

The effects of plant age and flower bud removal on ginseng leaf characteristics

What is this research about?

North American Ginseng (scientific name *Panax quinquefolius*) is a perennial herb that is commonly found in the undergrowth of hardwood forests, as it grows better and is adapted to shady (low-light) growing conditions. Compared to plants that grow in full sun, shade plants like ginseng tend to have thinner leaves with less chlorophyll-a (green pigment needed for photosynthesis) and more chlorophyll-b (yellow pigment). The medicinal properties of ginseng have been linked mostly to a group of plant chemical compounds called ginsenosides. Ginsenoside levels vary depending on a number of factors, including plant age, part (leaves versus roots), and light levels. Removing flower buds (also called inflorescences) either by hand or using chemical sprays is known to increase ginseng root growth, but the effects of this procedure on leaf characteristics or ginsenoside content have not been researched.

What did the researchers do?

In the middle of the growing season, researchers collected leaves from 2-year-old (non-fruiting), 3-year-old (fruiting and non-fruiting), and 4-year-old (fruiting and non-fruiting) North American Ginseng plants. The non-fruiting plants had their flower buds removed either by hand, or by using a chemical spray of Ethephon. Twelve leaf characteristics were measured, including: fresh weight, dry weight, leaf area, levels of chlorophyll-a and chlorophyll-b, leaf water content, and leaf thickness. The levels of ginsenosides were calculated in samples of ground up, dried root and leaf samples.

What you need to know:

In 4-year-old ginseng plants, removing flower buds increased leaf weight (fresh and dry), area, mass, volume, and thickness, and decreased leaf thickness. Removing flower buds did not affect ginsenoside levels. Although a shade plant, ginseng plants had leaf characteristics associated with a sunny habitat.

What did the researchers find?

Leaflets from the 2-year-old plants had the lowest fresh weight, dry weight, area, and internal gas volume, while leaf water content was fairly constant with age. Total chlorophyll levels were similar in 2- and 3-year-old plants, but lower than that of 4-year-old plants. While removing flower buds had no effects on leaf characteristics in 3-year-old plants, in 4-year-old plants this increased leaf fresh and dry weight, area, and thickness, and decreased leaf water content. Ginsenoside levels in roots and leaves were not affected by flower bud removal. Although ginseng is a shade preferring plant, the specific leaf mass (SLM) and chlorophyll a/b ratio (a measure of light level preference) suggest it can perform like a sunny habitat plant.

How can you use this research?

Ginseng growers can use this research to better understand how plant age and removal of flower buds affects ginseng leaf characteristics and ginsenoside content.

Plant scientists can further this research by investigating the relationships between leaf characteristics, light levels, and rates of photosynthesis.

Keywords:

North American Ginseng, *Panax quinquefolius*, leaf characteristics, shade plant, dry weight, ginsenoside

About the University of Guelph researchers:

John Proctor is a Professor Emeritus in the Department of Plant Agriculture, at the University of Guelph. Email: jprocto@uoguelph.ca.

J. Alan Sullivan is a Professor in the Department of Plant Agriculture, at the University of Guelph. Email: asulliva@uoguelph.ca.

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