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Title: Glucosinolate dynamics in a traditional cabbage cultivar: variations across tissues, developmental stages and management practices

Background and Objectives:
Glucosinolates, bioactive defence compounds in *Brassica* spp., offer numerous health benefits. However, as a result of domestication and breeding for yield, the diversity of secondary metabolites in commercial varieties has been reduced. Organic farming practices offer a sustainable alternative by improving plant nutrition and promoting resilient traditional varieties that are less dependent on chemical inputs. This study investigated glucosinolate variation in a traditional Catalan cabbage cultivar across tissues and developmental stages, and evaluated the influence of different organic soil amendments in a regenerative horticultural system.

Methods:
Four soil treatments were applied: two tilled controls (compost and an N-rich organic fertiliser) and two no-till treatments with high and low doses of C-rich woody residues (WR) from pruning. Growth, yield, glucosinolate content, and photosynthetic pigments were measured in leaves and flower buds at flowering onset, first harvest, and resprouting.

Results:
The N-rich fertiliser accelerated plant growth and yield at first harvest, with higher photosynthetic pigment levels compared to compost. WR treatments delayed phenology and reduced plant size. Particularly at low doses, WR increased glucosinolate levels, with the highest concentrations observed in leaves at flowering onset and in flower buds during resprouting. Glucosinolate concentrations ranged from 12 to 80 $mg \cdot g^{-1}$ dry weight in leaves and 7 to 68 $mg \cdot g^{-1}$ in flower buds. Glucosinolates increased in flower buds from the first harvest to resprouting but decreased in leaves during the same period. In particular, neoglucobrassicin was lowest at the onset of flowering but increased in leaves until the first harvest, together with glucobrassicin. At resprouting, glucoraphanin was predominant, especially in flower buds.

Discussion:
We observed a trade-off between plant growth and glucosinolate levels. While the N-rich fertiliser promoted growth and yield, low WR doses increased glucosinolate levels, improving nutritional value despite reduced growth. Glucosinolate concentrations were up to 25 times higher than those reported for commercial varieties, confirming the potential of this traditional cabbage as a nutrient-rich food source. The combination of leaves and flower buds could increase glucosinolate intake, offering applications for other Brassica species. These findings highlight the role of organic amendments in balancing growth and accumulation of bioactive compounds to promote sustainable crop management.

Keywords: Brassica oleracea, glucosinolates, healthy food, organic agriculture, traditional cultivars

Thematic area: Food

Summarized CV of the first author:
Dr. Marina Pérez Llorca (Scopus Author Identifier 57204646871) is a postdoctoral researcher in the Department of Biology, Environment, and Health at the University of Barcelona (UB). Dr. Pérez-Llorca has extensive experience in plant responses to environmental stress and is currently working on projects about the effect of organic soil amendments on the nutritional quality of fruits and crops. She has collaborated with various companies in the agri-food sector on projects regarding the effect of biostimulants on the physiology and performance of crops. She is the author of 16 articles, 11 of which she is the first author, and 15 of which are listed in Q1. She has several stays in international universities, including Cardiff University, the University of Cape Town or the University of Évora.