Biochemical Characteristics of Sorghum (*Sorghum bicolor* L. Moench) Flour Supplemented with Cluster Bean (*Cyamopsis tetragonoloba* L.): Influence of Fermentation and/or Cooking

1Hayat Z. Elbashir, 2AbdelMoniem I. Mustafa, 2Abdullahi H. El-Tinay and 2Elfadil E. Babiker
1Department of Biochemistry, Faculty of Science, University of Juba, Khartoum North, ElKadaro, Sudan
2Department of Food Science and Technology, Faculty of Agriculture, University of Khartoum, Khartoum North 13314, Shambat, Sudan

**Abstract:** The aim of the present study is to investigate the effect of cluster bean supplementation followed by fermentation and cooking on biochemical characteristics of sorghum cultivars flour. Two Sudanese sorghum cultivars (Dabar and WadAhmed) were supplemented with cluster bean. The flour of the two cultivars and supplements were fermented for different periods of time and then cooked. The proximate composition of the cultivars flour and cluster bean showed that the protein was found to be 8.36, 9.76 and 44.65% for Darar, WadAhmed and cluster bean, respectively. Fermentation of the cultivars flour for different periods of time significantly (p<0.05) changed the titratable acidity, non protein nitrogen, crude protein and the dry matter for both cultivars. The protein digestibility of the cultivars flour and supplements was significantly (p<0.05) increased with fermentation time even after cooking. The protein fractions contents of the flour before and after cooking and that of the supplements were fluctuating for both cultivars. Lysine content of the cultivars flour was significantly (p<0.05) increased with fermentation time even after supplementation. However, other amino acids contents were fluctuating with fermentation time before and after supplementation for both cultivars.

**Key words:** Fermentation, supplementation, sorghum, cluster bean, protein fractions, amino acids

**INTRODUCTION**

Malnutrition and under nutrition are prevalent in several parts of the developing countries in the world. The reasons behind this situation include high population density, poor socioeconomic status for the people, inadequate sanitary and health facilities and non-availability of enough quantity and quality of foods (FAO, 1997). Although these factors are closely interrelated, major food sources, dietary habits and the processing methods used in the preparation of food significantly influence the nutritional status of the populations. Animal foods, although excellent in nutritional quality, are not available in enough quantity to these populations mainly due to their higher costs and certain religious traditions and customs. Hence, greater emphasis has been placed throughout the world on increasing the production of plant foods, improving their nutritional quality and developing simple and economical methods for their storage and processing. Cereals, legumes and oil seeds form a major bulk of dietary proteins, calories, vitamins and minerals to the developing nations (Steller, 1993). With increasing dependence upon cereal grains to provide both energy and protein requirements for man living in the developing countries, the need for raising the overall nutritional status of cereal grains has become increasingly important and much effort has been made to improve the amount and quality of cereal proteins. Many methods employed to improve the nutritional quality and organoleptic properties of cereal-based foods include genetic improvement, amino acid fortification, supplementation or complementation with protein rich sources such as grain legumes and defatted oil seed meals (Ibrahim *et al.*, 2005). In recent years large and concentrated efforts have been directed to enhance the nutritional quality of almost all agriculturally significant cereal grains and in particular aimed at attaining the most favorable levels in the essential amino acids in cereal proteins such as sorghum and millet. Sorghum like other cereals is known to be deficient in lysine which creates amino acid imbalance and subsequent growth retardation. Therefore, various means have been proposed to improve the nutritional quality of dishes prepared from sorghum; these include germination and fermentation to increase the available lysine level (Ibrahim *et al.*, 2005). According to FAO (1997) sorghum (*Sorghum bicolor* (L.) moench) is considered as one of the most important food crops in the world, following