

2012-05-31

# Comparison of specific leaf area of invasive and native blackberries

Valerie Sims

*Western Oregon University*, [vsims10@mail.wou.edu](mailto:vsims10@mail.wou.edu)

Follow this and additional works at: <https://digitalcommons.wou.edu/aes>

 Part of the [Biology Commons](#), and the [Ecology and Evolutionary Biology Commons](#)

---

## Citation

Sims, Valerie. "Comparison of specific leaf area of invasive and native blackberries." Poster presentation at the Academic Excellence Showcase, Western Oregon University, May 31, 2012.

This Poster is brought to you for free and open access by the Student Scholarship at Digital Commons@WOU. It has been accepted for inclusion in Academic Excellence Showcase Proceedings by an authorized administrator of Digital Commons@WOU. For more information, please contact [digitalcommons@wou.edu](mailto:digitalcommons@wou.edu), [kundas@mail.wou.edu](mailto:kundas@mail.wou.edu), [bakersc@mail.wou.edu](mailto:bakersc@mail.wou.edu).

# Comparison of specific leaf area of invasive and native blackberries

Valerie Sims

Western Oregon University, Monmouth Oregon

## INTRODUCTION

Invasive species are known to have harmful effects on many ecosystems and show rapid growth and reproduction rates. One possible way for a plant to maximize its growth rate is to have a high specific leaf area (SLA) but few studies have looked at SLA differences in ecological and taxonomically related invasive and native species. In a common garden setting, I studied SLA differences between phylogenetically related invasive Himalayan blackberry (*Rubus armeniacus*) and native Pacific blackberry (*Rubus ursinus*). In both species area and weight of leaf blades were closely related and SLA was not different between the invasive and native blackberry. Also the results indicate that inclusion of the petiole, rachis and petiolule does not make the SLA data variable when compared to only the compound leaf blades. These results lead me to believe that there are other factors that may contribute to the success of invasive blackberries. I hypothesized:

1. **Invasive species will have a higher specific leaf area than native species** allowing them to maximize photosynthesis and growth rate.

2. **SLA measures based on the blade only will be less variable than whole leaf SLA for species with compound leaves.** Both species have compound leaves which include variable amounts of relatively low area and high weight stalk (where stalk includes petiole, rachis and petiolule; see figure 3).

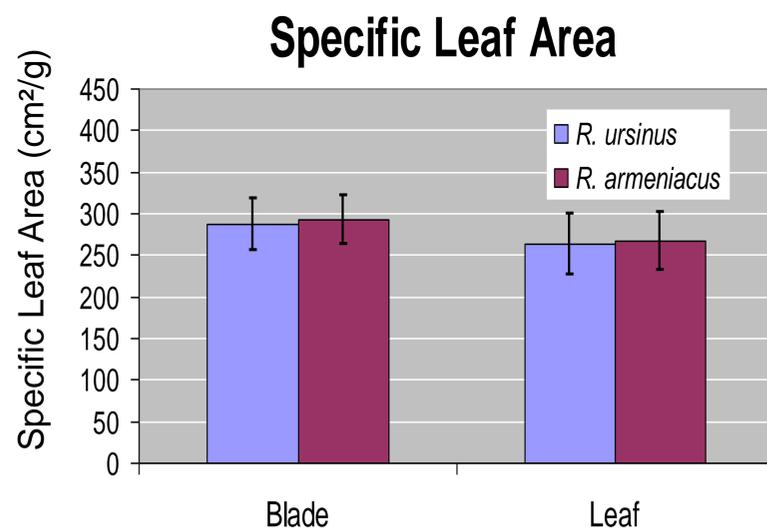


Figure 1. Average of blade specific leaf area and whole leaf specific leaf area of *R. ursinus* and *R. armeniacus*. n=6-9, means +/- 1 SD.

## METHODS

•Six to nine individuals of the genus *Rubus* (*R. armeniacus* and *R. ursinus*) were collected from field sites in the Willamette valley and coast range of Oregon.

•Each individual was grown in a randomized design in 3-gallon pots in a heated greenhouse. Plants were watered twice a day with 12 hours of supplemental lighting (+ ~500  $\mu\text{mol m}^{-2} \text{s}^{-1}$ ) and weekly feedings of fertilizer (18%N/21%P/18%K).

•For each plant three sun exposed, recently matured leaves were collected and hydrated overnight in a beaker of water in the dark. The next day the blade and petiole were carefully cut apart and each was immediately scanned on an Epson perfection v500 photo scanner. Images were converted to  $\text{cm}^2$  using the software Image J. The leaves and petioles were placed in the oven for 48 hours at 80° C and then weighed using an analytical scale to determine dry mass. SLA's were calculated as follows:

$$\text{SLA}_{\text{blade}} = \text{blade area} / \text{blade weight}$$

$$\text{SLA}_{\text{leaf}} = (\text{blade area} + \text{stalk area}) / (\text{blade weight} + \text{stalk weight})$$

•Averages, variation, and standard deviations were calculated by Microsoft excel and student t-tests were calculated by hand.

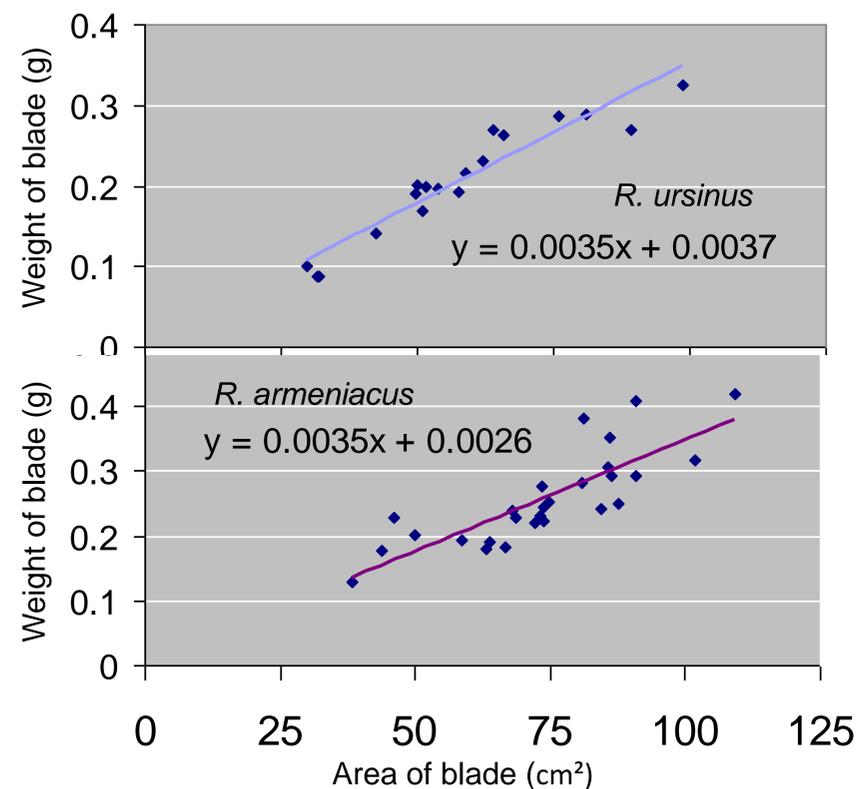


Figure 2. Area of blade vs. weight of blade for *R. ursinus* and *R. armeniacus*. n=6-9 plants with 3 subsamples each,



Himalayan blackberry (*Rubus armeniacus*; left) and native Pacific blackberry (*Rubus ursinus*; above)

## RESULTS

1. In both species area and weight of leaf blades were closely related (figure 2). SLA was not different between the invasive and native blackberry (figure 1). The t-tests comparing each species for  $\text{SLA}_{\text{blade}}$  and  $\text{SLA}_{\text{leaf}}$  were not significant ( $P > 0.05$ ) suggesting that a change in specific leaf area versus weight may not drive growth rate. Alternative explanations for greater growth of the invasive species include the invasive species having more biochemical elements (e.g. more RUBISCO and other Calvin cycle enzymes) that increase photosynthetic efficiency.

2. When comparing  $\text{SLA}_{\text{blade}}$  and  $\text{SLA}_{\text{leaf}}$ , the results indicate that inclusion of the petiole, rachis and petiolule does not make the SLA data highly variable (figure 1).  $\text{SLA}_{\text{leaf}}$  was slightly lower than  $\text{SLA}_{\text{blade}}$  but use of one or the other did not affect comparisons between the species.

## REFERENCES

- Jennifer L. Funk & Peter M. Vitousek. 2007. Resource-use efficiency and plant invasion in low-resource systems (Nature 446, 1079-1081).
- H. Lambers and H. Poorter. 1992. Advances in ecological research (volume 3, 292-295)

## Acknowledgements

Faculty Sponsor:  
Dr. Ava Howard

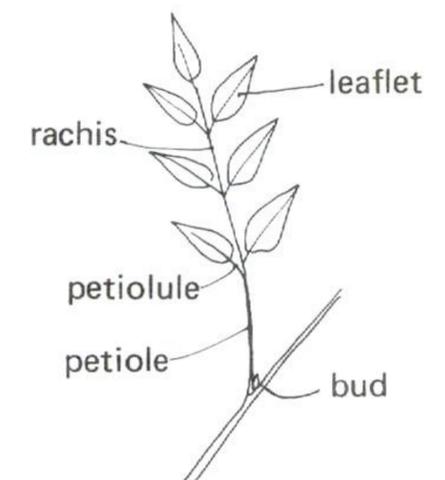


Figure 3. Diagram of a compound leaf. (<http://desertflower.files.wordpress.com/2008/09/compound-leaf.jpg>)