



There is a difference between natural plant Vitamin C and synthetically produced Vitamin C

Since its launch in 2017, Biologi have been the pioneers in single plant cellular skincare. The Bioverse group of companies, of which Biologi is a part of, continues to conduct independent scientific research, confirming what we already know, that plant extracts provide superior results for the skin when compared to synthetic alternatives.

Our specific testing started over a year ago to prove that most natural Vitamin C extracts can be distinguished from products using synthetic Ascorbic Acid, a hotly debated topic in the skincare industry. Today, we can confidently claim that Vitamin C in our products is distinguishable from synthetic L-Ascorbic Acid. Our recent independent scientific findings of our plant extracts conducted through the Centre for Accelerator Science (ANSTO) have confirmed that Vitamin C in its natural form in our extracts is from the C3 type plants, which is consistent with its origin from fruits like Kakadu Plum. At the same time Ascorbic Acid is in some products on the market carries the signature of C4 plant origin and is consistent with its synthetic production from corn starch – the main industrial pathway.

The ratio of the stable isotopes of carbon, carbon-12 and carbon-13, is used to distinguish plants which have different photosynthetic metabolic pathways, due to differences in carbon fixation from atmospheric carbon dioxide. The different photosynthetic pathways give rise to C3, C4 and CAM plants. CAM plants are found primarily in arid areas, are less common and not considered further.

The range of $\delta^{13}C$ values (in per mill, ‰) shows that these two plant types can be differentiated. Most plants are of C3 type, in particular all trees are in this group. C4 group is much smaller, includes mainly grasses, though not all grasses, and some sedges. Among the representatives of this group are some important agricultural species like corn (maize) and sugar cane. On the other hand, wheat and rice are C3 type plants. The $\delta^{13}C$ values for samples from Plant Extracts & Biologi products indicate these products are from a C3 plants or trees.

RADIOCARBON RESULTS

ANSTO code	Sample Type	Submitter ID	$\delta^{13}\text{C}$	percent Modern Carbon		Percent Biobased carbon
			per mil	pMC	1 σ error	
OZAL36	Plant material	1 fruit	-27.3	103.17	+/- 0.22	100%
OZAL37	Plant material	2 freeze dried	-27.3 +/- 0.1	102.73	+/- 0.19	100%
OZAL38	Other (organic)	3 ext in water	-28.2 +/- 0.2	102.85	+/- 0.24	100%
OZAL39	Other (organic)	4 synthetic mix	-12.7 +/- 0.3	101.60	+/- 0.20	100%

The $\delta^{13}\text{C}$ value for sample of some powder claimed to be from Kakadu plum (from another source) indicates that the carbon in this material is sourced from C4 plants. As we know, Vitamin C is produced by trees and shrubs and is accumulated within their fruit. These fruits include Kakadu Plum, oranges, blueberries etc. Some grasses do produce noticeable quantities of Vitamin C accumulated in the green matter, for example spring onion (a C4 plant), but they are not usually used as a source for extracts and mass Vitamin C production. So, why do some products on the market demonstrate C4 plant signature? There is a very simple explanation.

To produce synthetic ascorbic acid, modern industry uses natural precursor – a starch, a glucose polymer, produced from corn (C4 plant). It is then subjected to two stage microbial fermentation process with specially constructed microbes (called Reichstein-Grüssner process for those interested in detail), and some chemical processes using various chemical interfaces - including the use of acetone (aka nail polish remover) - to finally create the synthetic L-Ascorbic Acid. Which still carries the carbon isotopic signature of its precursor – corn.

This synthetic L-Ascorbic Acid is then sometimes marketed as 'natural Vitamin C' - which we can now prove is wrong. Vitamin C in its natural form is from trees and fruits, and is the source of our Biologi plant extracts, while some marketed ascorbic acid is synthetically produced from grasses.

In conclusion we now have the means to determine if the vitamin C you are consuming or applying to your skin is from a natural plant source or synthetically produced which will now allow the consumer to choose if they want natural or synthetic in their body or on their skin.



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