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Quantitative Variation in the Amino Acid Pattern of Some Rice Varieties

By

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ABSTRACT

A study was made to compare the protein quality of nine important ruling rice varieties of Tamil Nadu. Higher levels of most essential amino acids were observed at medium protein content. Bhavani and CO 36 with medium protein content possessed a better concentration of some essential amino acids than Karuna which had the maximum protein content. In general, protein content correlated negatively with lysine.

INTRODUCTION

The importance of rice in protein-deficient Asian diets is well known. Among cereal proteins, rice protein has one of the best nutritional values (Juliano, 1972) as it contains all the dietary essential amino acids, though improperly balanced (Patrick and Hoskins, 1974). Varieties like Bhavani, Karikalan, CO 36, have been obtained by refined breeding techniques and released for cultivation among the farmers in Tamil Nadu (Srinivasalu *et al.*, 1973 and Swaminathan *et al.*, 1973). The present study aims to compare the nutritional quality in terms of amino acid concentration to protein content on such varieties.

MATERIALS AND METHODS

The rice varieties chosen for the present study include Bhavani, Karikalan, Karuna, Sona, Vaigai, CO 25, CO 36, IR 20 and ASD I harvested in the *Khariff* season of 1973. All the samples were obtained from the Paddy Breeding Station, Tamil Nadu Agricultural University, Coimbatore. The samples were dehusked and ground to a fine powder with a mortar and pestle manually.

Crude Protein Determination: Accurately weighed 0.1 g portions, in triplicates, of the well mixed ground sample were used for determination of total N by the Kjeldahl Gunning-Arnold method (AOAC, 1965). The conversion factor of 5.95 x N was used for calculating crude protein content. Analyses are reported on moisture-free basis.

Amino Acid Analysis: Amino acid contents were determined by conventional procedures with a Perkin-Elmer Model KLA-3B amino acid analyzer. Accurately weighed 0.2 g of the finely ground rice sample was weighed into hydrolysis tubes and 6 ml of 6 N HCl was added. The acid sample

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mixture was frozen and thawed to remove entrapped air and then hydrolyzed under vacuum at 110°±1°C for 24 hr. Hydrolyzed solutions were centrifuged at 2000 rpm, washed with 20 ml of 0.1 N HCl and evaporated to dryness in a vacuum desiccator. Excess HCl was removed by repeated evaporation *in vacuo* using a few ml of deionized water each time. The residue was dissolved in 2 ml of pH 2.2 buffer and subjected to adsorption chromatography on Dowex 50 W (H^+) 200–400 mesh column (200 x 16 (ID) mm). The sample was washed with 80 ml of deionized water and the amino acids eluted with 100 ml of ammonia solution. The eluate was evaporated to dryness in a rotary flash evaporator at 45–55°C. A few ml of deionized water was added thrice to the residue and reevaporated to dryness. Finally, the residue was dissolved in a known quantity of pH 2.2 buffer, centrifuged (2500 rpm) and the supernate analyzed. Values for isoleucine, serine, threonine and valine were corrected for their incomplete hydrolysis or degradative loss during hydrolysis by multiplication with the factors 1.078, 1.082, 1.036, and 1.081, respectively (Kohler and Palter, 1967). Tryptophan could not be determined by this method of hydrolysis. As the sulphur-amino acids were partially oxidized to cysteic acid, only those which were unoxidized and unseparated were calculated together. Results are expressed as g amino acid per 16.8 g N.

RESULTS AND DISCUSSION

Protein and amino acid contents of the individual rice varieties are presented in Table 1. The protein content ranged from 4.94 – 8.90 g per cent. The variety Karuna had the maximum protein and Sona, the lowest while the remaining varieties had a range of 6.47 to 8.19 g per cent. According to Beachell *et al.* (1972), rice varieties containing 6 to 8 per cent protein are grouped as low protein varieties. Thus Karuna and Vaigai with a protein content of above 8 g per cent, alone can fall into a high protein group while the following percentages of Karikalan (7.99 g), CO 25 (7.52 g), CO 36 (7.28 g), IR 20 (6.70 g), ASD 1 (6.55 g), and Bhavani (6.47 g) belong to the low protein group.

The contents of lysine and threonine, the two most limiting essential amino acids of rice, are compared in Figure 1. Lysine was

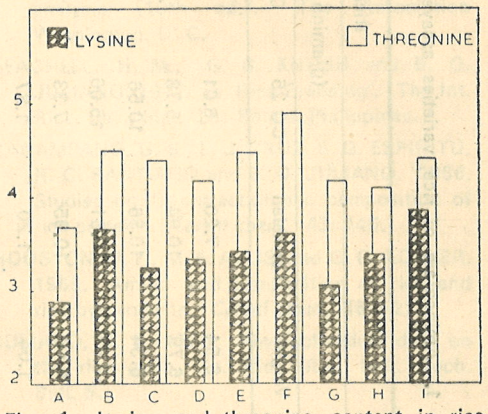

Fig. 1. Lysine and threonine content in rice varieties

found high in Bhavani (3.83 g/16.8 g N) and threonine in IR 20 (4.90 g/16.8 g N). Sona had the lowest lysine content (2.87 g/16.8 g N) and CO 36 of threonine (4.03 g/16.8 g N). Several investigations have shown a significant decrease in lysine content when protein content increased (Cagampang *et al.*, 1966 and Houston *et al.*, 1969). Although not proportionally significant, a decrease in lysine