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Food Chemistry 77 (2002) 193–196

Food Chemistry

www.elsevier.com/locate/foodchem

Effect of fermentation and dehulling on starch, total polyphenols, phytic acid content and in vitro protein digestibility of pearl millet

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Received 24 April 2001; received in revised form 10 September 2001; accepted 10 September 2001

Abstract

Two pearl millet cultivars: Standard and Ugandi, obtained from El Obeid Research Station, were used in this study. Investigation showed that the Ugandi variety had significantly ($P \leqslant 0.05$) higher polyphenols and phytic acid contents than the standard and significantly lower in vitro protein digestibility (IVPD), (72.7 and 70.4% for the Standard and Ugandi, respectively), indicating lower nutritional quality. The two cultivars were fermented for 14 h at room temperature (30±2° C) and starch, polyphenols, phytic acid and IVPD were determined at 2-h intervals. Dehulling was found to cause a significant reduction in protein, polyphenols and phytic acid contents for the two cultivars. Fermentation and dehulling caused a significant increase in the IVPD for the two cultivars: 82 and 84% for the fermented ones and 79.1 and 78.6% for the dehulled samples.

Keywords: Dehulling; Fermentation; In vitro protein digestibility; Pearl millet; Phytic acid; Starch; Total polyphenols

1. Introduction

Bulrush millet (*Pennisetum typhoideum*), also known as pearl millet, is of the same order and height as maize and sorghum; it is the most drought-resistant millet. Pearl millet is sown on about 15 million ha in Africa and 12 million in Asia (Riley, Gupta, Seetharama, & Mushonga, 1993). Among millets, pearl millet is known to have a higher protein content and better amino acid balance than sorghum. The higher ratio of germ to endosperm is responsible for the higher protein content (Dendy, 1995).

Fermented cereal products are widely consumed in India and many countries of Central and Southern Africa. Fermentation usually involves malting and souring by mixed cultures of yeast and lactobacilli. Fermentation causes degradation of grain components, especially starch and soluble sugars, by both grain and fermented media enzymes (Chavan & Kadam, 1989a, 1989b).

Generally, in Africa and Asia, sorghum and millets are consumed after decortication; the grains are wetted and decorticated traditionally using a wooden mortar and pestle. Decortication is found to decrease antinutrients of pearl millet, decreasing the total polyphenols and phytic acid (Monawar, 1983), increasing starch content (Almeida-Dominguez, Serna-Saldivar, Gomezma, & Rooney, 1993) and increasing the IVPD (Dhankher & Chauhan, 1987).

2. Materials and methods

2.1. Materials

Two pearl millet cultivars, Standard and Ugandi, obtained from El Obeid Research Station, were cleaned and ground to pass a 0.4-mm screen. Another portion was dehulled mechanically and the milled part was used to prepare the fermented dough.

2.2. Preparation of dough

Fermented dough was prepared in the traditional domestic way. Pearl millet flour (600 g) was mixed with 600 ml water; previously fermented dough (150 g) was then added to the mixture of flour and water to act as a starter. After thorough mixing, samples were taken at 2 h intervals until the end of fermentation, which was terminated after 14 h at ambient temperature (30±2 °C). Samples were dried in an air oven at 70° C and were finely ground.

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0308-8146/02/$ - see front matter
PII: S0308-8146(01)00336-3