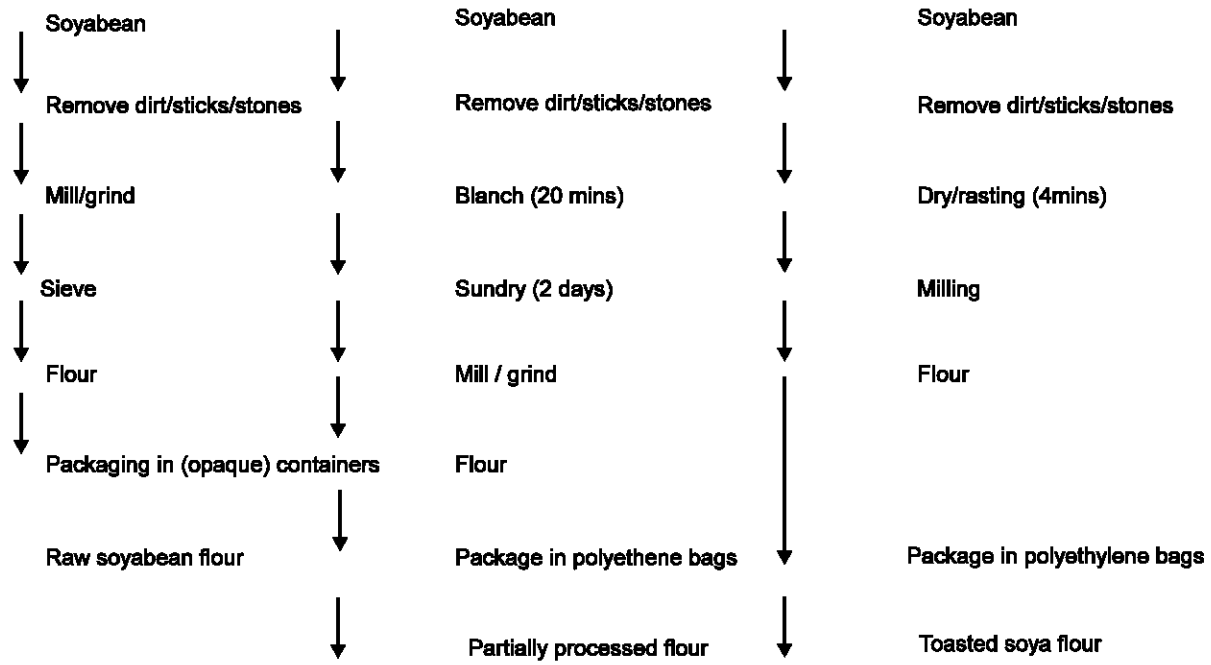

Fig. 1: Flow chart of three methods for processing soya flour
Protein 40%, Fat 20%, Minerals, 3.7%. Source: Osho (1993)

(1996) said that extension service efforts are necessary in Nigeria and other African countries to increase soyabean production and consumption. There are several institutions responsible for creating awareness about soyabean processing and utilization technologies, these include Agricultural Development Project (ADP), IITA, National Agricultural Extension Research and Liaison Services (NAERLS) and others. In Nigeria, Women in Agriculture the arm of ADP teach farm families soyabean processing and utilization.

Health Benefits from Soyabean Consumption: Consumption of foods containing soyabean and soyabean constituents has been associated with reduced heart disease risk factors, reduced osteoporosis, alleviation of menopausal symptoms, reduced cancer risk and in a limited number of studies reduced diabetes. It also helps people to stay lean (reduced obesity). Isoflavone compounds found in soyabean, especially genistein may help to stay lean by causing us to produce fewer and smaller fat cells (Naaz *et al*., 2003). About 6 million men and 6.3 million women that are living today have a history of coronary heart disease. Soyabean works in the prevention or minimizing the conditions through controlling cholesterol, blood pressure, vascular function and direct effects on the cells of the artery wall (AHA, 2000).

Soyabean prevents heart attack and stroke through lowering cholesterol. Soyabean is reputed to be able to lower total cholesterol levels by 30% (Desroches *et al*., 2004). Beneficial effects of soyabean on cholesterol concentrations have recently culminated in the U.S. Food and Drugs Administrations (FDA) approving a health claim that 25g of soyabean protein a day as part of diet low in saturated fat and cholesterol, may reduce the risk of heart diseases (Teixeira *et al*., 2000).

It is also now known that the very high magnesium content of soyabean can cause expansion of the peripheral blood vessels thereby helping to decrease blood pressure to prevent hypertension (Lijuan *et al*., 2000). Men which were at risk of developing coronary heart disease consuming soyabean in diets have been found to have significant reductions in both diastolic and systolic blood pressure (Sagara *et al*., 2004).

Soyabean can be very beneficial to diabetic patients particularly Non-Insulin Dependent Diabetes Mellitus (NIDDM). The protein in soyabean and also in other legumes is excellent for diabetic patients who tend to have problems with animal source of protein. The protein and fibre in soyabeans can prevent high blood sugar level and help in keeping blood sugar levels under control. It is also now known that the proportion of

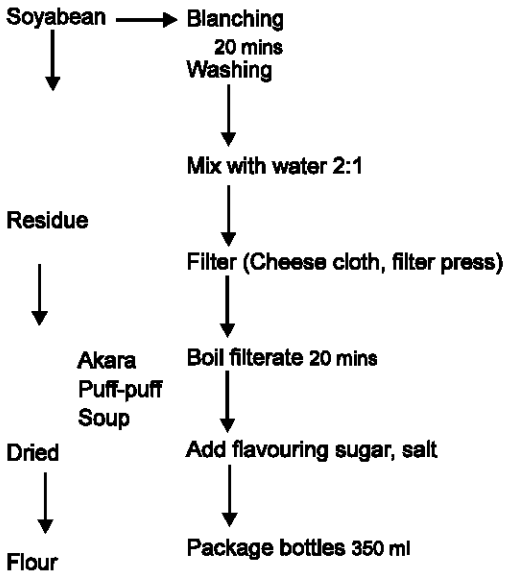

Fig. 2: Processing soyabean milk and milk residue (soya paste)

Note: Soyabean milk residue can be incorporated into traditional foods to improve their protein contents

Source: Osho, 1993

potassium to sodium (ratio 3/1 – 11/1) makes soyabean an ideal food for diabetes mellitus patients (Lijuan *et al*., 2000). Soyabean has also been shown to promote serum insulin production (Fukushima, 2000). It has been demonstrated that soya protein helps persons with diabetes prevent kidney diseases and improve the cholesterol profile (Teixeira *et al*., 2000).

There is evidence that soya foods may help reduce bone loss that typically occurs after menopause. Soya isoflavone can help women with low bone mineral content prevent hip fractures in postmenopausal years (Chen *et al*., 2003). Soyabean is thus particularly important in postmenopausal years because it prevents hip fractures, reduces fat development especially abnormal fat and blood pressure (Anderson, 2003).

It is also known to inhibit cancer development the second leading cause of death, which in the U.S is responsible for the death of about 552,000 people in 2000 (1,500 death per day) (ACS, 2000). High fibre soyabeans are able to help reduce the risk of colon cancer. In areas of the world where soyabeans are eaten regularly, rates of colon cancer, as well as some other cancers including the breast cancer tend to be low. Soyabean contains relatively high amounts of glucosycermide, which may be the reason for the cancer-preventive effect of eating soya foods (Symolon *et al*., 2004).

Soyabeans may be the most practical means of relief from kwashiorkor (Protein Calorie Malnutrition), which is increasing in prevalence among children in many parts

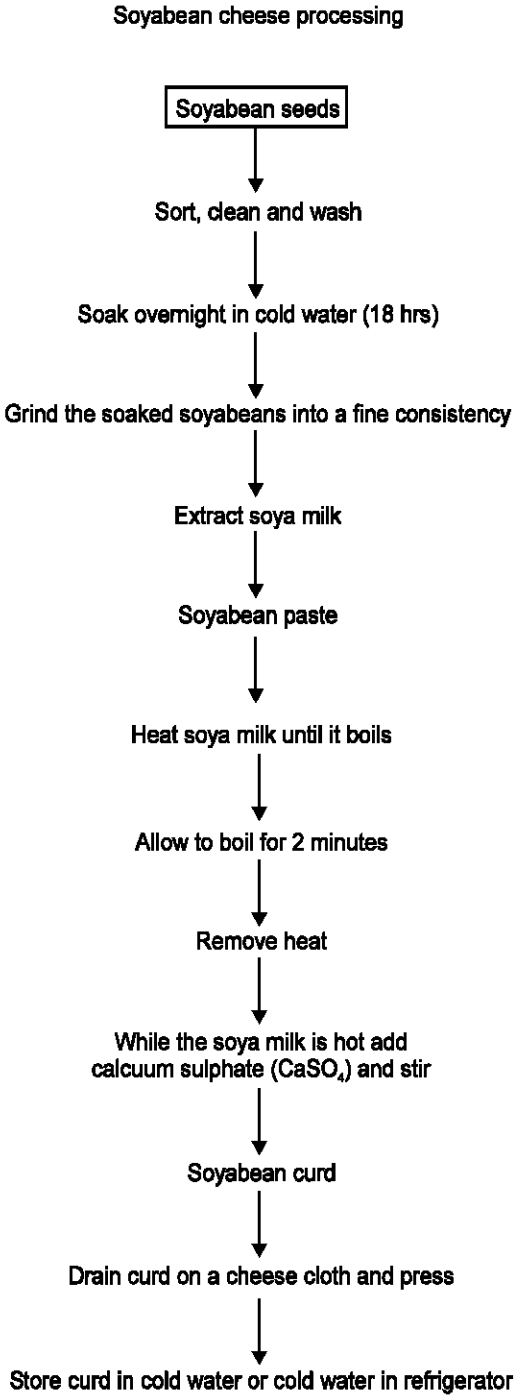

Fig. 3: Processing of soyabean seeds into soyabean curd

Source: Enwere (1998).

of the world (Grewal, 2000).

It may be concluded from the foregoing account on nutritive and health values that with soyabean the housewife can vary her dishes by replacing meat, fish, cow's milk etc. partly or entirely with the low cost

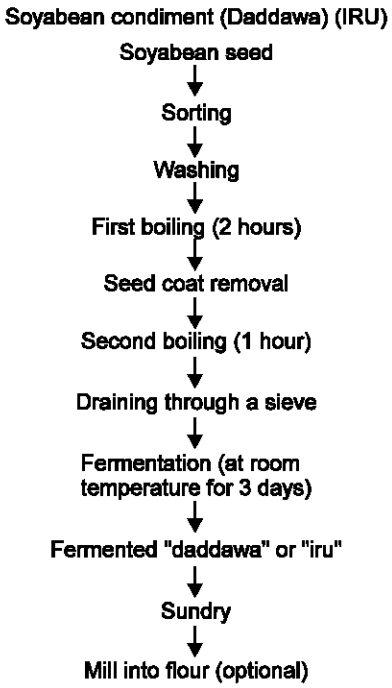

Fig. 4: Flow chart for processing of soyabean condiment (Daddawa) (IRU)
Source: NAERLS (1989)

products without decreasing the nutritive value of the menu. There is every hope that to bridge the widening gap between protein requirement and availability. Soyabean holds promises as the main source of protein for the future in many countries. Eating soyabean will reduce the number of malnourished children in sub-Saharan Africa including Nigeria (IITA, 1995). Therefore efforts should be made by extension workers, IITA and other health agencies in reaching considerable number of people especially rural farmers. Creating awareness about the usefulness of soyabean consumption for health and practical demonstration of how soyabean can be processed into various foods is very necessary.

A great deal of information has been accumulated. The processing of this commodity has been exhaustively described by various authors especially Loo (1978); NAERLS (1994); Osho (1993); Enwere (1998). A brief but comprehensive account on processing of a large number of these foods has been provided by Osho (1993). In the already prepared breakfast cereal, the soyabean is well heated to eliminate the anti-nutritional and undesirable factors. The beany flavour of soyabean is reduced prior to incorporation into breakfast cereals by only water blanching of alkali soaking and blanching (STS, 1987).

Processing of products prepared from a combination of soyabean and cereals or tubers to increase protein content and complement the amino acids profile in the food has been described in Nigeria by various authors including Okebukola and Enwere (1992) for baby foods, Enwere and Ukaegbu (1992) and Enwere (1998) for breakfast cereal and for soya cassava foods. In soya gari, soyabean flour is mixed with gari in the ratio 1:3 and not exceeding it (Osho, 1993; Enwere, 1998).

Some of the major soyabean products and the steps involved in the processing are presented in Fig. 1 to 4, which are flow charts showing how to process soya flour in three ways, soya milk, soya awara and soya daddawa (NAERLS, 1989; Osho, 1993; Enwere, 1998).

Steaming at 100^{o}C inactivates the anti-nutritional factors in raw soya flour, thus rendering a maximum protein efficiency ratio. Soya milk should always be boiled for 5 to 10 minutes before consumption, so that no active inhibitor and no active haemagglutinins will be present (Loo, 1978). According to Nwokolo (1996) the more the degree of processing of soyabean the higher the digestibility. Major processing methods include soaking, dehusking, roasting and milling. It could be milled into paste of flour depending on the type of food preparation method to be used (NAERLS, 1994).

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