

How “wild” is American wild ginseng? Investigating the role of human cultivation in shaping morphological and genetic diversity of a valuable non-timber forest resource

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Introduction

Background

- Understory plants are critical to environmental, social, and economic dimensions of sustainability, comprising a large portion of forest biodiversity as well as resources in the form of non-timber forest products (NTFP's) that people rely on for nutrition, medicine, and livelihoods around the world. [1]
- American ginseng (*Panax quinquefolius* L.) is a conservation-priority understory herb of high cultural and economic value for its medicinal properties. [2]
- American ginseng is in decline in the wild because of overharvesting for commercial trade but is being grown commercially in Wisconsin and Canada as well as in small-scale forest farms in the Appalachian region. [2,3]

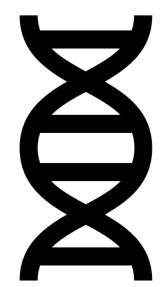
Present Study

- Following previous findings that people plant commercial seeds in Appalachia [3,4], how do commercial shade gardens in Wisconsin and Ontario influence genetic and phenotypic diversity in wild ginseng?
- Are there morphometric markers of unconscious selection that we can use to identify wild lineages to prioritize for germplasm conservation? [3,5]

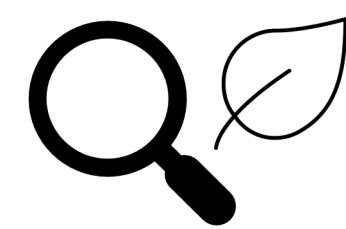
Hypotheses

- Genetic lineages from commercial centers show morphological inconsistencies from the dichotomous key for the species. [6]
- Alternatively, ginseng's life history characteristics and low levels of self-compatibility may allow it to resist human influence—at least on a timescale that we can observe in our research. [7]

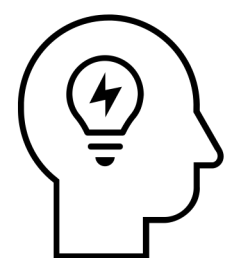
Methods



1) Microsatellite genetic analysis using markers developed by partners in the USGS (randomForest in R). [4,8]



2) Morphometric analysis of digitized leaf scans. [6]. Random forest modelling will assess whether traits align with genetic group membership. [8]



3) Ethnographic analysis of key informant interviews and focus group discussions. (NVivo QSR software). [9]



Figure 1. Conceptual diagram of hypothesized relationship between commercial and wild ginseng under unconscious selection and possible introgression/admixture of cultivated lineages. [10]

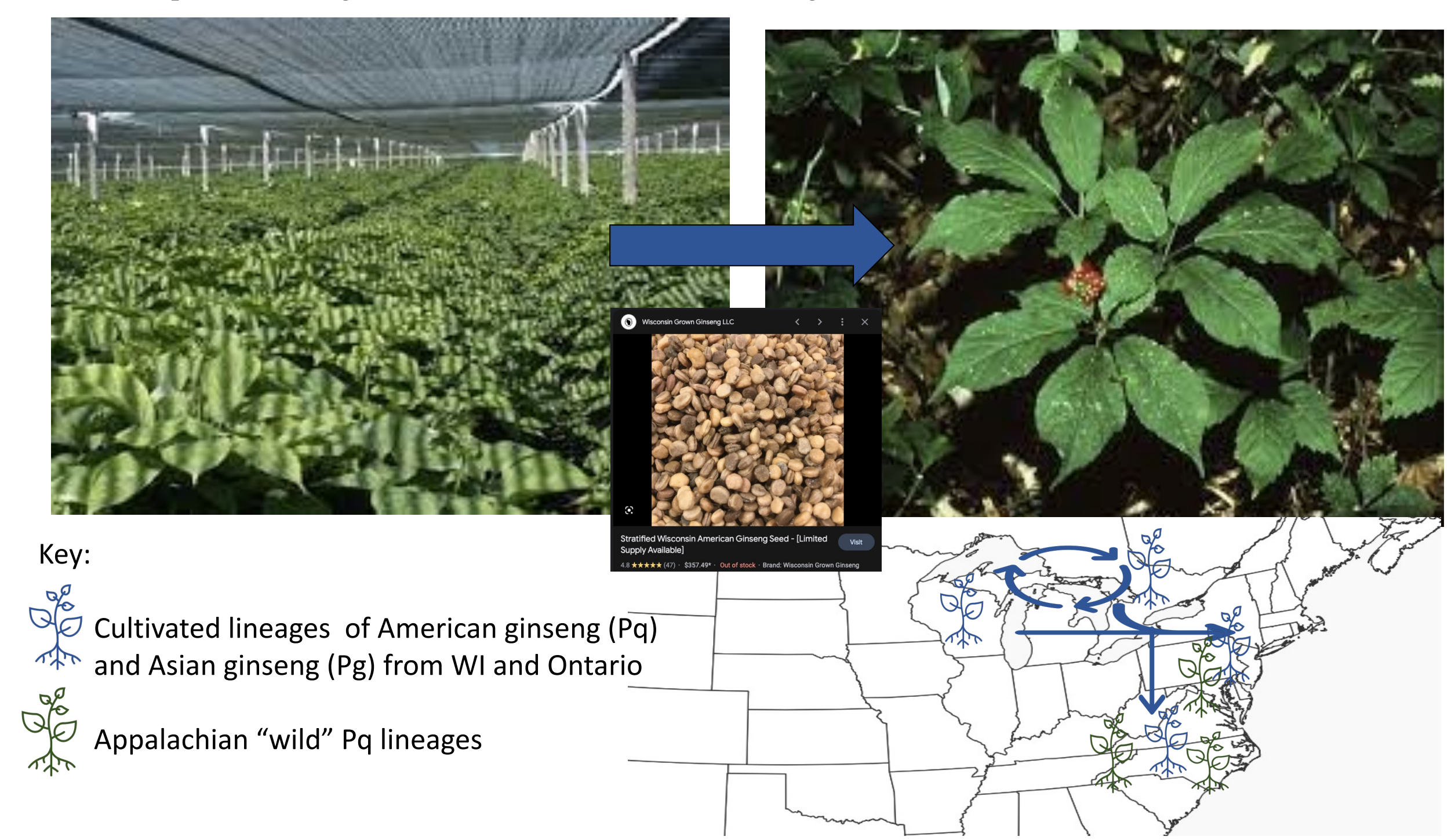
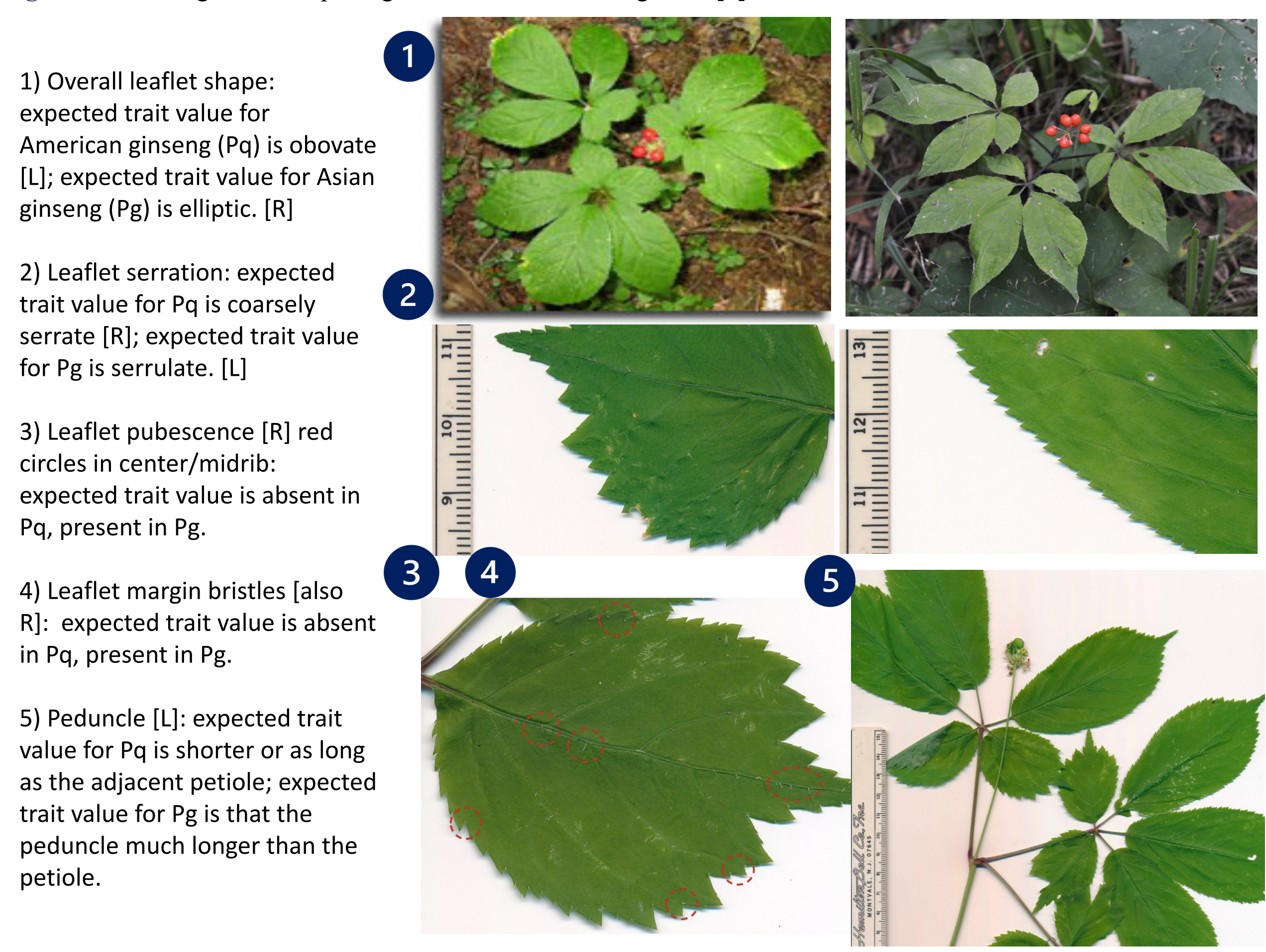


Figure 2: Above-ground morphological traits under investigation. [6]



Preliminary Observations

Morphometric Data

- Above-ground morphological diversity exceeds what is currently represented in the taxonomic key
 - Peduncle to petiole ratio unreliable marker
 - These findings lend preliminary support of previous literature highlighting the importance of exploring the relationships between cultivated and wild populations

Ethnographic Data

- Pilot fieldwork in Marathon County, Wisconsin with commercial ginseng growers indicates growers identify above-ground morphological characteristics they associate with specific ginseng lineages (e.g., Canadian, Menominee Native American)

Next Steps

- Collect data for 8-10 cultivated populations from Ontario, Canada.
- Amplification and microsatellite configuration.
- Compare data with Wisconsin cultivated populations and Pennsylvania wild populations.
- Conduct key informant interviews and focus groups with growers.
- Develop citizen science initiative for landowners to upload ginseng photos for broadly georeferenced morphological diversity assessment.

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