

Amino Acid Profile

Amino acid profile or composition is an important feature in determining the nutritional value of wheat for human and animal diets and are considered crucial to good health. Amino acids are the building blocks of proteins and approximately 22 amino acids are commonly distributed among the proteins of all biological materials. Of these, 18 can be found in cereal grain proteins. Amino acids are organic compounds containing basic amine (-NH₂) and acidic carboxyl (-COOH) functional groups, in addition to a side chain (R group) specific to each amino acid.

The classification of amino acids is based on different features, one being whether the amino acid can be acquired through the diet. According to this, three types are identified: essential, conditionally essential and non-essential amino acids. Classification as essential or non-essential, does however not reflect their actual importance, since all of them are necessary for human health. Essential amino acids are considered “essential” as they cannot be synthesised by the body and must be obtained from the diet. The nine essential amino acids are phenylalanine, valine, threonine, tryptophan, methionine, leucine, isoleucine, lysine and histidine. Arginine, cysteine, glycine, glutamine, proline and tyrosine, are considered conditionally essential in the human diet, meaning their synthesis can be limited under special pathophysiological conditions. Alanine, aspartic acid, asparagine, glutamic acid and serine are non-essential amino acids, meaning they can be synthesized by the body.^(1,2)

The results of the 40 samples analysed by SAGL and reported as g amino acid/100 g sample, are provided in Table 7 on pages 61 and 62. The values obtained for all amino acids on these samples, were within the normal range reported for wheat in literature, deficient in certain essential amino acids, such as tryptophan, lysine, threonine, methionine and histidine, but high in glutamic acid and proline, which is not essential. The range per season per individual amino acid compared well over the seven seasons for which data is available.

Due to the fact that protein and amino acid composition of wheat vary with crop varieties, application of fertilisers, irrigation practices, soil composition and climatic conditions, the amino acid content generally showed a wide variation between samples. The exception being tryptophan, ranging from 0.12 to 0.18 g/100 g this season. Similar small differences were observed in previous seasons. The World Health Organisation's (WHO) recommended daily dose for tryptophan is 4 mg/kg/day.⁽³⁾

Lysine values varied between 0.31 and 0.42 g/100 g, comprising \pm 2.3 – 3.1% of the total amino acid content. The WHO recommended daily dose for lysine is 30 mg/kg/day. Threonine's WHO recommended daily dose is 15 mg/kg/day⁽³⁾ and ranged from 0.33 to 0.51 g/100 g this season. Methionine values compared well with previous seasons, ranging from 0.09 to 0.23 g/100 g. The WHO daily recommendation is 15 mg/kg/day for the sulphur containing amino acids in total.⁽³⁾

The values for histidine varied between 0.24 and 0.39 g/100 g. The results also showed that the samples were high in the essential amino acid leucine, with values ranging from 0.70 to 1.13 g/100 g. Phenylalanine values varied between 0.45 and 0.79 g/100 g. According to the results, the samples were rich in glutamic acid and proline, together contributing \pm 40% of the total amino acid content.

References:

1. Richard D. Semba, Michelle Shardell, Fayrouz A. Sakr Ashour, Ruin Moaddel, Indi Trehan, Kenneth M. Maleta, M. Isabel Ordiz, Klaus Kraemer, Mohammed A. Khadeer, Luigi Ferrucci, Mark J. Manary. (2016). Child Stunting is Associated with Low Circulating Essential Amino Acids. *EbioMedicine* (6), page 246-252.
2. Williams, P. 2011. A Practical Introduction to Cereal Chemistry. First Choice Books, page 4-19.
3. World Health Organization. Protein and amino acids requirements in human nutrition: report of a joint FAO/WHO/UNU expert consultation, Teck. Rep. Series no 935, World Health Organization, Geneva, Switzerland 2007.