

Chapter 13

Agricultural Trade and Undernourishment, Nutrition, and Dietary Diversity: The Use of Elite Selection Cultivars of Legumes

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ABSTRACT

The results described in this chapter are of the investigation based on the collaborative research of scientists from the three Russian universities (Omsk State Agrarian University, Bashkir State Agrarian University, and Orenburg State University) which started in 2014. The authors assess various indicators of food safety. The study includes physical and chemical properties, technological characteristics, and chemical composition of new elite selection cultivars of pea ("Pisum arvense", the harvest of 2018, Bashkir Scientific and Research Institute of Agriculture) and haricot bean (harvest of 2018, Omsk State Agrarian University). Most of the samples have increased phytochemical capacity and high protein concentration (21.15-22.49% in haricot bean; 19.38-23.75% in pea). The authors demonstrate that these cultivars can be used for the enrichment of foodstuff and the creation of new functional foods.

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INTRODUCTION

In the previous decade, factual nutrition of the world population can be characterized as unsatisfactory. Nutrition is the intake of food considered in relation to the dietary needs. Proper nutrition (an adequate, well-balanced diet combined with regular physical activity) is a cornerstone of good health (Food and Agriculture Organization of the United Nations [FAO], 2013). The priority of state policy is ensurance the right of people for balanced nutrition. The disturbance of food status causes health disorders and leads to the development of foodborne diseases, such as atherosclerosis, hypertension, obesity, diabetes mellitus, osteoporosis, arthralgia, and malignant tumors, among others. The maintenance of health along with the prevention of foodborne diseases seem to be the aims of utmost importance for the governments worldwide (Tutelyan, n.d.)

According to Tutelyan (2005), globally, there is a decrease in consumption of meat, dairy, and fish products, vegetable oils, vegetables, and fruit. Meanwhile, there is an increase in consumption of fat, sugar, confectionery, bakery products, bread, and potato. Despite the abundance of feedstuffs and low level of hunger in the world, there is a steady deficiency in consumption of quality protein, essential nutrients, vitamins, and food fibers. The problem is particularly relevant in Russia, where over 80% of people struggle the deficiency of crude protein consumption. The average norm of protein consumption is 90-100 grams per day including 60-70% of animal protein. According to the standards of physiologic requirements in energy and feedstuffs for various groups of population in Russia (Government of the Russian Federation, 2008), animal proteins should provide at least 50% of a daily diet of an adult individual, while plant proteins should make the remaining 50%. For adults, daily physiologic need for proteins is 65-117 grams for men and 58-87 grams for women. Currently, the deficiency of animal proteins varies from 15% to 20% of the recommended norm. It does not meet the recommendations of the World Health Organization (WHO) and the standards of physiologic requirements in energy and feedstuffs in Russia (Government of the Russian Federation, 2008).

Globally, the general deficiency of protein is estimated at 10-25 million tons per year. About half of the global population suffers from a lack of protein. Apart from proteins, the deficiency in other nutrients (fats, carbohydrates, vitamins, and microelements) leads to weaker immunity, increase in disease vulnerability, and disturbance of physical and mental development. The need for protein is an evolutionarily developed dominant in human nutrition caused by the need of providing optimum physiologic level of irreplaceable amino acids intake. Two groups of proteins are defined in the structure of world resources of food protein, i.e. plant protein and animal protein. The sources for animal protein are meat and meat products, dairy, and fish and fish products which can be absorbed by up to 93-96% by a human organism. They include the full amount of irreplaceable amino acids sufficient for protein biosynthesis in a body. Plant proteins are derived from oil, grain and leguminous crops, root and tuber crops, nuts, vegetables, and melon cultures. In plant proteins, there is a deficiency of irreplaceable amino acids. Also, they contain inhibitors of proteinase that reduce digestion of proteins. Plant protein is absorbed by up to 62-80% by a human organism. Despite the high biological value of plant proteins, the correlation of plant and animal proteins makes 80% and 20%, respectively, in the world nutrition balance.

Beans and cereal crops grain are the traditional sources of protein ingredients. Over the times, grain crops have been particularly important in the formation of protein sources. However, their widespread application is limited by the content of gluten which may cause food allergy among certain groups of people. One of the solutions of this problem is production of soybeans and other crops, such as pea, chickpea, lupine, vetch, lentil, haricot bean, and other leguminous crops (Table 1).

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