CHANGES IN AMINO ACID COMPOSITION IN THE PRODUCT (KERNEL) AFTER DEHULLING LUPIN SEEDS

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INTRODUCTION

Both the spectrum and the content of individual amino acids (AA) significantly affect the nutritional value of food components. The actual content of individual AA in the feed significantly affects not only the production performance of animals but also their health status (Jeláňk et al., 2018). Since dietary protein sources are usually a costly part of feed for monogastric animals, farmers are currently trying to find affordable, often only natural protein resources of plant origin that can be effectively used for animal production.

The aim of the present study was to evaluate the effect of dehulling of the seeds from three white lupin varieties on the content of individual AA in the target products.

MATERIALS AND METHODS

The white lupin varieties Dieta, Amiga and Zulika were the object of the study. All the white lupin varieties were grown on the farm of the University of Veterinary and Pharmaceutical Sciences Brno in the land registry of Bartosíkovec village in the district Nový Jičín, under the identical soil and climate conditions (region where cereals are grown, 276 m above sea level, annual rainfall of 776 mm). Each variety was grown on the area of 10 ha. The sowing occurred at the beginning of April 2017 in the amount of 200 kg/ha. The crop was harvested at the end of August 2017. On a day before the harvest, 10 samples were taken from each variety (0.5 kg) from various parts of the field. In a laboratory, seeds were manually dehulled to produce a kernel. Hulls were the secondary product of this process.

The amino acid composition of the whole seed, kernel and hulls was determined by acid hydrolysis samples by 6 N HCl at 110 °C for 24 hours using an automated AAA 400 amino acid analyzer (INGOS a.s., Prague). The analysis was based on the coloration reaction of amino acids with an oxidizing agent-hydroxylamine. The following amino acids were determined from the amino acid spectrum: aspartic acid (Asp), threonine (Thr), serine (Ser), glutamic acid (Glu), proline (Pro), glycine (Gly), alanine (Ala), valine (Val), methionine (Met), isoleucine (Ile), leucine (Leu), tryptophan (Trp), phenylalanine (Phe), histidine (His), lysine (Lys) and arginine (Arg).

RESULTS

It resulted from the amino acid analysis in the lupin seeds that the kernel after manual dehulling had the higher content of all analysed AA (P < 0.05), except for methionine (Met), for which no significant change was observed (Table 1, 2 and 3).

There were differences in the average values of individual AA as well as among the studied varieties. Higher differences in AA contents were shown among the individual varieties, the highest for Dieta (Figure 1), from 25.3% (Ala) to 43.1% (Try), lower for Amiga (Figure 2), from 14.3% (Val) to 24.3% (Arg) and the lowest for Zulika (Figure 3), from 11.1% (Val) to 17.7% (Try). The results showed that the highest effect on the increase of AA content after dehulling was observed in the kernel of Dieta. The percent increase of the total AA content in the kernel of the studied varieties compared to their whole seeds was from 11% (Zulika) to 43% (Dieta). In comparison with the standard extracted soybean meal, the lupin kernel contained less Lys and Met, on the other hand, it contained markedly higher content of Arg, an essential AA especially for poultry.

CONCLUSIONS

The results show that lupin seeds are a significant source of amino acids which makes them an important source of high-quality protein for animal nutrition. By dehulling, a kernel can be obtained which is nutritionally superior to seed and in which the content of essential and non-essential AA is increased. Based on the AA analysis of three white lupin varieties (Dieta, Amiga and Zulika) we have concluded that lupin seeds and their products contain only a very small amount of amino acid methionine. Except methionine, histidine was the least represented AA in the lupin protein; on the other hand, the highest content of arginine was found for all varieties which is the most typical and dominant AA although there are differences between the respective varieties.

In the tested varieties, the content of all essential AA in the kernel after dehulling increased from 13.2% (Zulika) to 33.0% (Dieta) and the content of all non-essential AA increased from 14.6% (Zulika) to 33.3% (Dieta). The content of all essential and all non-essential AA was significantly reduced in the hull as compared to the whole seed from the evaluated lupin varieties, on average by 80%.

REFERENCES


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Table 1: Content of amino acids in the whole seed, kernel and hull of Dieta lupin variety (g/kg of DM)

Table 2: Content of amino acids in the whole seed, kernel and hull of Amiga lupin variety (g/kg of DM)

Table 3: Content of amino acids in the whole seed, kernel and hull of Zulika lupin variety (g/kg of DM)

Figure 1: Significant increase in the content of individual amino acids (AA) in the kernel compared to the whole seed of Dieta lupin variety (x̄ ± sd of DM basis)