

An analysis of leaf morphological markers in *Brassica rapa*



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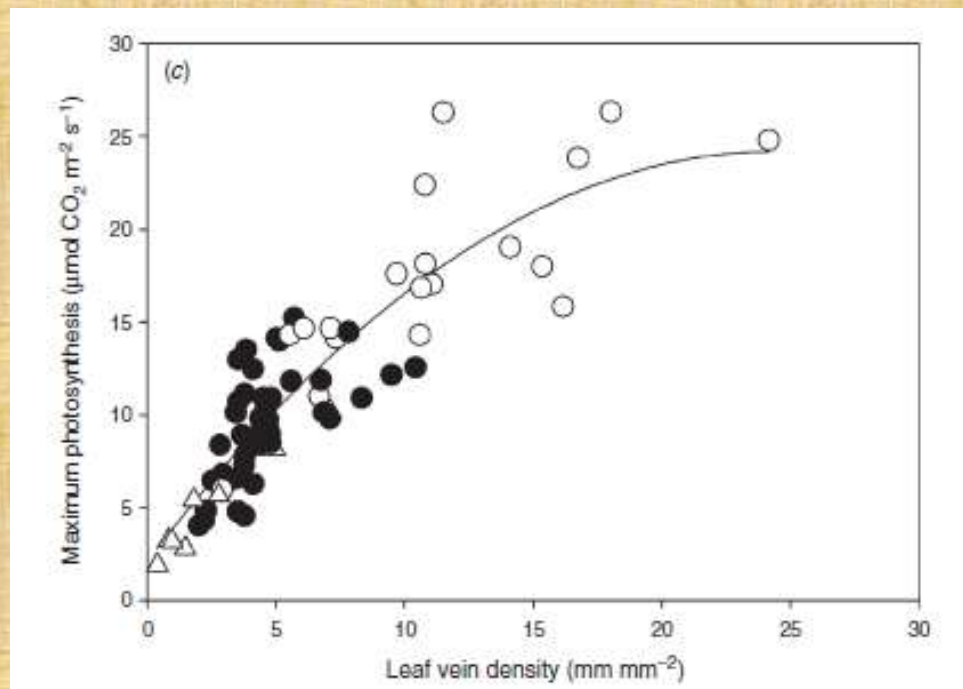
Advisor: Brent Ewers

Additional help from Marc Brock and Rob Baker of the Weinig lab

Introduction

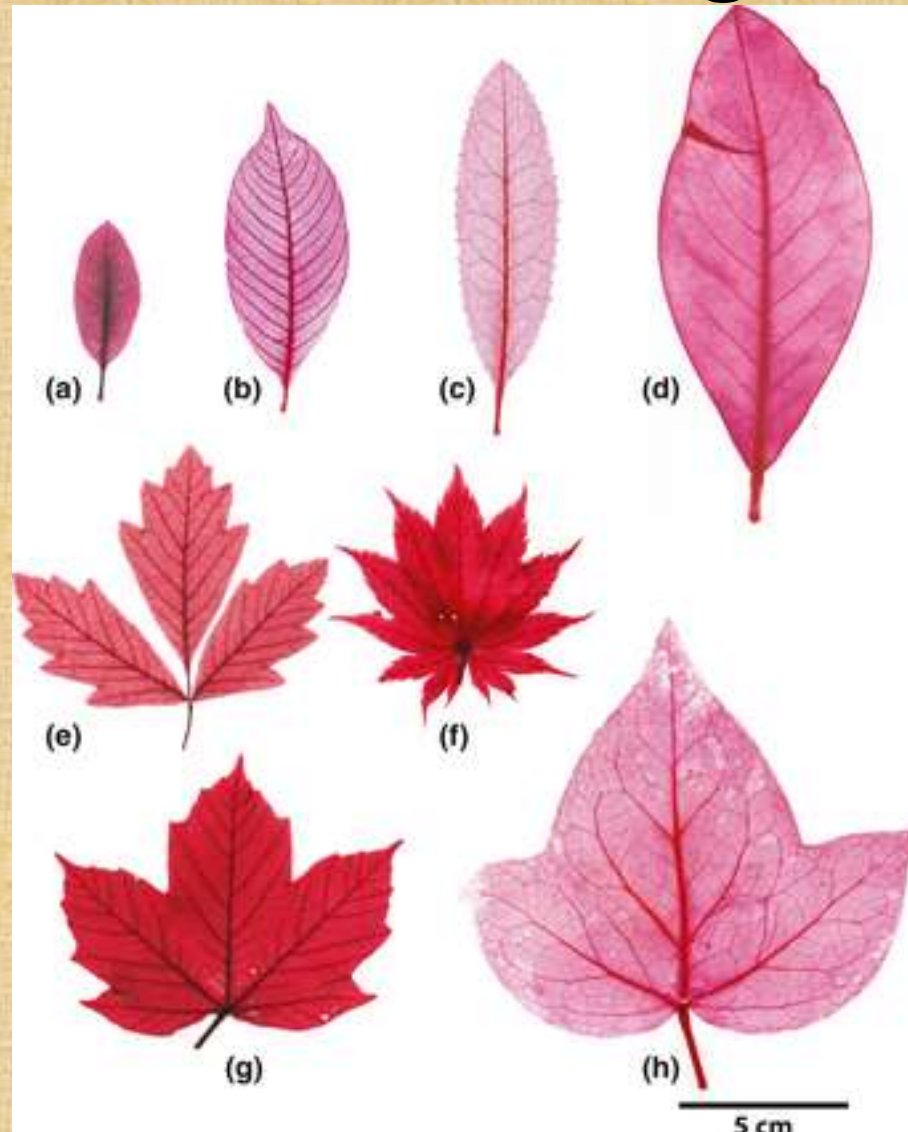
- Leaf morphometrics is the study of leaf morphological traits and their relationship to each other.
- Some of these traits contribute to leaf functionality

- Other traits represent the tissue support system of the leaf
- Understanding these relationships is important to optimizing leaf development in plants of interest.



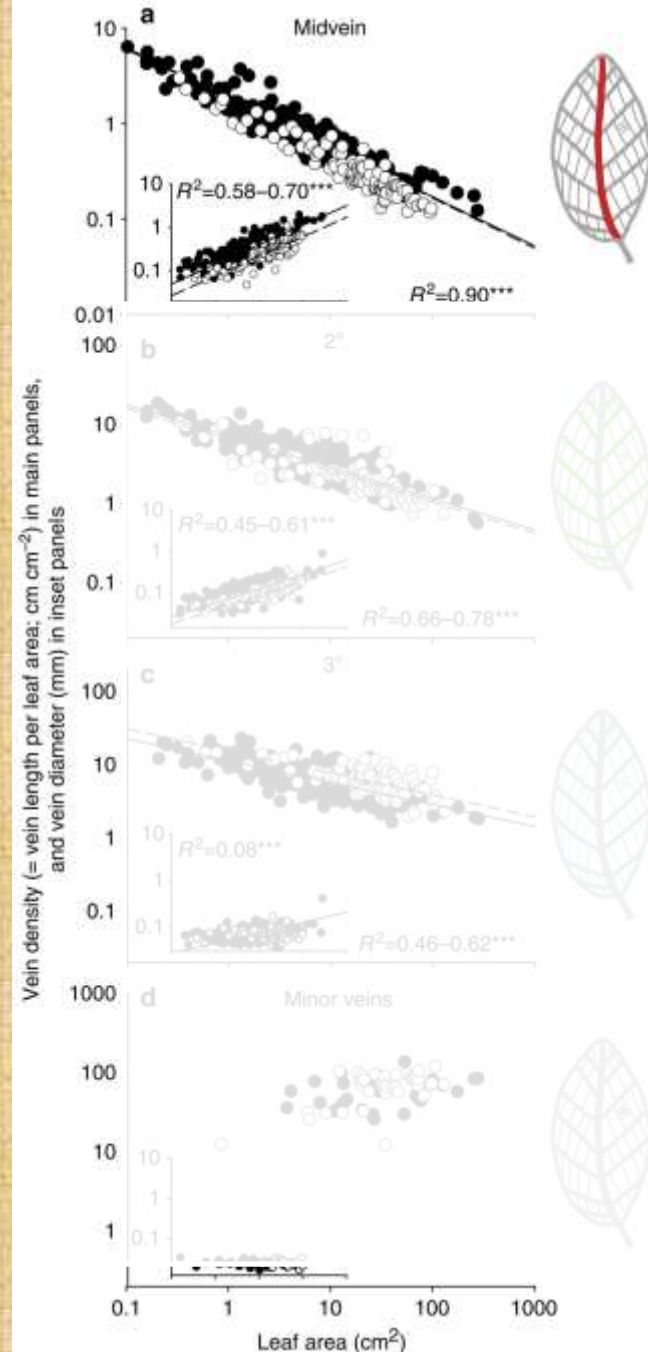
Brodribb, T., T.S. Feild, and L. Sack. (2010). Viewing leaf structure and evolution from a hydraulic perspective. *Functional Plant Biology* 37

Leaf Vein Length

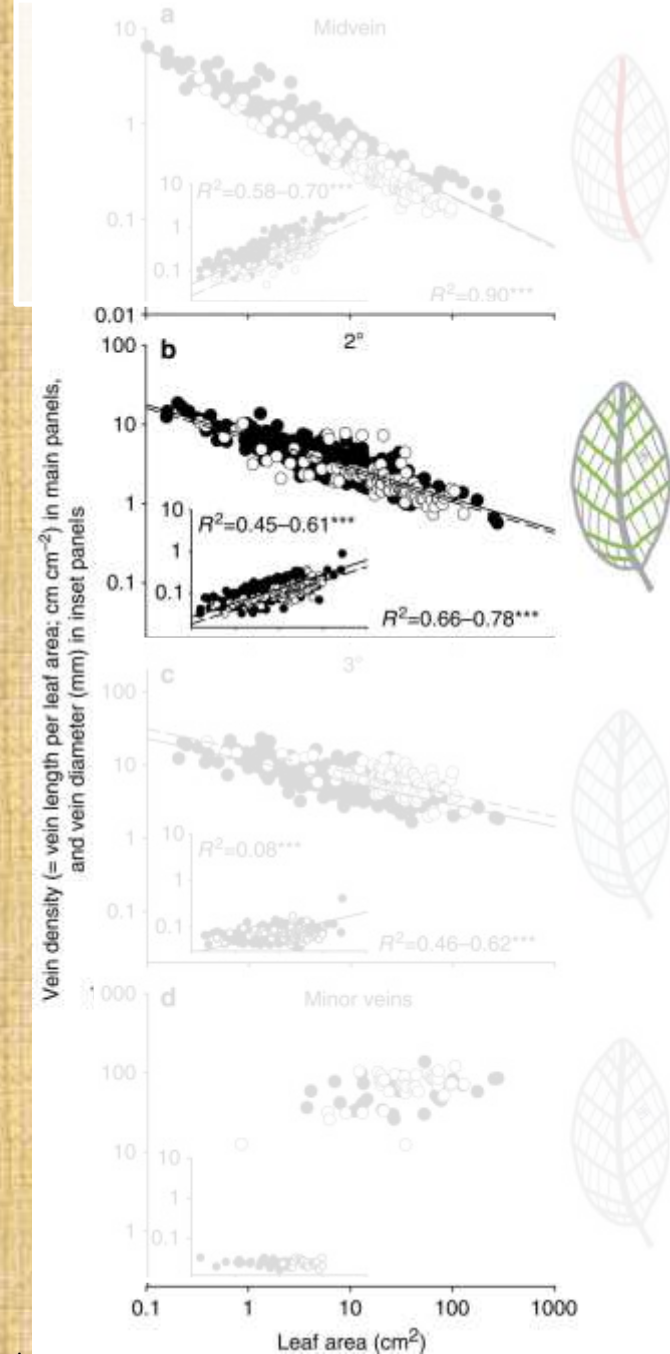


Sack, L. and C. Scoffoni. (2013). Leaf venation, structure, function, development, ecology and applications in the past, present, and future. *New Phytologist*

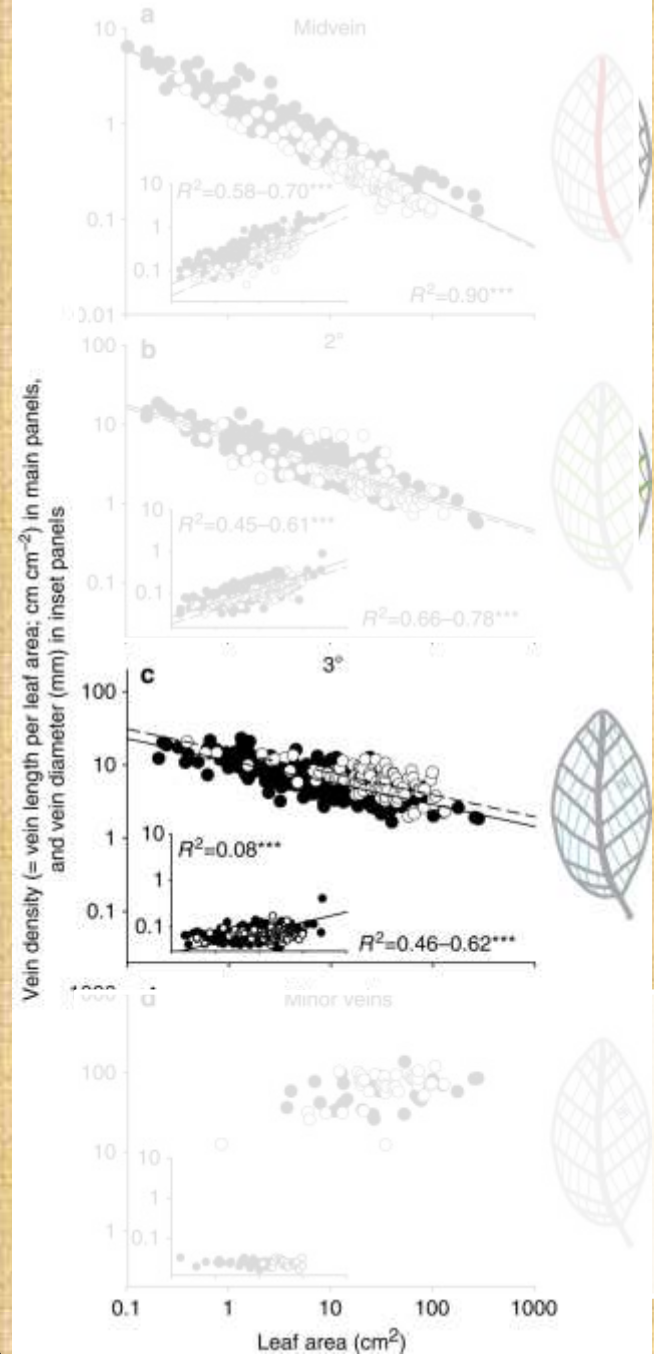
- Leaf veins represent an evolutionary relationship between transport and photosynthesis.
- Y-axis of inset is vein diameter



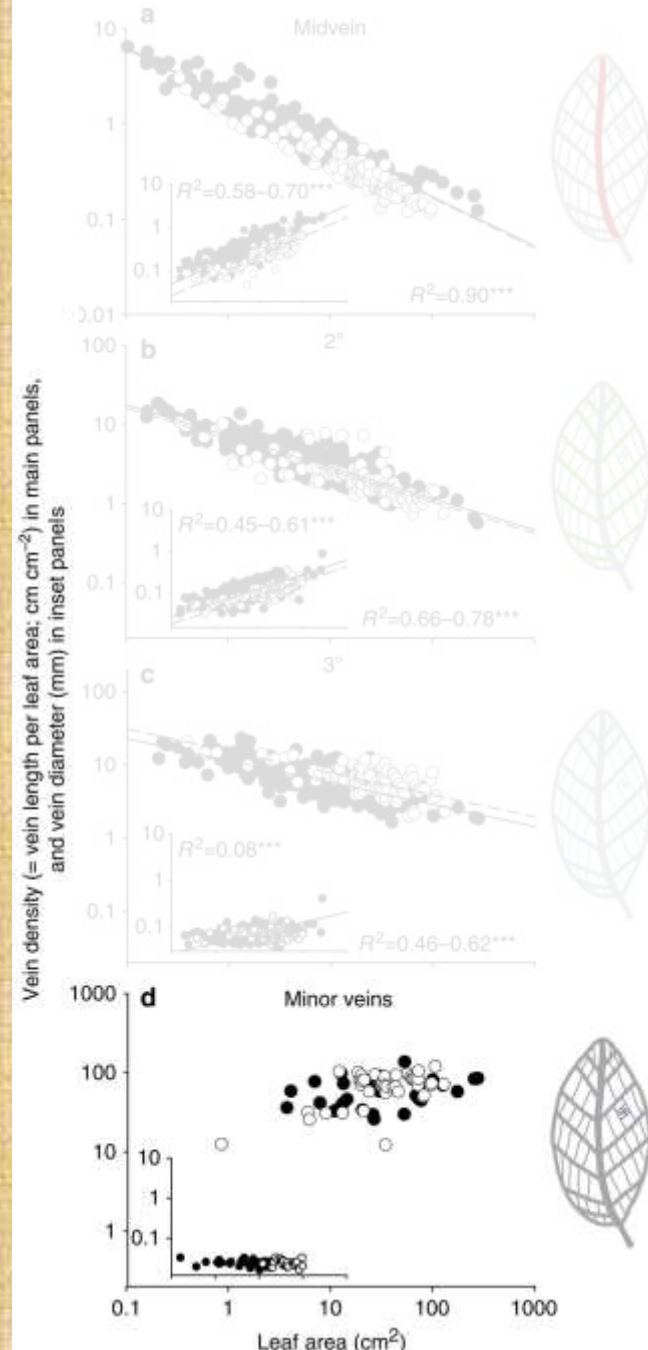
Secondary Veins



Tertiary Veins



- Most morphometric studies look at relationships between species.
- This study looks at leaf relationships within a species. It will hopefully elaborate on the amount of genetic variation for these traits. Genetic variation represents the possibility of selection.



Methods

- The leaves were supplied by Marc Brock and Rob Baker. They were planted on June 2nd, 2011.
- Each leaf was the second true leaf produced by the plant.



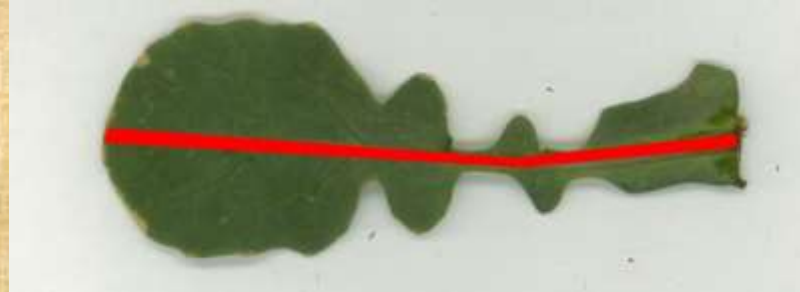
Methods

- These leaves were scanned on July 5th and 6th. The markers were measured using the program ImageJ.
- The dataset is a collection of 43 genotypes. Each genotype is a “Recombinant Inbred Line.”



Markers Measured

- Total leaf length



- Width of main vein at widest point of the petiole

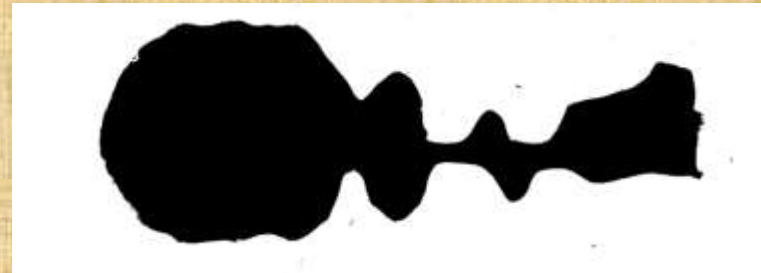
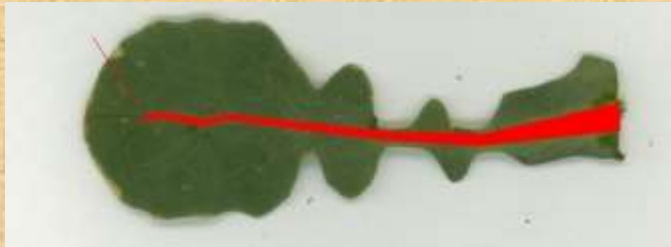


- Width of the main vein at the point its width is equal to a nearby secondary vein

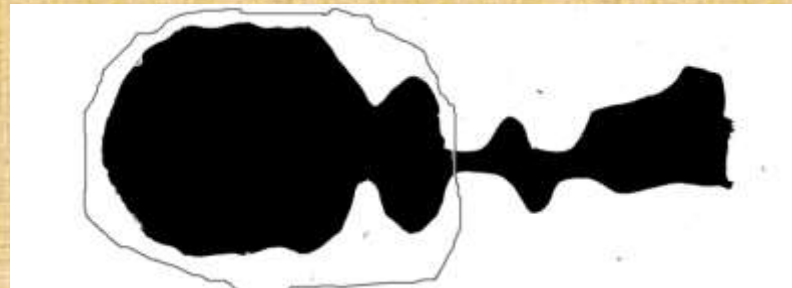


Markers Measured

- The distance between these two widths

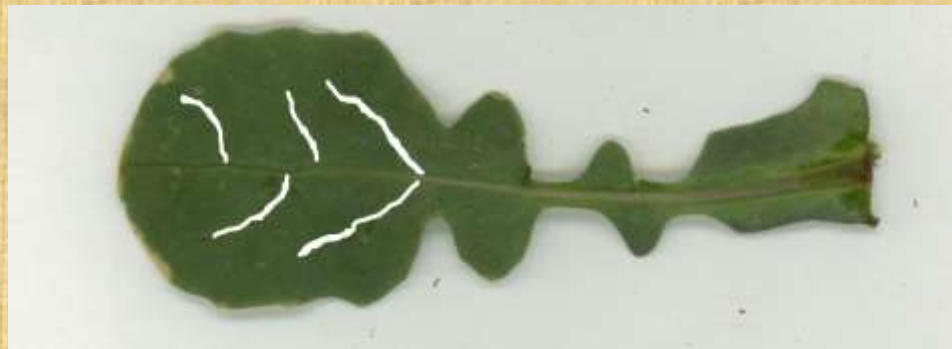


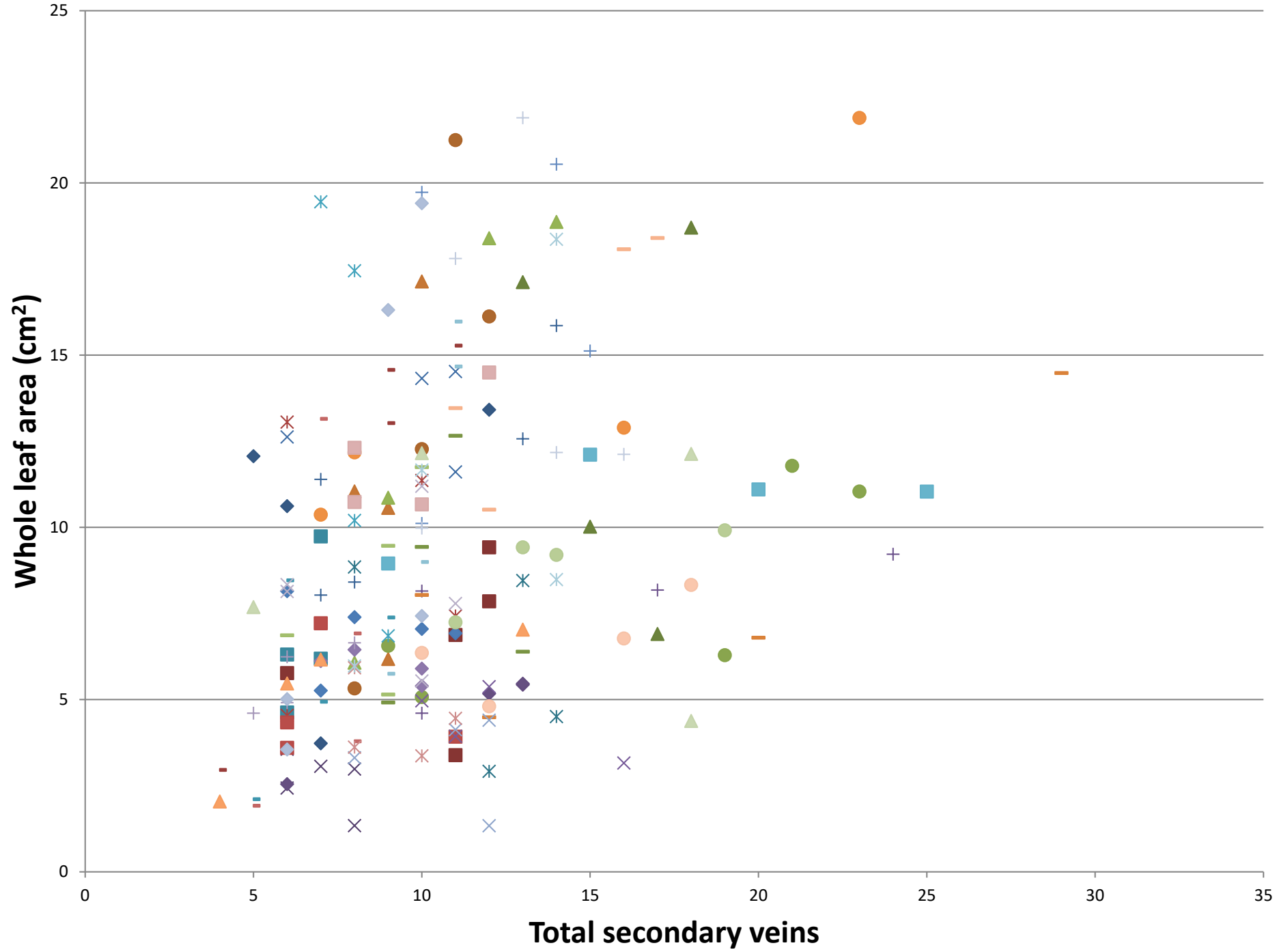
- Total leaf area

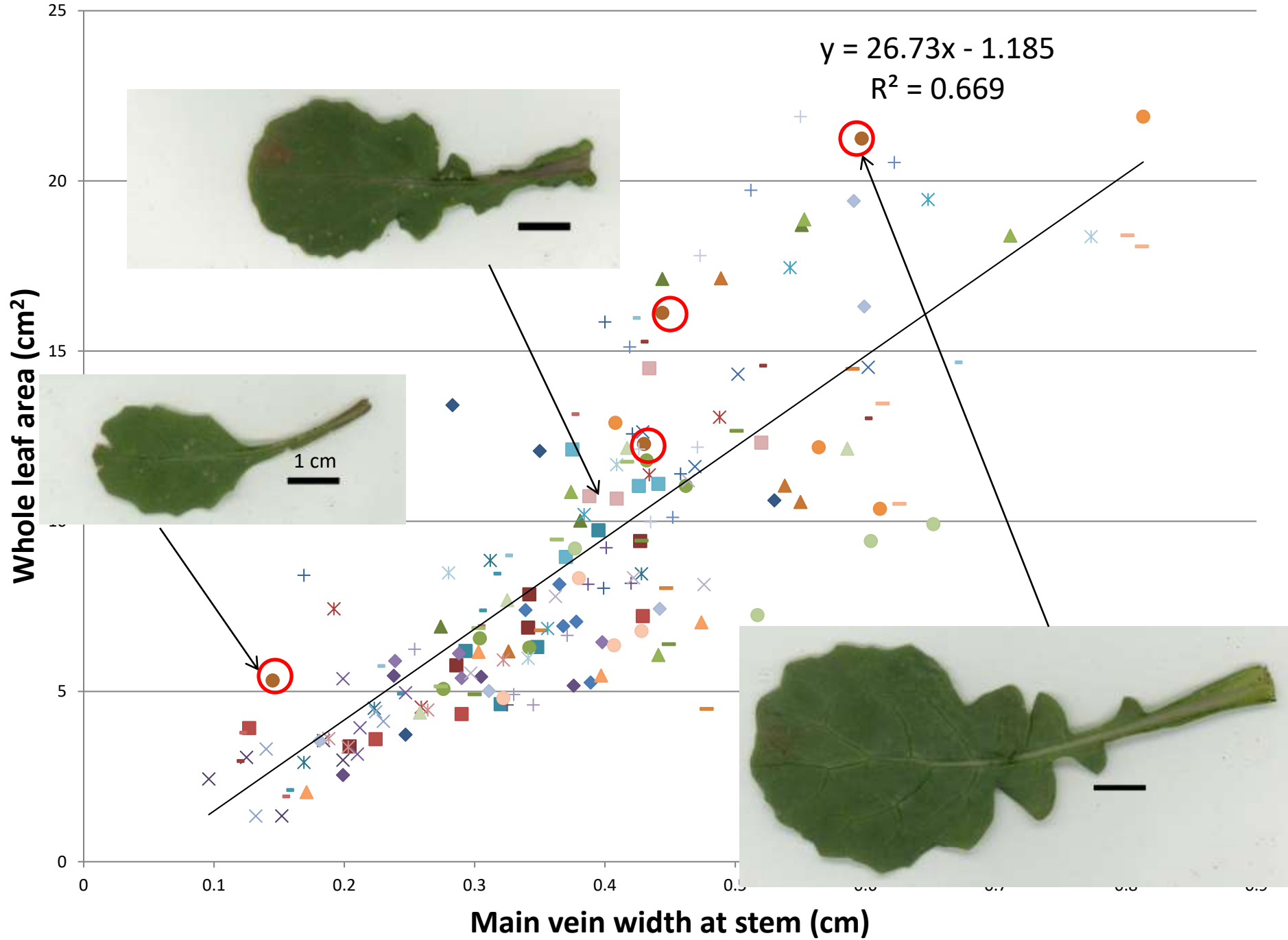


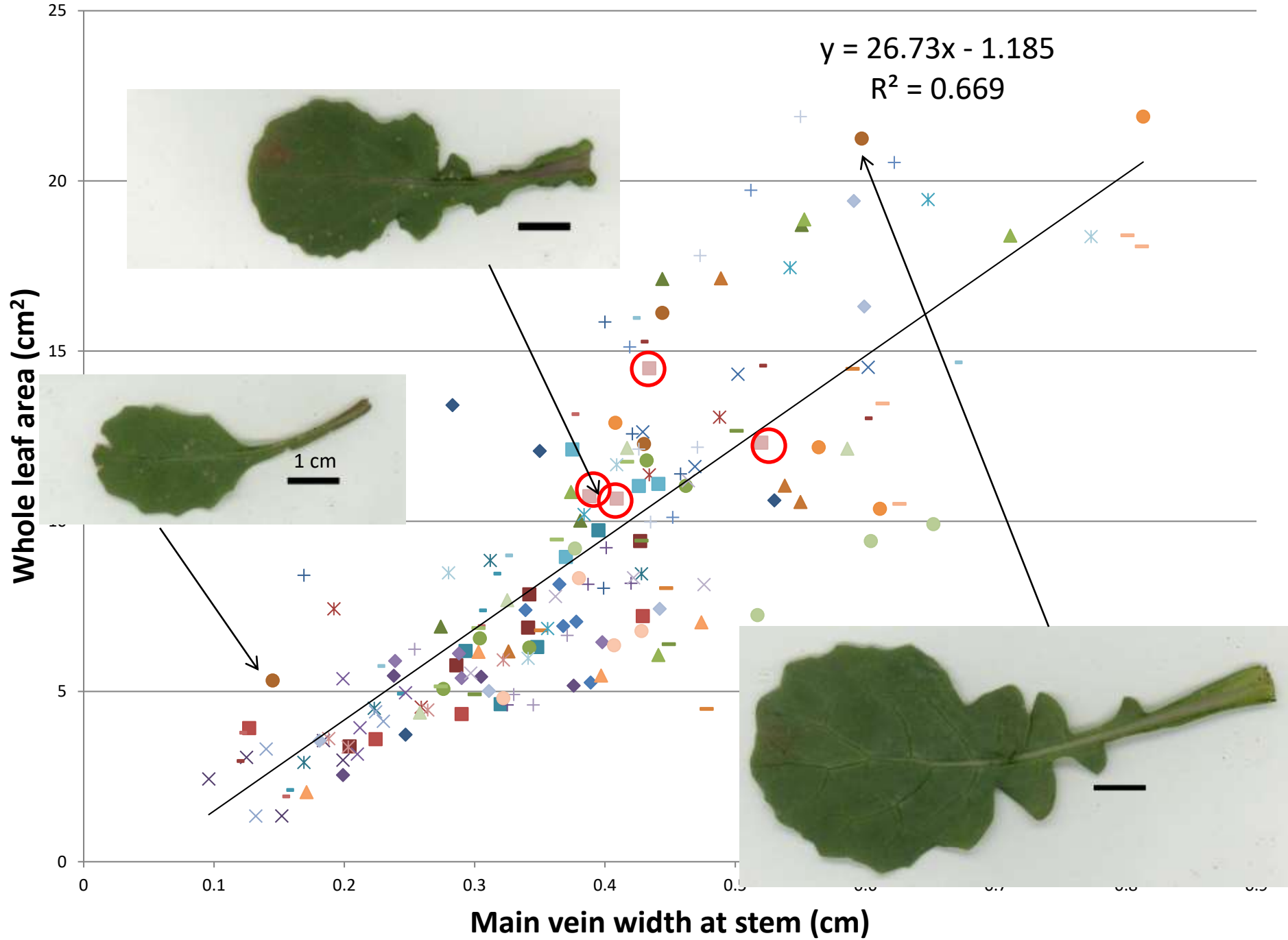
- Blade area

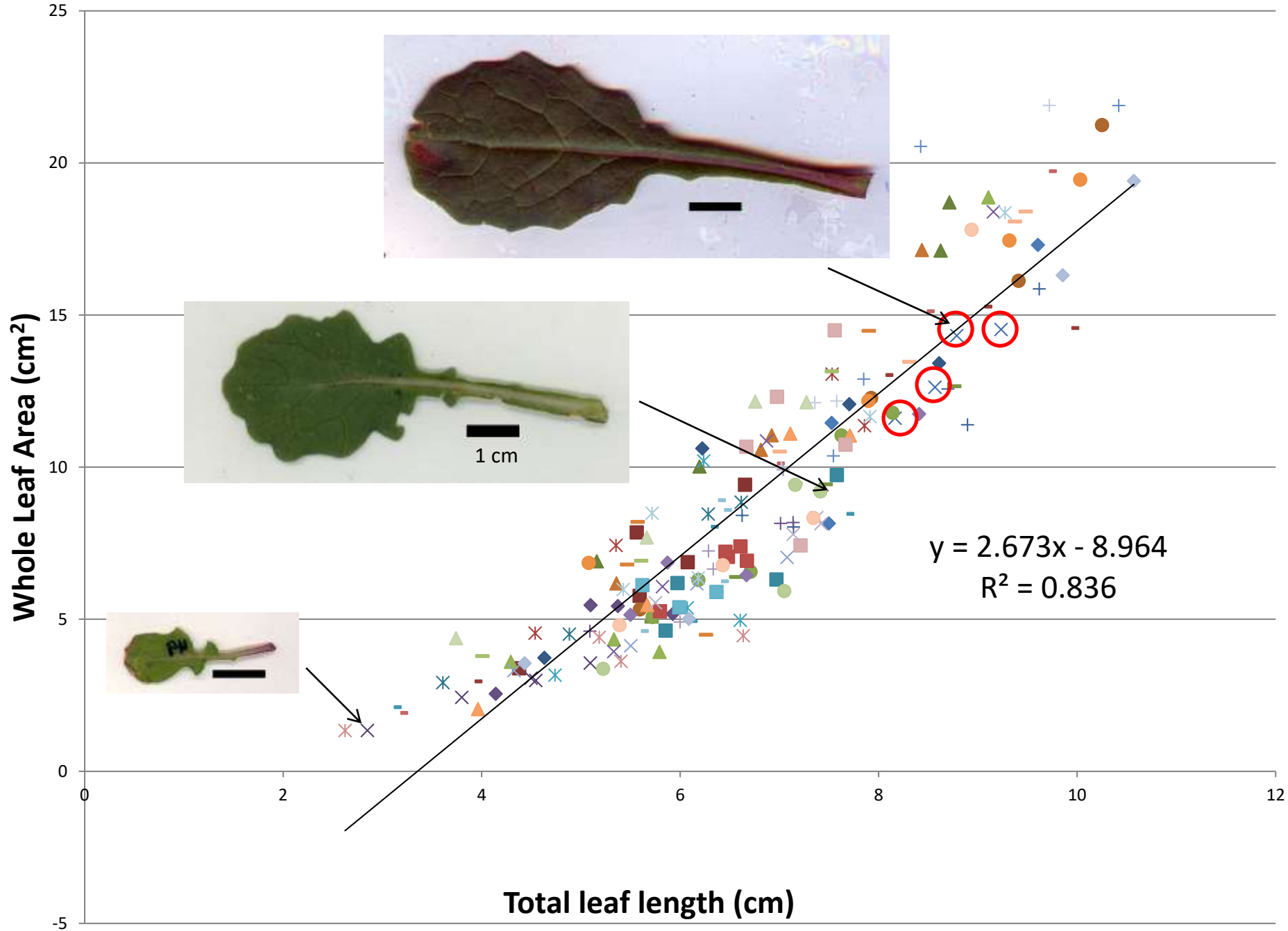
- Number of veins

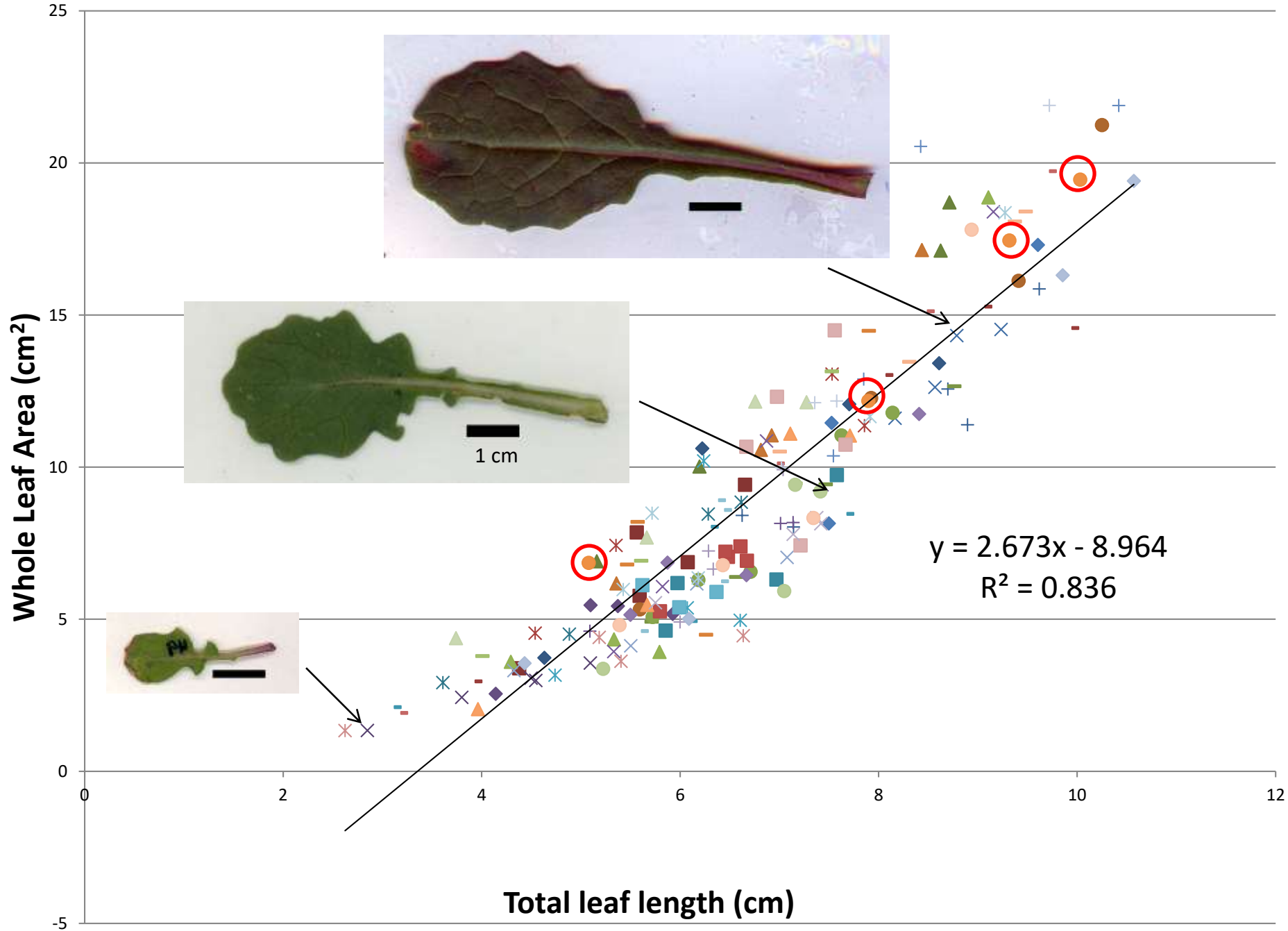


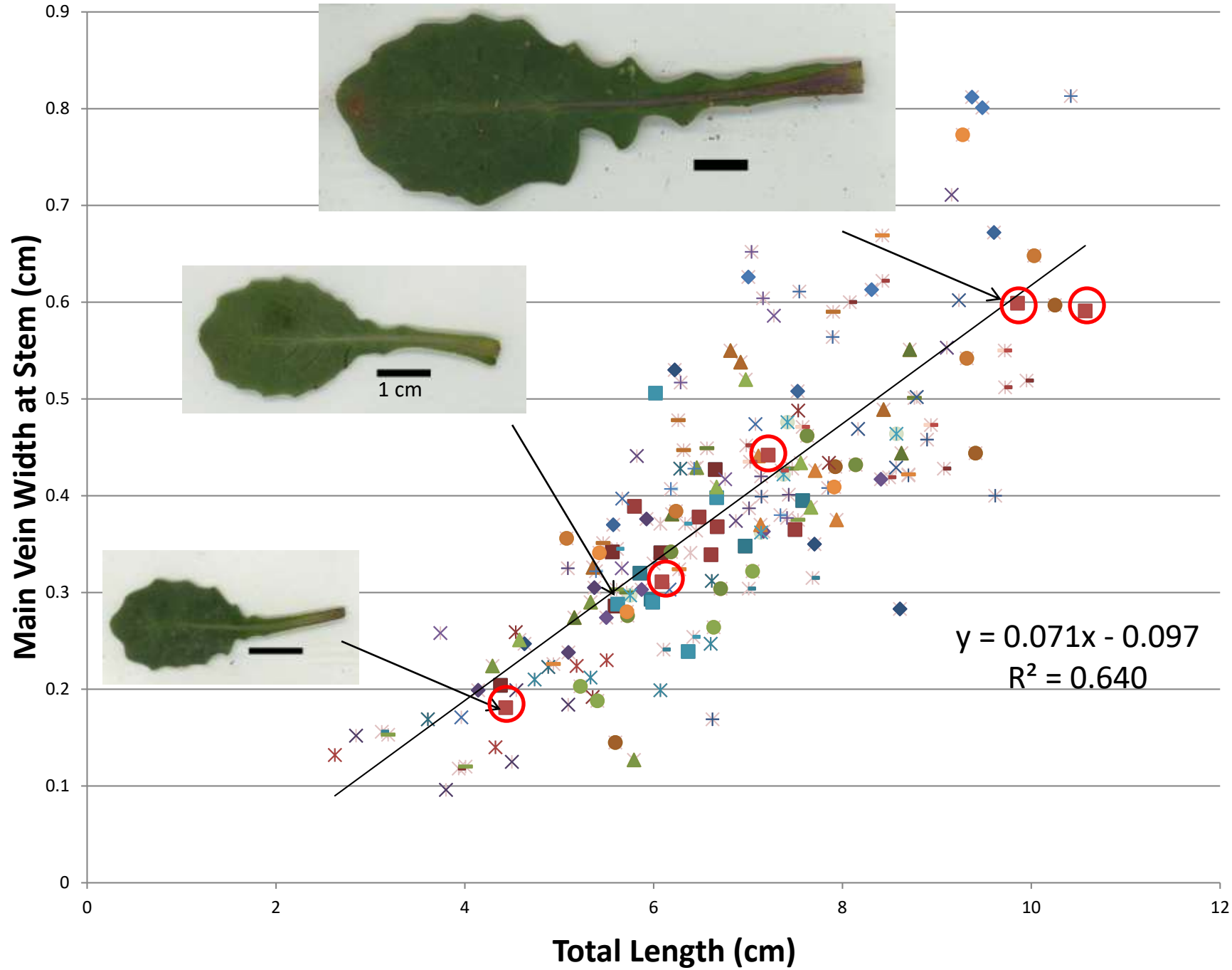


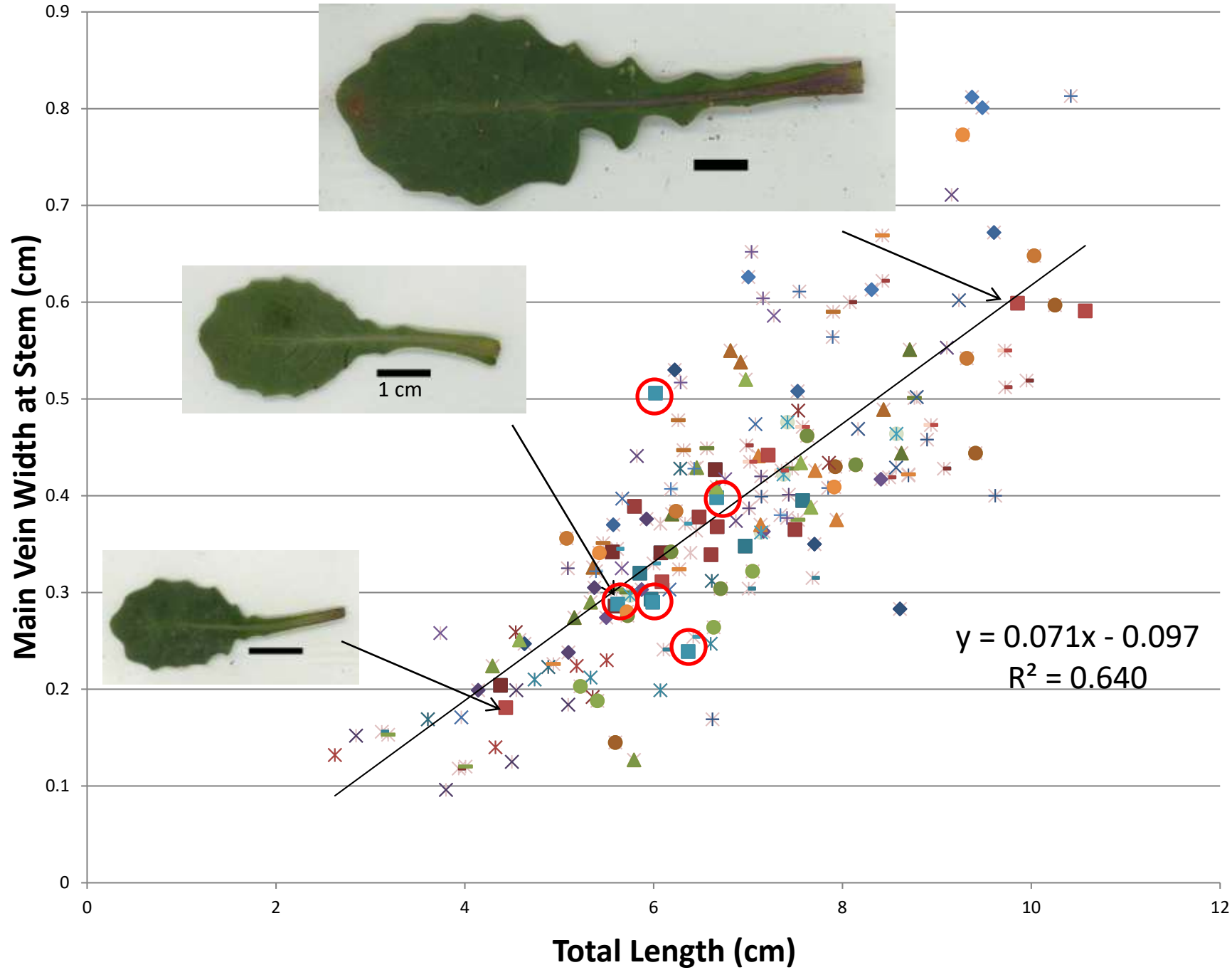












Conclusion

- Leaf length is correlated to area, which will help with gas exchange studies.
- There is plasticity in some genotypes but not in others.
- Future studies of total leaf vein lengths are needed

References

- Brodribb, T., T.S. Feild, and L. Sack. (2010). Viewing leaf structure and evolution from a hydraulic perspective. *Functional Plant Biology* 37: 488-498.
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