

# SEM pollen analysis of *Heliophila* (Brassicaceae)



Sharon Carter, University of Central Florida Orlando FL ([c\\_sharon\\_ucf@knights.ucf.edu](mailto:c_sharon_ucf@knights.ucf.edu))  
Ihsan Al- Shehbaz, Missouri Botanical Gardens ([ihsan.al-shehbaz@mobot.org](mailto:ihsan.al-shehbaz@mobot.org))

# Introduction

**Brassicaceae –  
Mustard Family**

- **320 genera**

- **3660 species**

- **Easily identifiable**







*Stenopetalon*



*Iberis*



*Draba verna*



*Ornithocarpa torulosa*



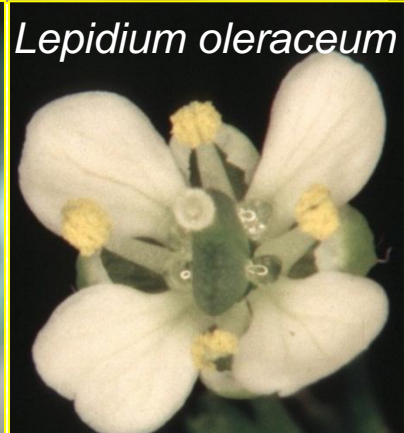
*Streptanthus glandulosus*



*Schizopetalon walkeri*



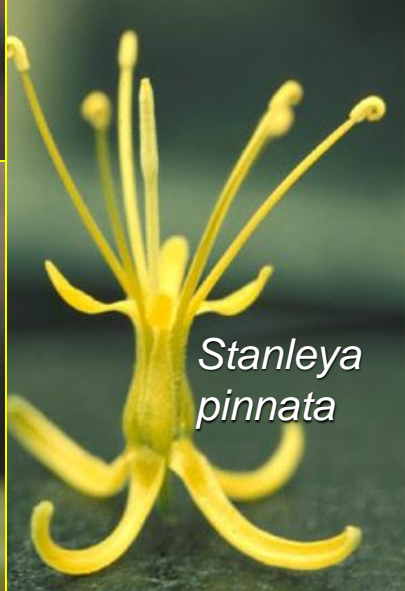
*Zerdana anchonioides*



*Lepidium oleraceum*



*Lepidium lasiophyllum*



*Stanleya pinnata*

# Floral Diversity



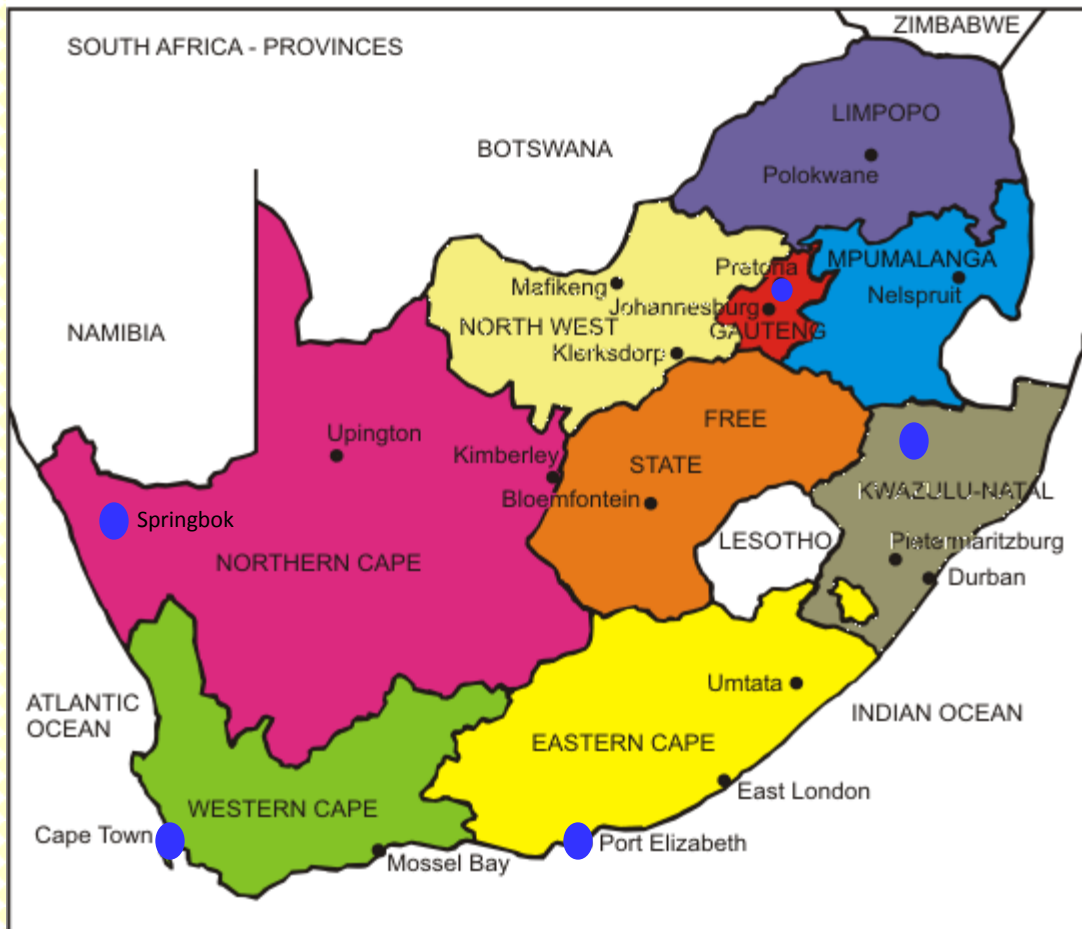
# *Heliophila*

-Endemic to South Africa,  
especially the Cape Region

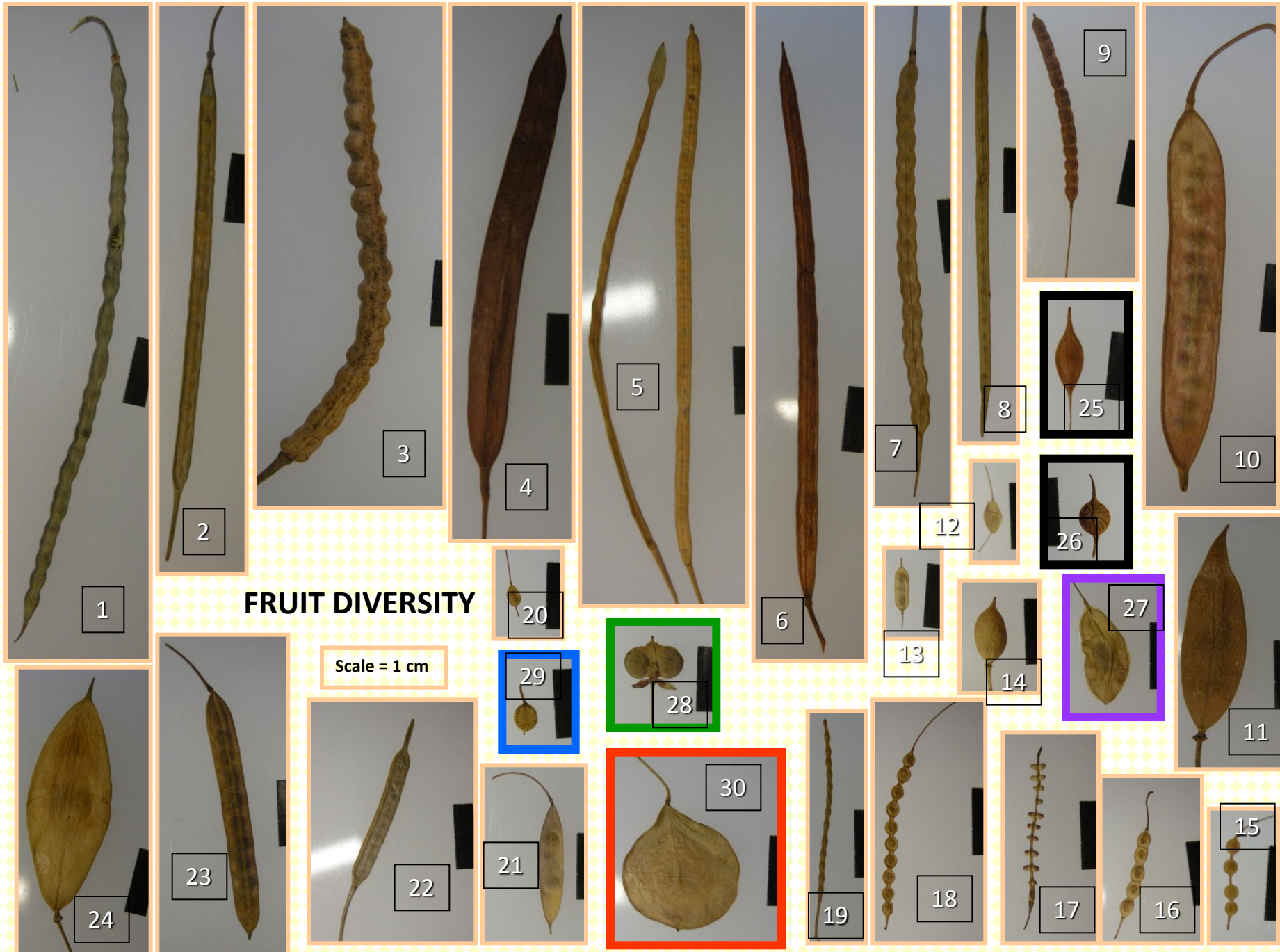
-88 species

-High variability in fruit  
morphology

- Fynbos eco-region







**FRUIT DIVERSITY**

Scale = 1 cm

1

2

3

4

5

6

7

8

9

10

25

26

27

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26

27

28

29

30

# *Heliophila* fruits

1. *H. cornuta*
2. *H. elongata*
3. *H. cinerea*
4. *H. callosa*
5. *H. africana*
6. *H. scoparia*
7. *H. pendula*
8. *H. descurva*
9. *H. variabilis*
10. *H. latisiliqua*
11. *H. brachycarpa*
12. *H. patens*
13. *H. diffusa*
14. *H. ephemera*
15. *H. pusilla*
16. *H. collina*
17. *H. arenaria*
19. *H. amplexicaulis*
20. *H. cornellsbergia*

21. *H. eximia*
22. *H. concatenata*
23. *H. crithmifolia*
24. *H. scandens*
25. ***H. hurkana*** [formerly *Cycloptychis marlothii*]
26. ***H. maraisiana*** [formerly *Cycloptychis virgata*]
27. ***H. monosperma*** [formerly *Schlechtertia capensis*]
28. ***H. juncea*** [formerly *Brachycarpaea juncea*]
29. ***H. polygaloides*** [formerly *Silicularia polygaloides*]
30. ***H. suborbicularis*** [formerly *Thlaspaecarpa capensis*]

# Objective

Determine pollen ornamentation  
in the genus *Heliophila*  
using SEM  
(scanning electron microscopy)





# Why Study Pollen?



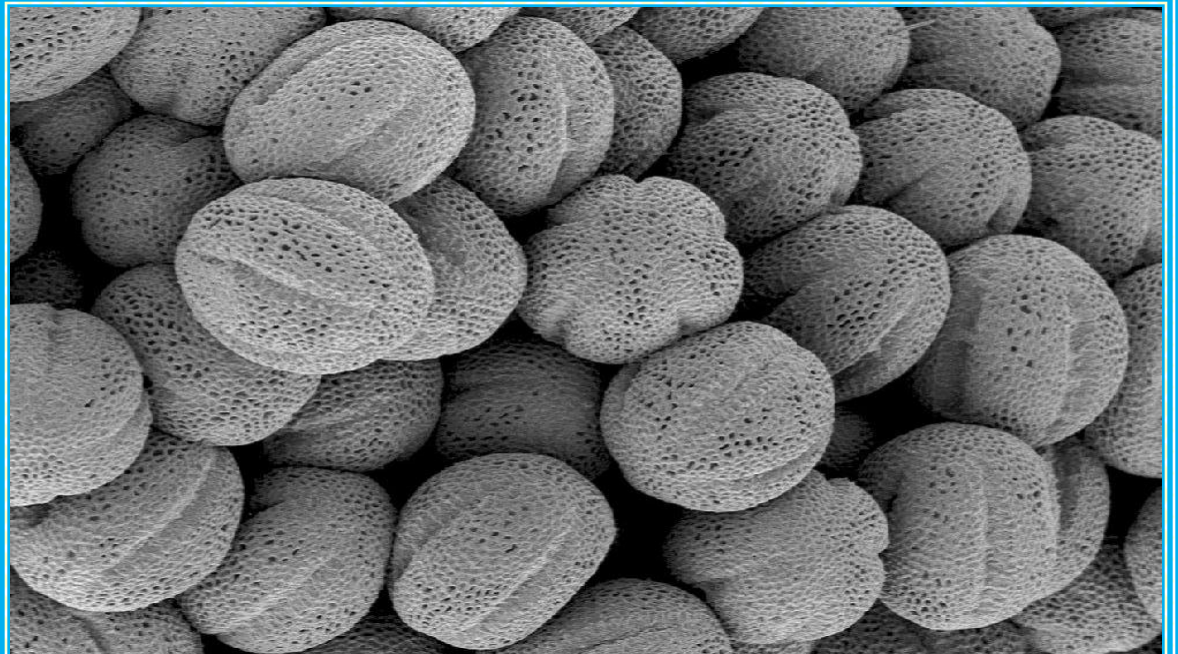




**Pollen  
Tricolpate**

**96.2% of  
Brassicaceae**

*Streptanthus carinatus*



**Pollen polycolpate**

**Tribe Physarieae  
(3.8% of family)**

*Physaria gordonii*

# Methods

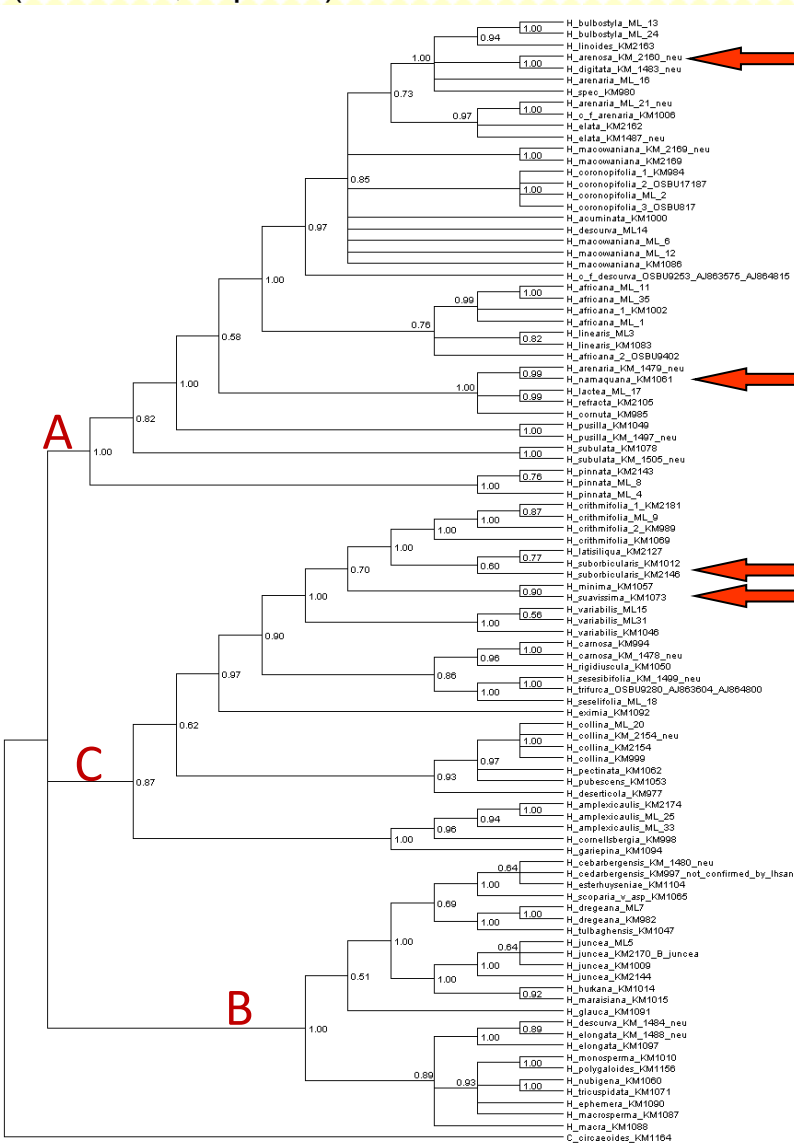
- Mount pollen from anthers to SEM stubs for all 62 taxa of *Heliophila*
- Sputter Coat for 2 min at 35 mAmps
- View using SEM
- Measure polar, equatorial, and colpi length and determine the P/E ratio

Table 1. Pollen characters of the species in *Heliophila*

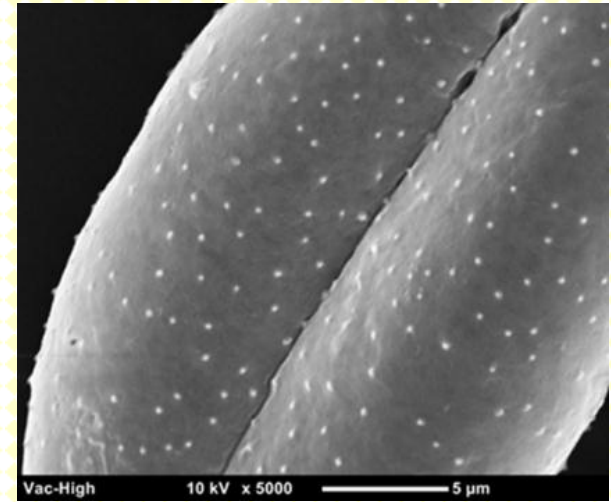
	A	B	C	D	E
1	Species	Polar length in micrometer (P)	Equatorial diameter in micrometer (E)	Colpus length (L)	P/E Ratio
2	<i>H. juncea</i> (2 specimens)	(26-33) 30.5	(13-15) 14	(23-29) 26.75	2.18
3	<i>H. pusilla</i>	(38-40) 39	(16-17) 16.5	(32-34) 33	2.36
4	<i>H. amplexicaulis</i>	(36-39) 37.5	(16-18) 17	(30-33) 31.5	2.21

Cladogram from  
Lysak et al. 2012  
(Taxon 61, in press)

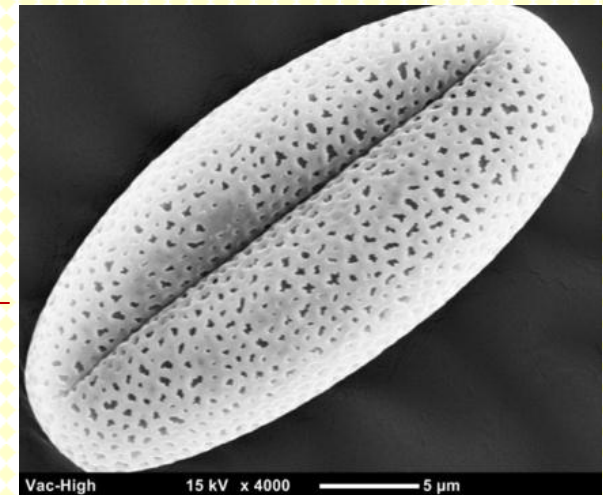
# Results



Spinulose



Reticulate

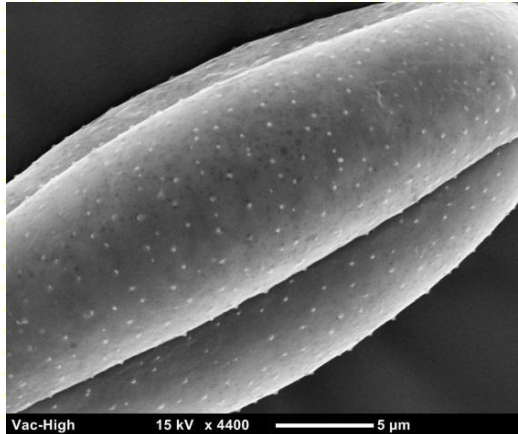




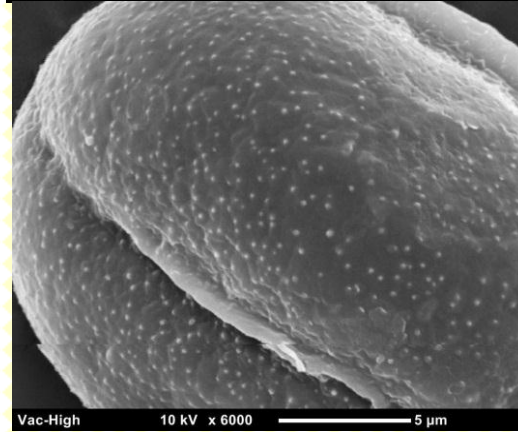
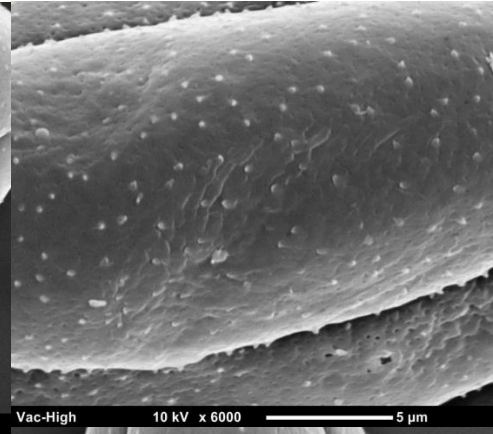
# Spinulose

- 41 species

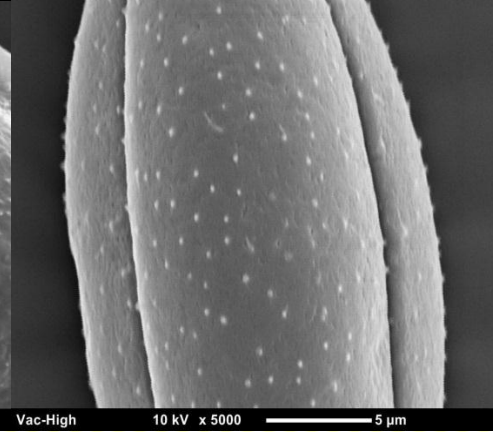
*H. pusilla*



*H. coronopifolia*



*H. linearis*

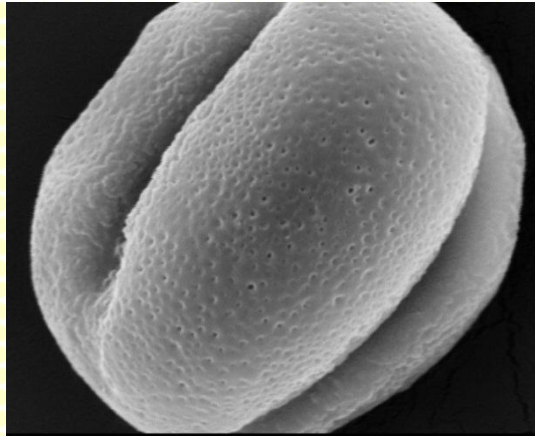


*H. collina*

# Reticulate: Coarse and Fine

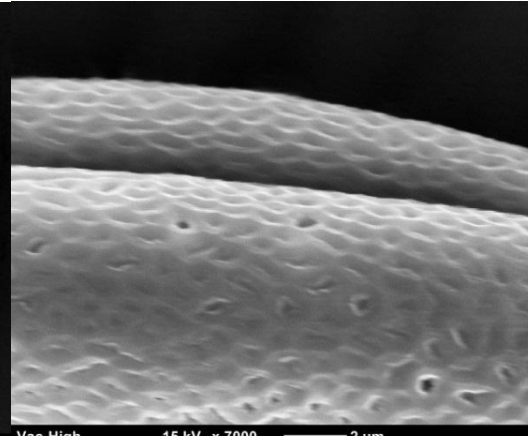
- 17 Species

*H. brachycarpa*

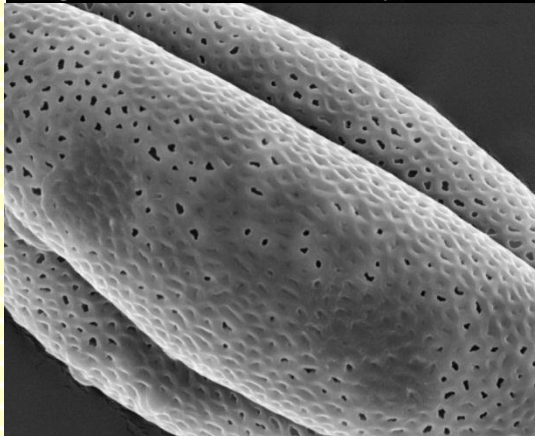


Vac-High 15 kV x 9000 2 μm

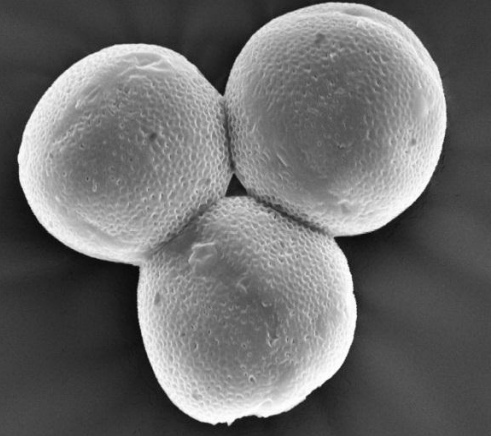
*H. glauca*



Vac-High 15 kV x 7000 2 μm



Vac-High 10 kV x 5000 5 μm



Vac-High 15 kV x 2400 10 μm

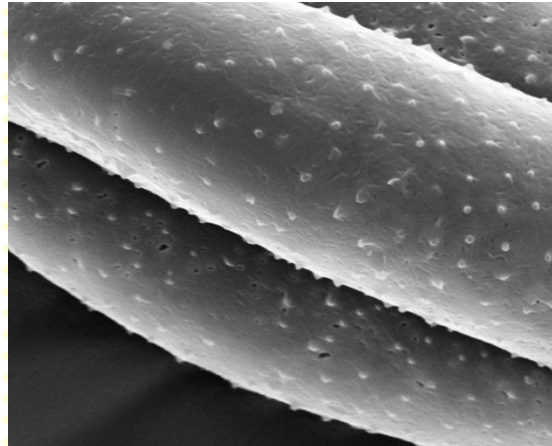
*H. dregeana*

*H. macrosperma*

# Spinulose with fine reticulation

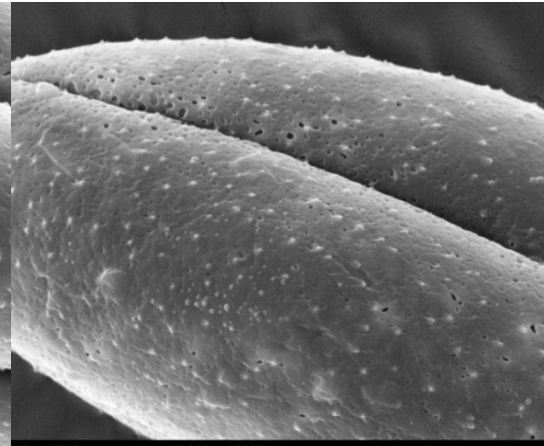
- 4 Species

*H. arenosa*

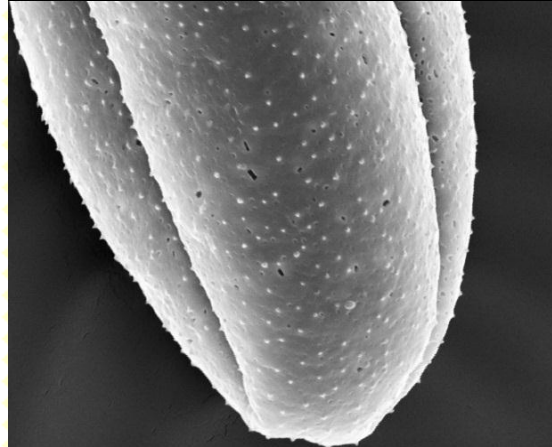


Vac-High 15 kV x 5000 5 µm

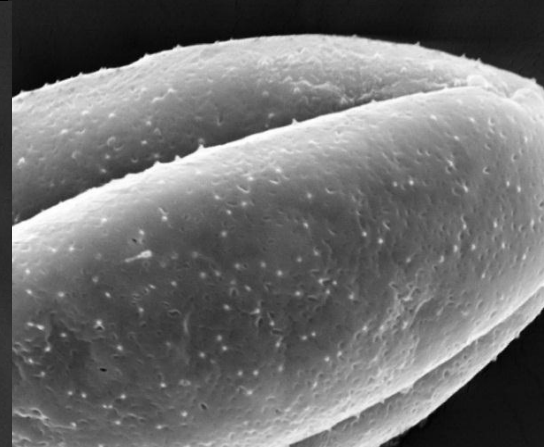
*H. namaquana*



Vac-High 10 kV x 5400 5 µm



Vac-High 15 kV x 4000 5 µm



Vac-High 15 kV x 5000 5 µm

*H. suavissima*

*H. suborbicularis*



# Conclusion

## Pollen ornamentation types

### Major

-Reticulate (coarse and fine):

*Heliophila* Clade B

-Spinulose: *Heliophila* Clades A,C

### Minor

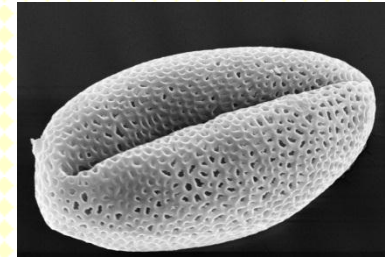
-Spinulose with fine reticulation:

*Heliophila arenosa* and *H.*

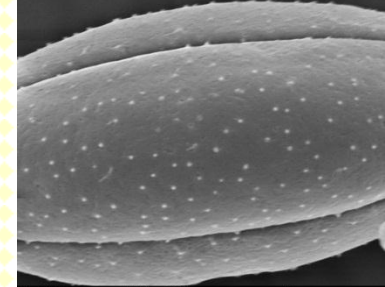
*namaquana* (Clade A)

*Heliophila suborbicularis* and *H.*

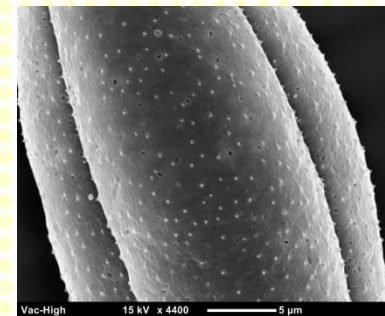
*suavissima* (Clade C)



Vac-High 15 kV x 3400 5 µm



Vac-High 10 kV x 5000 5 µm



Vac-High 15 kV x 4400 5 µm

# Future Work

- Use light microscopy and transmission electron microscopy to analyze the anatomic structural basis of the pollen wall
- Determine if the Spinulose type is present in other genera of Brassicaceae
- Study the flower pollinators to understand if the Spinulose type has possible adaptive pollination values

# Acknowledgments



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# References

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