Harmful substances in legume seeds – their negative and beneficial properties

D. Jamroz, J. Kubizna

Department of Animal Nutrition and Feed Quality, Wrocław University of Environmental and Life Sciences, Chełmońskiego 38C, 51-630 Wrocław, Poland

Abstract

The leguminous seeds constitute a valuable source of feed and dietary protein, however, they contain also many different substances that are recognised as antinutritive factors. This review deals with harmful substances and composition of leguminous seeds, their profitable and negative activity considering also the effect on physiology of digestion, intestinal functions and health of animals.

Key words: animal nutrition, leguminous seeds, antinutritive substances activity

Leguminous plants, particularly their seeds, are the important source of protein for humans and animals in many countries worldwide, especially in Asia, Africa and South America. These foods and feeds contain ca. 22-45% of protein and different important minerals (Petterson and Mackintosh 1994). Leguminous plants are also rich source of different active substances, among them also harmful or even toxic ones (Marquardt et al. 1977, Zduńczyk et al. 1994, Duranti and Gius 1997, Huyghe 1997, Erbas et al. 2005, Duranti 2006). It should also be considered that the most harmful substances occur in seeds.

Legume seeds, independently of species and varieties, are rich in the globulinous active proteins characterized by the specific amino acids composition. They are rich especially in lysine (Duranti and Gius 1997, Duranti 2006), but are deficient in methionine and isoleucine (Sujak et al. 2006) (Tables 1, 2). In comparison to the best, high-proteinous feedstuffs, such as soya bean meal, leguminous seeds contain in total less amino acids, however much more than cereal grains. Characteristic for these seeds is low concentration of sulfur amino acids, so, application of a great amounts of them to animal diets causes the necessity of simultaneous supplementation of the diets with DL-methionine. Biological value of leguminous seeds protein is in general lower (45-52%) when compared to grains (62-68%) mainly because of the less profitable amino acids balance. Legume proteins can reduce the risk of coronary heart disease and diabetes (Martinez-Villaluenga et al. 2006) and show antioxidant activity (Jul et al. 2003, Arcan and Yemenicioglu 2007). Leguminous seeds, particularly lupins, are rich in microelements, among them e.g. manganese and selenium (Tables 3, 4) but also in antioxidants – tocopherols (Lampart-Szczapa et al. 2003, Erbas et al. 2005, Arcan and Yemenicioglu 2007) and dietary fibre (Table 5). The energetical value of legume seeds differs to a great extent depending on leguminous plant species and species of animals fed these plants (Table 6, 7). The fat content varies within 0.8-2.0% (peas, faba bean) up to about 8-10% in lupine seeds.

The nutritive value of the leguminous plants and their seeds is restricted by the high activity of the present undesired substances. Green plants and seeds