PDF - EVALUATION OF SOME PHYSICAL AND CHEMICAL CHARACTERISTICS OF IFE BROWN BEAN, SOY BEANS AND SOME SOY BEAN PRODUCTS - researchcub.infoABSTRACT

Soya beans and Ife brown beans were evaluated for theirphysical characteristics (seed size, seed shape, textile colour and weight)before and after cooking with hot plate. The cooking time of the Ife brownbeans seed was 52 minutes and soya beans seed did not
cook after 180 minutes of boiling.
The chemical analysis revealed that the proximatecomposition for whole soya beans , dehulled soya bean, roasted soya bean flourand Ife brown bean were;CP. 22.69%, 24.56%, 20.94%, 27.75% and 19.44%respectively, while values were 7.42% for whole soya beans seed, 2.22% fordehulled soya beans, 5.86% for roasted beans, 1.88% for soya milk and 5.47% forIfe brown. The ash content were 4.90%, 4.75%, 3.85%, 1.50% and 3.6% for wholesoya bean seed, dehulled soya bean seed, roasted soya bean flour, soya milk andIfe brown. The samples had EE of 22.28%, 25.78%, 24.71%, 15.37%, and 4.98%,respectively and their NFE were 42.68%, 42.69%, 44.64%, 46.50% and 66.51%respectively.
The mineral measured in the bean samples were Na: 0.04%,0.02%, 0.12%, 0.03%, 0.03%; K: 0.43%, 0.49%, 0.51%, 0.33% and 0.29%; P 0.4%,0.38%, 0.44%, 0.24% and 0.13% respectively. Ca content was 0.77%, 0.5%,0.35%,0.39% and 0.24% respectively. While Mg was 0.03%, 0.14%, 0.25%, 0.15% and 0.12%respectively. Fe content was 22.68 mg/kg, 20.93 mg/kg, 24.56 mg/kg, 20.75 mg/kgand 9.35 mg/kg respectively. Zn was 12.55 mg/kg, 14.12 mg/kg, 13.08 mg/kg,20.75 mg/kg and 7.35 mg/kg respectively. This study also shows that Ife brownabsorbed more water than soybeans, soybeans were also smaller than Ife brownand the weight of Ife brown was also higher than soybeans. There werevariability in the chemical composition of various beans samples.

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CHAPTER ONE
INTRODUCTION
The soybean (U.S.) or soya bean (UK) (Glycine max)(Multilingual Multiscript Plant Name Database. Retrieved September, 2012.) is aspecies of legume native to East Asia, widely grown for its edible bean whichhas numerous uses. The plant is classed as an oilseed rather than a pulse bythe Food and Agricultural Organization (FAO).
Fat-free (defatted) soybean meal is a significant and cheapsource of protein for animal feeds and many pre-packaged meals; (SwarthmoreCollege Computer Society, 2012). Soy vegetable oil is another product ofprocessing the soybean crop. For example, soybean products such as texturedvegetable protein (TVP) are ingredients in many meat and dairy analogues (Riazand Mian, 2006). Soybeans produce significantly more protein per acre than mostother uses of land (National Soybean Research Laboratory., 2012). Traditional non fermented food uses of soybeans include soymilk, and from the latter tofu and tofu skin.

Fermented foods include soysauce, fermented bean paste, natto, and tempeh, among others. The oil is usedin many industrial applications. The main producers of soy are the UnitedStates (35%), Brazil (27%), Argentina (19%), China (6%) and India (4%) (USDA,2012). The beans contain significant amounts of phytic acid, alpha-linolenicacid, and the isoflavones genistein and daidzein.

The soybean [Glycine max (L.)] Merrill, family Leguminosae,subfamily Papilionoidae] originated in Eastern Asia, probably in north andcentral China. It is believed that cultivated varieties were introduced intoKorea and later into Japan some 2000 years ago. Soybeans have been grown as afood crop for thousands of years in China and other countries of East and SouthEast Asia and constitute to this day, an important component of the traditionalpopular diet in these regions.

Although the U.S.A. and Brazil account today for most of thesoybean production of the world (see Table 1), the introduction of this crop toWestern agriculture is quite recent. Soybeans are primarily an industrial crop,cultivated for oil and protein. Despite the relatively low oil content of theseed (about 20% on moisture-free basis), soybeans are the largest single sourceof edible oil and account for roughly 50% of the total oilseed production ofthe world(FAO, 1992).

With each ton of crude soybean oil, approximately 4.5 tonsof soybean oil meal with a protein content of about 44% are produced. For eachton of soybeans processed, the commercial value of the meal obtained usuallyexceeds that of the oil . Thus, soybean oil meal cannot be considered aby-product of the oil manufacture. The soybean is, in this respect, anexception among oilseeds.

It can be calculated that, the quantity of protein in theyearly world production of soybeans, if it could be totally and directly utilizedfor human consumption, would be sufficient for providing roughly one third ofthe global need for food protein. This makes the soybean one of the largestpotential sources of dietary protein. However, the bulk of soybean oil meal isused in animal feeds for the production of meat and eggs. Despite considerablepublic and commercial interest in soybean products as food, the proportion ofsoybean protein consumed directly in human nutrition is still relativelysmall(FAO, 1992).

1.2 Production

World production of soybeans has increased by a factor ofeight in the last half century to reach its present level of over 100 millionmetric tons per year (Table 1). The leading producers are the U.S.A. (45%),Brazil (20%) and China (12%). Much of this phenomenal growth was due to thesharp increase in the U.S.A. production between 1950 and 1970, and to theintroduction of the soybean to Brazilian agriculture in the sixties.

An important factor in this development was the considerableimprovement in the yields, through plant breeding and advanced agro technicalpractice. Consideration of the economic advantages of soybeans has led manycountries to start large scale production of this crop. The consequences ofthese efforts are now beginning to be seen. The share of the “rest of theworld” in the production scene has been growing steadily to reach the presentlevel of 23%(FAO, 1992).

Table 1. World production of soybeans COUNTRY

COUNTRY PRODUCTION

(million metric tons) kilogram/hectare

1976 1986 1987 1988 1976 1988

U.S.A. 34.4 52.8 52.3 41.9 1721 2270

Brazil 11.2 13.3 17 18 1750 1859

China 12.1 16.6 12.2 10.9 855 1443
WORLD 62.1 94.4 100.2 92.3 1384 1909
Source: FAO Production Yearbook, 1992

1.3 Marketing

Soybeans are marketed as most other major bulk commodities.Spot and future prices are governed by offer and demand. With the exception ofperiods of disastrous drought in the major producing areas, supplies have beenable to keep abreast of the increasing demand. Consequently, the price ofsoybeans on the international market has remained remarkably stable, despiteinflation.

Over 25% of the world production of soybeans is traded,unprocessed, on the international market. Most of the trading is done by asmall number of large companies. The U.S.A. is the leading exporter, withapproximately 75% of the traded volume. The leading importer is Japan. Inaddition, very considerable quantities of soybeans are processed in thecountries of production, for export as meal or oil. In fact, some countriesfavour the export of meal and/or oil over the export of unprocessed beans, as amatter of foreign commerce policy. As an example, exports of soybean meal fromBrazil far exceeds the quantity of raw soybeans exported by that country.

The peculiar meal/oil ratio of soybeans, as mentionedbefore, may create an exportable surplus of one of the two products. This typeof imbalance between the local demands for oil and protein explains part of theinternational commerce of soybean meal and oil.

Soybeans are sold by grade and the price is adjustedaccordingly. In the U.S.A., soybeans are classified as grains and as such,their grading is regulated by the U.S. Grain Standards Act. The criteria forgrading are test weight (weight per unit volume, lb./bushel), damaged seeds andcalor (proportion of green, brown or black beans). The purchaser may includeadditional quality parameters according to the end use. Moisture content is an absolute requirement and it is alwaysspecified in the contracts and certificates, regardless of grade.

Soybean production and trade quantities are often expressedin bushels. Although the bushel is a unit of volume, it can be converted toweight, assuming a standard weight-per-bushel value. One metric ton of soybeansis normally equivalent to 36.7 bushels. Conversely, one bushel of soybeansweighs 60 pounds or 27.24 kilograms.

1.4 Agricultural Characteristics

Soybeans grow well on almost all types of soil, with theexception of deep sands with poor water retention. The optimal soil pH is 6.0to 6.5, therefore liming may be required. With respect to climate, the soybeangrows best in temperate zones. The soybean is a so-called short-day plant,meaning that flowering occurs when the nights begin to lengthen. The breedingof varieties with different maturation periods (maturity groups) has permittedoptimal production in a wide range of latitudes. Recently, a worldwide program,known as the International Soybean Variety Experiment (ISVEX) and headed by theInternational Soybean Program (INTSOY) of the University of Illinois atUrbana-Champaign, demonstrated the feasibility of growing soybeans insubtropical and tropical regions as well. It was found that, given adequatevariety selection and under experimental conditions, the yields obtained attropical and subtropical locations were comparable to those observed undertemperate climate conditions (about 1950 kg. per hectare). Although the yieldsobtained in actual production by farmers are much lower, the results of thisremarkable experiment expand considerably the limits of the potential soybeangrowing areas of the world.

Rainfall in the range of 500 to 700 mm. is required for goodyields. Adequate water supply is especially important during the period of podand seed development (pod filling stage). Irrigation is now considered anessential factor for increased profit and security to the farmer.

An important characteristic of the soybean plant is itsnitrogen fixation capability through symbiosis with nodulating bacteria in thesoil. It has been estimated that up to 50% of the total nitrogen of the plantmay be supplied by the nitrogen fixing mechanism.

Soybeans are planted in late spring to early summer. Fullmaturity is reached in early-to-mid-autumn. At this point, the leaves start toyellow and drops and the seeds begin to lose moisture. The decision when toharvest is important. Ideally, soybeans should be harvested when the watercontent of the seed is 13%, the maximum safe moisture level for long-rangestorage. If the moisture content at harvest is higher, forced-air drying of theseeds will be required prior to storage. On the other hand, if the seeds aretoo dry, extensive splitting and cracking of the beans may occur in the courseof mechanical harvesting. Another factor to be considered is the respirationlosses of the seeds between maturation and harvesting. Respiration rate isstrongly moisture-dependent, being higher at high moisture content. Therefore,respiration losses may be considerable if harvesting is delayed too long when,for example, the rate of natural drying of the seeds is low, due to humidweather.

The use of heated-air dryers provides extra flexibility withrespect to harvesting time and rate of harvesting, independently of weatherconditions.

1.5 Physical Characteristics and Morphology of the Soybean

The shape of the soybean seed varies from almost sphericalto elongated and flat. The industrial varieties grown for oil are nearlyspherical while the elongated varieties are the ones used as a vegetable. Thecolour of the seed may be yellow, green, brown or black. Industrial varietiesare yellow and the presence of seeds of other colours in a lot is considered adefect. Seed size is expressed as the number of seeds per unit volume orweight. Industrial soybeans weigh 18-20 grams per 100 beans. The seeds of“vegetable” varieties are considerably larger.

Seed structure consists of the seed coat (hull) and twocotyledons, plus two additional structures of lesser weight: the hypocotyls andplumule. The cotyledon represent 90% of the seed weight and containspractically all the oil and protein in its palisade-like cells. Microscopicexamination of these cells reveals the presence of protein bodies (also knownas aleuron grains) and lipid bodies (or spherosomes) which constitute storage bodiesfor proteins and oil, respectively. Protein bodies measure, on the average, 10microns while the lipid bodies have, typically 0.2 to 0.5 microns in diameter.

The hull, which accounts for roughly 8% of the seed weight,holds the two cotyledons together and provides an effective protective layer.

1.6 Objective of the Study

The objective of this study is to determine the physical andchemical characteristics of Ife brown beans, soybeans and some of its products.Also to determine the nutritional value of these legumes.

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