

Results

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To check for the effect of heterospecific pollen we assume that the optimal seed production is the hand cross pollination (pollinated with pollen from a different individual of the same species). Then, we subtract to the mean value of hand cross pollination the mean value of heterospecific pollen effect across treatments (50% conspecific-50%heterospecific pollen). Previously we have scaled the seed set for each species with mean 0 and standard deviation of 1 to be able to compare among species. When a species had higher values of seed production with treatments than the cross, we set as maximum value for the treatments the same as the hand cross pollination. However, we should take into account that analysis in general improve if we keep these negative values. If we put these words into a formula being i the different focal species and j the different donors:

Eq.1

$$HpEffect_i = Mean(CrossPollinationSeeds)_i - Mean(TreatmentSeeds_{ij})$$

Part 1 Relation between effect of Hp and evolutive distance

I try Mantel test and procustes test, although both are similar procustes performs better in a wider range of circumstances Peres-Neto and Jackson (2001). Moreover, I consider the square root of the evolutive distances which improves the statistical power in comparison to the normal distances Letten and Cornwell (2015).

1) With the RBCL marker

Heterospecific pollen effect~evolutive distance

r	p	Analysis	Type
0.2558924	0.033	Mantel	normal evolutive distance
0.2949348	0.016	Mantel	sqrt evolutive distance
0.3466341	0.714	Procustes	normal evolutive distance
0.4666208	0.640	Procustes	sqrt evolutive distance

I wonder if the matrices are too small for procustes, is a general trend for all the analysis to have a non significant p value and correlation around these numbers.

2) With the ITS marker

Heterospecific pollen effect~evolutive distance

r	p	Analysis	Type
0.2743059	0.026	Mantel	normal evolutive distance
0.2891004	0.024	Mantel	sqrt evolutive distance
0.4217703	0.775	Procustes	normal evolutive distance
0.5317588	0.724	Procustes	sqrt evolutive distance

I plot now the pairwise distances on the x axis and the effect of heterospecific pollen on the y axis. The greater the effect of heterospecific pollen the greater the number on the y axis.

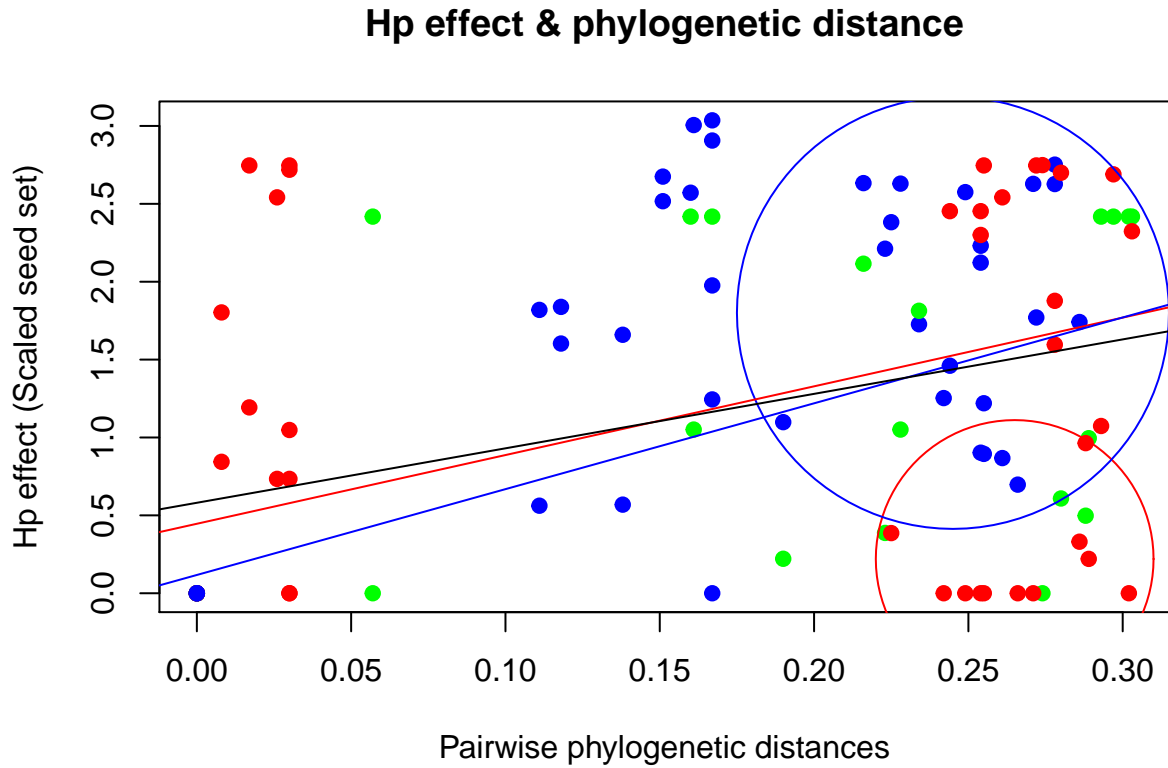
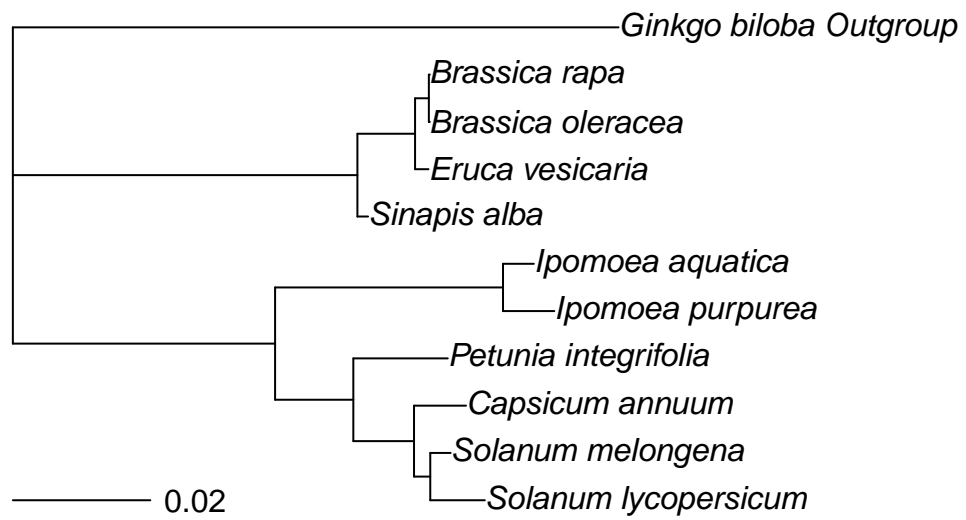


Figure 1: Figure 1. Scatterplot of the evolutive distances (x axis) and the mean scaled effect per species (ITS markers). In other words, each point is defined by the phylogenetic distance between a pair of species (x axis) and the effect of heterospecific pollen which considers also an interaction between the same pair of species (donor and recipient)(y axis)

Overall, it seems that with phylogenetic distance, heterospecific pollen effect increases for the three families. From Mantel analysis we can conclude that we have a significant correlation between phylogenetic distance and heterospecific pollen effect with r values between 0.25 and 0.3. However, for procustes test we were not able to find a significant correlation between these two despite the procustes correlation gave higher values. In Figure 1 we can also see these general pattern of a higher effect with phylogenetic distance with the different regressions lines per family. I have done simple linear models, probably I should consider other alternatives that fit better the cloud of points. In Figure 1 the two colored circles are there for a reason, once we consider just the crosses between the “far related species” we see a general pattern for solanaceae with almost all the values above 0.5. Solanaceae curiously belongs to the group with gametophytic incompatibility which is predicted to suffer more from heterospecific pollen. Moreover, for Brassicaceae (red points) again for the far related crosses we find kind of two groups with high effect and no effect. The no effect correspond to the species without incompatibility (over 50% of selfing) and the high effect to the species with strong incompatibility (0% of selfing), again this confirms theory.



Part 2 Relation between effect of Hp and traits

References

Letten, Andrew D, and William K Cornwell. 2015. “Trees, Branches and (Square) Roots: Why Evolutionary Relatedness Is Not Linearly Related to Functional Distance.” *Methods in Ecology and Evolution* 6 (4). Wiley Online Library: 439–44.

Peres-Neto, Pedro R, and Donald A Jackson. 2001. “How Well Do Multivariate Data Sets Match? The Advantages of a Procrustean Superimposition Approach over the Mantel Test.” *Oecologia* 129 (2). Springer: 169–78.