Green biorefinery – production of amino acids from grass silage juice

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The field of application for amino acids ranges from animal feeding and food industry to cosmetics. Nowadays, amino acids are produced by hydrolysing proteins, through fermentative or enzymatic processes or by chemical synthesis [1]. Amino acids are also generated in the ensiling process of grass biomass through protein decomposition. Grass biomass has become a surplus raw material in many European countries in the last decades due to restructuring of the agricultural sector [2]. Therefore, grass silage offers a biological and sustainable route to produce mixtures of proteinogenic amino acids [3] for possible applications in the feed, food or cosmetic sector. Based on preliminary findings concerning the treatment of grass silage juice at lab-scale, a process has been developed [4]. This process was implemented by the 'Green Biorefinery Upper Austria F&E GmbH'. A pilot plant has been established in Upper Austria in Utzenaich (near Ried/Innkreis) to extract amino acids and lactic acid from grass silage in 2008.

At this green biorefinery pilot plant the grass silage is pressed and grass silage juice is produced. Due the complex composition of the grass silage juice and its manifold compounds, a process with different state of the art separation technologies was applied to gain the valuable compounds lactic acid and amino acids. Firstly, the grass silage juice was ultrafiltrated to remove macromolecular compounds. Secondly, the ultrafiltrated juice was nanofiltrated to separate lactic acid and amino acids. Finally, the lactic acid enriched stream is treated by electrodialysis plants and the amino acid enriched stream is purified by using an ion exchanger device.

This work shows details on the purification and separation of the amino acid enriched stream from grass silage juice using an ion exchange process in pilot scale. To optimise the process, which is based on displacement chromatography, different strategies were tested at the plant. Firstly, two different output streams of the membrane processes were used at the ion exchanger device. Secondly, the performances of two different ion resins (different particle size), considering output and product quality, were tested and compared. Additionally, some experiments regarding the process optimisation were done at lab scale. The results of these investigations will be shown and discussed. Furthermore, a short outlook on prospective tasks and targets will be given.

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