NUTRITIONAL EVALUATION OF OILSEEDS AND LEGUMES AS PROTEIN SUPPLEMENTS TO CEREALS

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ABSTRACT

Several oilseed and legume protein products were fed to rats as the sole source of dietary protein, and in blends with cereals for the determination of protein efficiency ratio (PER) and biological availability of amino acids. In addition oilseed protein isolates were fed to mice for the determination of PER. Results of the mouse study revealed that the adjusted PER (casein=100) for Target rapeseed isolate (108) was higher than those of sunflower (74), safflower (77), soybean (86) or flax (92) isolates.

Results of the rat trials revealed that the adjusted PER for Tower rapeseed meal (88) was higher than those of fababean (21), field pea (59) and soybean meal (72). Supplementation with methionine (0.2%) resulted in improved PER for fababean (84), field pea (101) and soybean meal (97). Mustard flour and rapeseed flour gave PER of 109 and 106, respectively, while the value of sunflower flour was low (56). Protein isolates of Tower rapeseed and soybean gave PER of 92 and 80, respectively. Blending of legumes and oilseeds with wheat flour (PER=28) gave high PER

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values (60-85), as also occurred in rice blends (71-88). Supplementation of wheat-legume blends with lysine (0.4%), methionine (0.2%) and threonine (0.1%) brought all PER values above 100. It appeared that differences in PER of the diets paralleled the levels of the first limiting amino acid for rat growth. Results of balance trials indicated that the availability of the limiting amino acid(s) was lower than other essential amino acids for each protein source.

INTRODUCTION

The world-wide shortage of plant and animal protein for human nutrition has been given high priority in development programs sponsored by the WHO, FAO and other agencies of the United Nations. In the heavily populated regions of the world, the protein problems arise from an excessive dependence on cereal grains and root crops for most of the dietary calories. Oilseeds and grain legumes are higher in protein content than cereals, and contain moderate to high levels of lysine to balance deficiencies of cereal-based diets. Although their protein contents are high, most oilseed meals are fed to livestock because of dark colours, unpalatability and higher crude fibre levels. However, dehulling prior to solvent extraction of oilseeds results in protein flours (ca. 50% protein) which in turn can be used to obtain protein concentrates (ca. 70% protein) and isolates (ca. 90% protein). In the United States, the processing technology for soybean has been developed for the production of food grade protein flours, concentrates and isolates and their textured products, and more recently cottonseed, peanut and sunflower have received substantial attention. There is on-going research in Canada to develop food grade protein products from rapeseed, mustard, field pea, fababean, and many other Canadian crops. The establishment of the POS Pilot Plant Corporation in Saskatoon, Saskatchewan, to provide physical facilities for technology development in processing various crops to the level of food and feed grade products, is generating considerable interest and impetus to the establishment of a plant protein industry in Canada.

Extensive research has been done on the functional and nutritional properties of soybean flour, concentrate and isolate. Similar studies on the protein products from other oilseeds and legumes are of current interest in many research centres. The objectives of this