

Daffodil-derived galanthamine production in the uplands

Galantamine is a pharmaceutical compound that has been an approved Alzheimer's Disease treatment since 1998. Galantamine can be synthesised chemically but it is a difficult and expensive process. Producing galan/**t**/amine from galan/**th**/amine, an alkaloid extracted from certain plants, is more cost effective, but supplies are limited. This Innovate UK-funded project tested a novel approach to producing



galanthamine based on sowing daffodils into existing upland pasture and harvesting the green growth in spring. It was a collaboration between Pwllpeiran, engineers from Harper Adams University (who developed specialist machinery for planting and harvesting), and a company (Agroceutical Products Ltd).

- ⇒ We planted the daffodil bulbs between September and November, depending on soil conditions. Our best yields were with bulbs sown in lines around 0.8 m - 0.9 m apart at a sowing rate of 10 t/ha.
- ⇒ We used the variety Carlton, which is easy to source in bulk, produces a good yield of biomass, is tolerant of soil conditions, and produces a high galanthamine concentration.
- ⇒ We harvested the daffodils in March/April when the plants were at the goose-neck growth stage. Following harvest, we grazed the pastures with ewes and lambs. Incorporating daffodils into grazed pastures did not affect lamb performance.
- ⇒ Agronomy trials showed that the initial daffodil harvest is best left to the second spring after planting. Similarly, cutting every second year from then on produces the same total biomass as annual cuts, and gives the plants a chance to replenish bulbs, increasing longevity.
- ⇒ We had experimental sites ranging from close to sea level up to 426 m (1400 ft), and found altitude did not affect the concentration or yield of galanthamine from Carlton.
- ⇒ Overall, biomass yields were lower (~ 2.6 t FW/ha) and galanthamine concentrations higher (~ 0.05% FW) than expected.
- ⇒ We have found that daffodils are costly and difficult to remove from pastures.

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Related papers:

Fraser, M.D., Vallin, H.E., Davies, J.R.T., Rowlands, G.E. & Chang, X., (2021) Integrating *Narcissus*-derived galanthamine production into traditional upland farming systems. *Scientific Reports*, 11, 1389

Fraser, M.D., Davies, J.R.T. and Chang, X. (2017) New gold in them thar hills: testing a novel supply route for plant-derived galanthamine, *Journal of Alzheimer's disease*, 55, 1321-1325