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Abstracts of Original Communications

NUTRITIONAL VALUE OF BREADS MADE FROM WHEAT FLOUR AND WHEAT-MAIZE COMPOSITE FLOUR. I.O. Sotiku* and A. Akinlade.

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In Nigeria, the use of composite flour in bread making will reduce the amount of foreign exchange expended on wheat importation. The nutritional value of breads from wheat flour (B) and wheat flour diluted with locally available maize flour at 25% (B25) and 40% (B40) levels was assessed by chemical analysis and rat bioassay. The three bread types contained similar amounts of protein, fibre, energy and carbohydrates. Substitution of wheat flour with 25% maize flour increased the fat content of bread from 1.5% to 2.4%, calcium, 31mg to 58mg, iron, 24mg to 41mg and manganese, 9.0mg - 20.4mg/100g. Protein efficiency ratio of B (1.6) was higher but not significantly different ($P < 0.5$) from 1.48 and 1.44 for B25 and B40 respectively. True protein digestibilities for B, B25 and B40 were 0.87, 0.84 and 0.86 respectively. Substitution of wheat flour with 25% maize flour gave acceptable bread of nutritional value comparable to that of wheat flour bread. The flavour, texture and volume of bread from B40 were unacceptable in spite of its observed nutritional value.

NUTRIENT QUALITY OF HEAT-TREATED WHEAT CEREALS:

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In order to evaluate the effects on nutrient quality of heat-processed wheat cereals, several processes like extrusion cooking, drum drying, steam flaking, autoclaving and popping were compared during mild and hard conditions, respectively. The samples intended for gruels, porridge and breakfast cereals, were processed by a Swedish Baby Food Company (Semper AB).

Effects on protein quality and vitamin retention was studied. Protein quality was evaluated using biological methods (TD, BV and NPU). In addition amino acid pattern was determined as well as available lysin by a chemical method using FDNB as reactant. The retention of thiamine analysed according to the thiochrome method and folate retention was followed microbiologically using *Lactobacillus casei* (ATCC 7469) after hydrolysis with thermamyl and chicken pancreas.

Losses of protein quality varied between almost zero and 40 per cent. For losses above 20 per cent, FDNB-reactive lysin and the biological value of protein agreed, but for lower losses, the chemical method was less sensitive. The retention of thiamine and folate followed each other, but was lower for thiamine. It varied between zero and 100 per cent for thiamine and between 100 and 25 per cent for folates.

The wide variations in how various processes affected the nutrient quality will be explained in terms of process parameters.

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REPLACEMENT OF THE PEANUT OIL USED IN THE FORTIFICATION OF SUGAR WITH VITAMIN A FOR OTHER VEGETABLE OILS. L.A. Mejía* and O. Pineda. Institute of Nutrition of Central America and Panama, Guatemala City, Guatemala, C.A.

The objective of this study was to determine the technical feasibility of replacing the peanut oil currently used in the preparation of the premix to fortify sugar with vitamin A, for other vegetable oils available in Central America. For this purpose, cottonseed, soybean, corn and African palm oils were tested. Premixes were prepared using each one of the oils; and were stored for evaluation during a six month period. A premix prepared with peanut oil was used as control. It was found that the stability of vitamin A was similar in all premixes; less than 10% of the original activity being lost throughout the duration of the study. The physical characteristics of the premixes were also acceptable, with the exception of the one containing soybean oil which became caked and rancid. The peroxide content of the oils contained in the premixes increased throughout the study. The lowest level of oxidation occurred in the premix made with the African palm oil. Its peroxide content only changed from 1.4 to 8.8 mEq/kg of oil. In contrast, that containing soybean oil showed the greatest change in peroxides, from 2.8 to 130.0 mEq/kg of oil. It is concluded that it is technically feasible to substitute the peanut oil by another vegetable oil; this oil must be low in peroxides and high stability. Furthermore, it should not alter significantly the stability of the vitamin A contained in the premix during storage. On this basis, the African palm oil was the most suitable.

AMARANTH GRAIN: NUTRITIONAL VALUE OF AN ANCIENT CROP. B. Pedersen* and B. O. Egeun, National Institute of Animal Science, Roskildevej 25, DK-1958 Copenhagen V, Denmark.

At the time of the Spanish conquest, amaranth was a major crop in the Americas. Amaranths are cereal-like plants that produce small, high-protein grains; and the nutritional value of three pale seeded and one dark-seeded variety of *Amaranthus caudatus*, grown in Peru, was studied by chemical analysis and in balance experiments with growing rats. Effects of processing: popping, toasting and flaking were also examined.

The seeds contained 14-16% protein, 10% fat and 3% ash. The pale seeded varieties contained 64% starch and 8% dietary fibre. The black seeds had a higher content of fibre (16%). Tannins were present at a low level, about 0.3%; and all seeds contained heat-labile trypsin inhibitor activity. Amino acid analysis indicated that the limiting amino acids were leucine, followed by valine and threonine. Lysine concentration was very high, about 5.5 g/16 g N. True protein digestibility as well as energy digestibility of the pale seeds ranged from 87 to 90%; there were no major effects of processing. Digestibility of the black seeds was much lower, about 78%, and protein digestibility was further reduced to 68% by toasting. The biological value of the protein was quite similar for all products and very high (83-88%). The content of minerals and phytate varied among varieties and was also affected by processing. Femur zinc concentrations were low, except in the group of rats fed flaked amaranth. Amaranth is an unconventional crop which deserves further attention.

NUTRIENT STABILITY KINETICS OF MAIZE DURING PROLONGED STORAGE.

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Maize of yellow (8329-22) and white (8339-17) varieties were stored at a moisture content of 10 and 12% for 6 and 8 months respectively at 0°C, 24°C, 55°C and ambient temperature. The storage study was carried out using whole grains and flours packaged in air tight plastic containers. The non-enzymatic browning free amino acid, reducing sugars, peroxide value, acidity and in-vitro digestibility changes were monitored over the period. The visible browning measured by the Hunter's L-values was most apparent in the grains stored at 55°C and the effect was more in the whole grains than in the flours. Other parameters including the percent digestibility varied with the temperature, time and physical conditions. The differences in the parameters measured in the two varieties during the storage time was suggestive of compositional influence. The kinetics of the changes were determined and attempt was made to use the kinetic parameters from the fixed temperature study to predict the quality of the grains stored under atmospheric conditions.

CULTIVATION AND PROCESSING OF BRASSICA OILSEED AND UTILIZATION OF OIL IN FOODS IN AN INDIAN VILLAGE: SCOPE FOR IMPROVEMENT. 2/PROCESSING. R. Ohlson¹, S.-A. Liedén², C. Tullin¹ and L. Hambræus². ¹Karls-hamns AB 20992 Karlshamn, ²Institute of Nutrition 75123 Uppsala. Unique techniques for oilseed processing have been developed in Indian villages and consumer preference for these oils have been established. These oil mills have been based on a bullock driven pestle crushing seed in a stationary mortar (ghani mill). Technological development in recent decades has replaced the expensive bullock with an economic electric motor. Other benefits are higher oil yield and reduced processing time. To meet the competition from the large city expeller industries simplicity, economy and sensory qualities of the oils are of importance for village mill. Toxic split products from Brassica seed glucosinolates are supposed to be determinants of sensory qualities. Processing conditions as well as seed materials are of importance for the formation of these oil constituents. Influence of seed material and processing conditions on sensory qualities and toxicity of oils were investigated. High and low glucosinolate seeds were processed in one bullock and one motordriven ghani. Four motorghanis were combined with a baby expeller extracting residual oil left in ghani press-cake. A large city mill based on 56 motorghanis and 4 expellers (connected in series) was also included in the study. Processing time, temperature and added water were recorded. Oil yield and quality (FFA, AV, PV) were analyzed. Split products in oil were estimated by analysing intact glucosinolates in seed and cake. Composition and amount of individual split products varied considerably.