



Report HPLC analysis spent grain

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Report HPLC analysis spent grain

Brewers' spent grain (BSG) is the major by-product of the brewing industry, representing around 85% of the total by-products generated. BSG is available in large quantities throughout the year. Approximately 3.4 Mt of brewers' spent grain are produced every year in the European Union. It has received little attention as a marketable commodity and is mainly used as animal feed. Nevertheless, due to its high content of protein and fibre (around 20 and 70% dry basis, respectively), it can also serve as an attractive adjunct in human nutrition. At VIVES, a vegan burger (Figure 2) has been developed using spent grains as protein source and misfit vegetables to give the burger the desired flavour.



Figure 1. Dried BSG



Figure 2. Meatless burger made from dried BSG

Humans build their body protein primarily from the amino acids absorbed from the digested dietary protein. In order to synthesize a particular protein all the amino acids required by the human body must be simultaneously present in sufficient quantities. The body has the capacity to convert surplus of some of the simpler amino acids into certain others. On the other hand, the large human tissues can't form certain amino acids from any other source. The later groups of amino acids are called the essential amino. The essential amino acids are necessary for life and must be supplied through food in required quantities. The following nine amino acids are classified as essential for humans; histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. This study focuses on the qualitative and quantitative amino acids profile of different spent grains.

BSG samples were dried using a conventional drying oven (Figure 1). Dried BSG was pulverized using a pestle and mortar and then defatted with petroleum ether. After drying, the defatted material was subjected to hydrochloric hydrolysis for 24 hr. Prior to amino acid analysis with HPLC, the acid hydrolysates were neutralized. The results obtained at VIVES are shown in Figure 3.

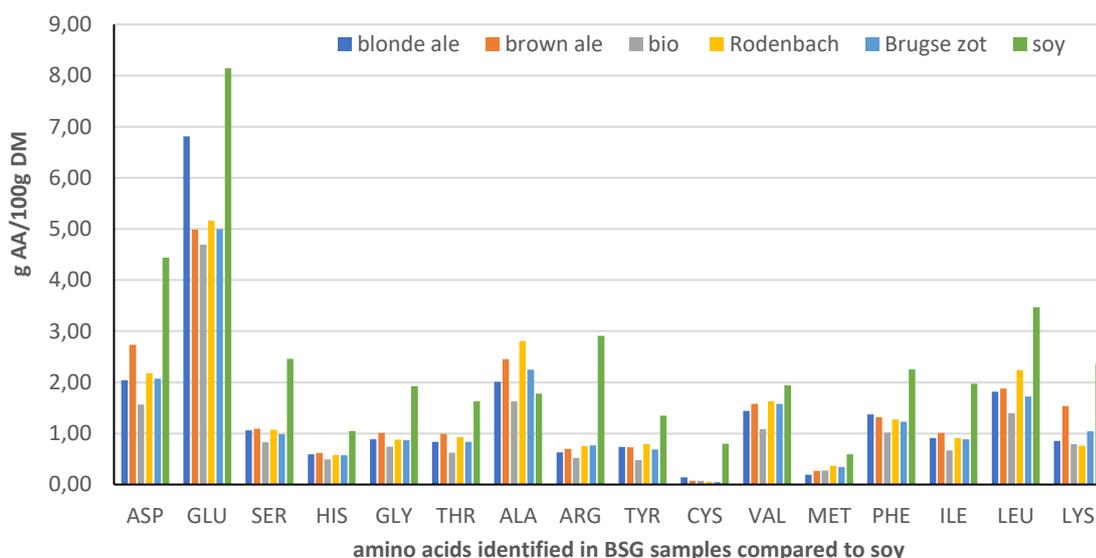


Figure 3. Amino acid profile of the tested BSG compared to soy expressed as g amino acids per 100 g dry matter. AA : amino acids; DM : dry matter

The following essential amino acids were found in the five BSG samples, methionine, phenylalanine, tryptophan, histidine, and lysine (Figure 3). Tryptophan can't be detected by this method since this amino acid is destroyed during acid hydrolysis. The levels were very similar in the different BSG samples with the exception of glutamine in the blonde ale BSG sample. The most prevalent amino acids in the BSG samples were glutamine, asparagine, alanine and leucine, with levels between 20 and 50 g kg⁻¹ DM. In general the levels of amino acids in the BSG samples were lower than those described for soy in the literature. One exception was alanine, this amino acid was in 4 out of 5 BSG samples present in higher amounts compared to soy. When we compare the levels of essential amino acids detected on average in the BSG samples with the recommended daily required dose (Table 1), we can conclude that BSG can be an attractive source of protein in human nutrition. Typical applications includes breads, mixed grain cereals, cakes, muffins, cookies, tortillas, snacks, doughnuts, and brownies. BSG incorporation can enhance the fiber and protein content of the developed baked products.

Essential amino acid	Recommended daily dose per kg body mass	g AA/kg DM in BSG
histidine	14 mg	5.7
isoleucine	19 mg	8.8
leucine	42 mg	18.1
lysine	38 mg	10
methionine	19 mg	2.9
phenylalanine	33 mg	12.4
threonine	20 mg	8.4
tryptophan	5 mg	N.D.
valine	24 mg	14.6

Table 1. Daily recommended dose of the essential amino acids in human food compared with the amounts present in BSG. AA : amino acids, DM : dry matter, N.D. not detectable