SUPPLEMENTATION OF WHEAT FLOUR WITH SOME LOCAL LEGUMES

THESIS

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By

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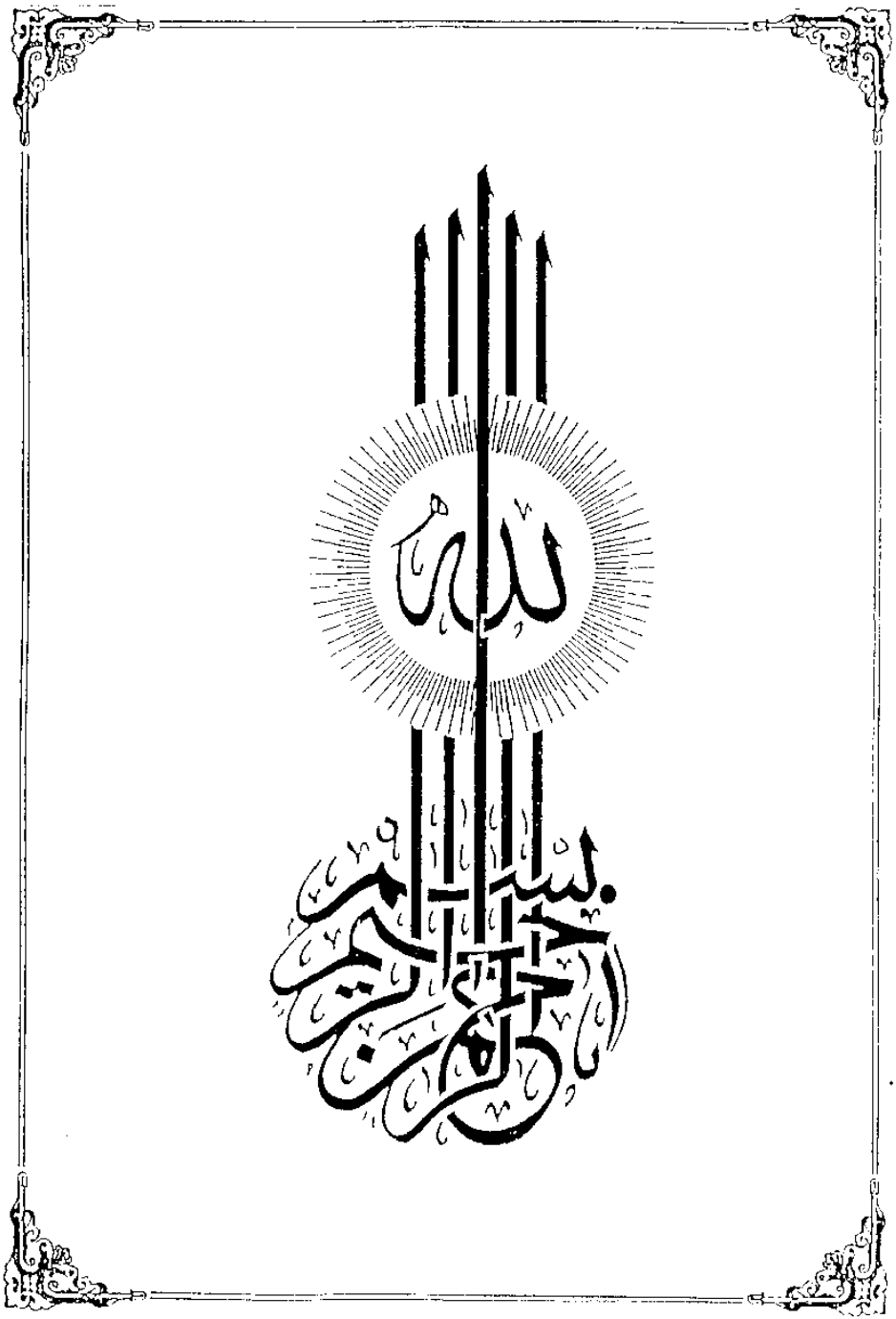

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INTRODUCTION

I N T R O D U C T I O N

In some agricultural countries the population has multiplied and out grown its present agricultural resources, nutrition has accordingly become a national problem. Such countries obviously require national policies under complete governmental directions.

Food, and its inadequate intake and utilizable proteins, stand to day as the most vital problem especially in developing countries.

Egypt is one of the developing countries where protein malnutrition remains the major problem of nutrition. In Egypt, as in mostsub-tropical and tropical countries supply of milk and animal protein is, on the whole, inadequate and attempt to increase their production are either impractical or uneconomical.

In 1960, Abdou, I. showed that raising the percaput animal protein consumption to 30 gm/day as in developed countries will require 250 million Egyptian pounds worth of meat every year. He declared that this is practically impossible and fortunately unnecessary if great attention is paid towards increasing production and consumption of legumes of different varieties.

Altschul, A.M., (1966) found that grains, the

stable food in most countries, provide nearly half of man's total supply of protein. In Egypt cereals supply about 64-75 % of total protein consumed.

Cereals are the cheapest and widest - spread sources of calories. They contain substantial amount of protein but they are not sufficient enough in quantity and lacking in quality. Human being not only needs a specified minimum amount of protein daily, but also protein of adequate quality. This shows the importance of cereals as a source of protein and how it is vital to use all available technical and scientific means to improve their protein quality and increase their production.

Satisfactory protein concentration may be achieved by supplementing the cereal grains with animal products or with other vegetable sources of protein.

Vegetable proteins are of lower nutritive value when compared to animal proteins because they do not contain amino acids in the proportions required by the animal body. They are usually deficient in one or more of the essential amino acids, e.g. sulphur containing amino acids, lysine, tryptophan or threonine. Sometimes, there is excess of certain amino acids causing amino acid imblance which inhibits growth and produces metabolic disturbances.

Vegetable sources of protein usually contain large amounts of carbohydrates, thus considered a bulky source of protein for infants and young children. They have lower digestibility and some of them contain intrinsic toxins or enzyme inhibitors.

Thus vegetable proteins if consumed individually are not efficient to promote growth in infants and children.

However, by the intelligent use of protein supplementation, vegetable proteins can be blended together to give mixtures of high nutritive value comparable to those of animal proteins.

Legumes form a good source of vegetable protein. Leguminous seeds have a high protein content. Their protein quality is usually from fair to good on the evidence that sulphur amino acids being the first limiting amino acid. Lysine which is deficient in cereals is present in sufficient amounts in legumes, thus they are of good supplementary value to cereal grains in raising their protein quality by scientific blending of both. This fact underlie the incorporation of legumes in cereal products such as bread to make a loaf of higher nutritive value.

Sandra, et.al (1978), showed that sulfur-containing amino acids are generally the first limiting factor in most legumes while tryptophan is most often next in deficiency. As they supply generous amount of lysine, legume protein complement well those in cereals which are generally low in lysine. Digestibility of legume proteins is a critical nutritional factor that varies from 51 -92 % (Patwardhan, V.1962). Cooking improves the bioavailability of many legumes by destroying certain antinutritional components inherent in them. Bressani, R. (1975), and Bressani, R., and Elias, L. (1969) showed that methionine supplementation of legumes protein markedly improves biological value and protein efficiency ratio.

In Egypt, leguminous seeds are the major nutritional source of plant proteins. These legumes include broad beans, lentils, lupinus termis, peas, fenugreek.... etc. Both broad beans and lentils are the most widely consumed legumes in Egypt.

The most important cereal grain in Egypt is wheat which is consumed mainly as bread, the stable food in Egypt.

Matz, S.(1959), showed that the composition of wheat varies from area to area and from year to year

within given area. Its protein content ranges from 7-18%, minerals from 1.5 - 2%, lipids from 1.5 - 2%, cellulose from 2 - 2.5 %, starch from 60-68% and moisture from 8 - 18 %.

The bran of wheat is rich in protein, phosphorus, iron, and vitamins (thaimine, riboflavine and niacin).

The main wheat exporting countries in the world are: U.S.A., Canada, Australia and Argentine.

These four countries sell 90% of the total amount of wheat that is put on the world's market (Wilfred, J. 1966).

Kinds or Classes of Wheat

Common Wheats:

It is a group consisting of hard red winter, soft red winter, hard red spring and white wheats. The spikelets of common wheats usually contain two or three kernels but sometimes four or more. They vary in colour from white to dark red and in texture from hard to soft.

Hard red winter wheat:

Rich in protein, varying from approximately 12 to 16 %. It ranks second only to hard red spring wheat in quality. The hard wheat are dark in colour show no white starch, high in gluten and make a "strong" flour used for breadmaking.

Soft red winter wheat

This is grown mostly under humid conditions. It has a low protein content (8 to 11). The soft wheat are pale in colour and show a white starchy interior. It is low in gluten,make "a weak" flour and are preferred for making biscuits, crackers, pies and starchy breakfast foods.

Hard red spring wheats:

This class of wheats is noted for its high protein content (12 to 16 %) and excellent bread-making. It is used extensively for blends with weaker wheats throughout the world.

White wheat:

White wheats are mainly used for pastry purposes, but some of them go into shredded wheat and bread.

Durum wheat:

Hight in protein. It grows within the hard red spring wheat areas. The center of production is generally moving to drier districts. The crop is used largely for making macaroni, spaghetti, vermicelli, and other edible pastes. The kernels of this type are the hardest known, therefore it is called "hard wheats". The spikelets contain 2 to 4 kernels. The kernels are long and very hard.

Club wheat:

It is minor in importance. It is used for making starch flour for pastry. The spikelets contain from 3-5 kernels. The kernels are usually short and small. The clums are short, stiff and erect, used for making crackers and starchy breakfast foods and in some localities the flour is used for breadmaking.

The strength of the wheat flour depends largely upon the gluten it contains, which gives to bread its elastic quality and its ability to absorp- water. Gluten may be removed from dough by washing with water.

A good quality gluten is pale yellow in colour tenacious and elastic. Gluten of poor quality is dark coloured tenacious but not elastic.

Hard red spring and hard red winter wheats contain an average of about 11 to 15 per - cent protein, while soft wheats contain 8 to 11 % protein (Matz, S., 1959).

The factors influencing the protein content of wheat have been studied because cereal grains are grown over wide areas and their protein content is an important index of quality for the manufacture of various types of wheat products.

Regions with mild, humid climates resulting in a long growing season and slow maturation will produce starchy kernels of low protein content.

Soils which are moisture- retentive and have a high percentage of their moisture available for the use of the plant, tend to yield grain of relatively low protein content. (Jacobs, 1951).

Other factors being equal, an increase in protein content is obtained by increasing the "available nitrogen" in the soil. Thus, under similar climatic conditions wheat grown on summer after legumes is generally of higher protein content than when grown after cereal grains or grasses.

Experiments reported in the literature show that phosphates applied in liberal amounts generally lower the protein content. While potassium bearing fertilizers do not materially affect the composition of the grain. (Jacobs, M., 1951).

Mierl, W.; Elbaya, A., (1978), showed that vitreous kernels of the wheat varieties Jubilar and Caribo were higher in protein content, sedimentation value, and wet gluten content than mealy grains. The ratio of soluble protein content to the total protein content and of gliadin to glutenin in vitreous kernels was

lower than that in mealy grains. Electrophoretic and gel chromatographic studies suggest higher H bonding forces between protein mols. of vitreous kernels. Nonstarch lipids are more extractable in mealy kernels because of the smaller compact nature of the protein matrix. Mealy grains produce higher amounts of break flour with lower mineral content than vitreous kernels.

Drews, E., (1979), found that kernel structure and components vary with location in the endosperm and hull and this affects the milling properties of bread cereals.

The significant factors for milling are the amount and distribution of hydratable materials (protein, pentosans, hemicellulose, glucum) in the cell walls of the endosperm and hull. When these components absorb water they are more difficult to mill. Kernels low in protein and hydratable components have mineral and enzyme containing separating layers that are more easily attacked in milling than kernels high in protein. The enzymes can then hydrolyze the kernel starch and aleurone cell walls, affecting flour quality.