

Agrochemical and bacteriological study of lettuce fertilized with cheese whey based digestate

^{1,2*}Álvarez-Méndez, S.J., ²Ramos-Suárez, J.L., ³Ritter, A. & ²Mata González, J.

¹salvmen@ull.edu.es, Instituto Universitario de Bio-Orgánica Antonio González, Universidad de La Laguna, Spain

² Departamento de Ingeniería Agraria y del Medio Natural, Universidad de La Laguna, Spain

³ Área de Ingeniería Agroforestal, Universidad de La Laguna, Spain

Cheese whey is a by-product from the cheese manufacturing. Within the framework of the circular economy paradigm, anaerobic digestion raises as a technology able to transform organic residues into an energy rich biogas and digestate, which is a nutritive liquid that may be used for crops fertigation. To evaluate the fertilizer potential of a digestate obtained from the anaerobic digestion of an industrial cow cheese whey, 3 cultivations of romaine lettuce (*Lactuca sativa* L var. *longifolia*) were consecutively studied during summer and autumn of 2021 and spring of 2022 in a greenhouse located at San Cristóbal de La Laguna (Canary Islands, Spain). Each experiment was carried out with 80 4-week-old lettuce plantlets grown in 2 liters polypropylene pots, watered regularly and subjected to 5 different treatments once a week (16 plantlets per treatment in a randomized complete block design): control water (pH = 7.1 ± 0.2), cow cheese whey (pH = 3.9 ± 0.1), a nutrient-rich liquid digestate obtained from the anaerobic digestion of the cow cheese whey (pH = 8.3 ± 0.1), a commercial organic horticultural fertilizer (pH = 5.8 ± 0.1) and the same digestate treated by adding an acidity regulator (pH = 6.1 ± 0.2). After 7 weeks, fresh weight, foliar area, head circumference and greenness of the lettuces fertilized with untreated digestate were statistically equivalent to those from lettuces treated with the commercial fertilizer. Similarly, the N, P, K, Fe, Cu, Zn and B content on leaves did not differ significantly between them. Moreover, all the measured physical parameters values of the lettuces fertilized with untreated digestate were significantly higher than those found in lettuces from the rest of the treatments, revealing that the attempt to avoid the high alkalinity of the digestate by adding a pH regulator had negative effects on the lettuces. As no *Salmonella* spp. neither *Escherichia coli* were detected during bacteriological analyses, digestate-fertilized lettuces were suitable for human consumption. These results highlight the power of anaerobic digestion to transform an organic waste into an added value product (digestate).



Figure 1. From left to right lettuces irrigated with: control water, cow cheese whey, cow cheese whey based digestate, commercial fertilizer and pH-corrected cheese whey digestate.

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