Protein quality traits of vegetable and field peas: Varietal differences

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Abstract. Four high yielding varieties of field (Rachna and RFP₄) and vegetable peas (Bon-nivielle and Arkal) were studied for their protein quality. Crude protein and true protein content of all four pea varieties varied from 19.5 to 20.6 percent and 18.7 to 19.8 percent, respectively. Non protein nitrogen formed only 3.94 to 4.84 percent of total nitrogen. Globulins were the major fractions followed by albumins and glutelins. All the four varieties of peas had similar methionine and tryptophan content. Lysine content of four pea varieties ranged from 7.56 to 9.65 g per 16 g of N. Cooking brought about an increase in in vitro protein digestibility of peas by 10 percent. The sodium dodecyl polyacrylamide gel electrophoresis of total protein revealed the presence of 22–25 bands with some difference in banding pattern of all four varieties. Some differences were observed in banding patterns of globulin and albumin of all four varieties, suggesting that composition of protein of pea varieties differed.

Introduction

Legumes are among the earliest food crops to be cultivated by man. Peas, beans, and lentils are consumed directly as food in many parts of the world and are important sources of dietary proteins in developing countries where animal protein is scarce or expensive or is not consumed for religious or cultural reasons. Availability of legume protein to the population can be increased by introducing new high yielding varieties of legumes which have a high protein content, early maturity, are resistant to disease and pests and can be grown in dry and fertile land.

Peas (*Pisum sativum*), a rich source of vegetable protein, are grown in temperate regions throughout the world, including high elevations of the tropics. Cultivars are known which can succeed as winter annuals in relatively hot countries like India. Proximate composition of peas is similar to that of other grain legumes. The seed contains high levels of protein, carbohydrate and low concentrations of fat and fibre. Peas have a potential
to serve as protein concentrate and can be processed to produce high protein containing products [1]. One of the most important advantages of peas is that they are resistant to damping off and powdery mildew.

The plant breeders are producing high yielding cultivars of peas so as to meet the protein requirements of growing population especially in developing countries like India. Besides quantity, quality of plant proteins is of paramount importance which depends upon the essential amino acid composition and their availability, amino acid imbalance, protein digestibility and anti-nutritional factors, etc. This paper presents the crude protein, true protein, essential amino acid composition, protein digestibility (in vitro and electrophoretic pattern of four new high yielding varieties of field and vegetables peas which are evolved by the Department of Plant Breeding, Haryana Agricultural University, Hisar, India.

Materials and methods

Materials. Dry mature seeds of four varieties of field and vegetable peas, i.e. Rachna, HFP₄, Bonnivielle and Arkal were procured in a single lot from the Department of Plant Breeding and Vegetable Crops, Haryana Agricultural University, Hisar, India.

Preparation of samples. The samples of different varieties of peas were cleaned of broken seeds, dust and other foreign materials and were ground in an electric grinder (Cyclotec, M/s Tector, Hōganäs, Sweden) using an 0.5 mm sieve and were used for further chemical analysis. To determine the in vitro protein digestibility, pea flour samples were cooked by autoclaving at 15 psi for 15 minutes.

Methods

Crude protein. Crude protein (N x 6.25) content in the samples was estimated by using the micro Kjeldahl method [2].

True protein nitrogen and non protein nitrogen. The true protein nitrogen was estimated by the methods described by Osborne and Voogt [3]. The nitrogen thus obtained (true protein nitrogen) was subtracted from the crude protein nitrogen to calculate the non protein nitrogen content.

Fractionation of proteins. The protein fractionation was carried out by the method of Naik [4] as modified by Singh et al. [5] by successive extraction