

POPULATION GENETICS PROJECT #1

Dan Schoen and Mike Clegg [1] studied the influence of flower color on the outcrossing rate in the common morning glory, *Ipomoea purpurea*. Focusing just on results from the first experimental design and ignoring the color differences, these are the data they report:

Maternal genotype	Offspring genotype		
	$Est^F Est^F$	$Est^F Est^S$	$Est^S Est^S$
$Est^F Est^F$	267	62	0
$Est^F Est^S$	81	120	44
$Est^S Est^S$	0	143	170

When plants reproduce by a mixture of self-fertilization and outcrossing the expected frequencies of getting a particular offspring genotype, given the mothers genotype can be written as

Maternal genotype	Offspring genotype		
	$Est^F Est^F$	$Est^F Est^S$	$Est^S Est^S$
$Est^F Est^F$	$p_m \tau + (1 - \tau)$	$(1 - p_m) \tau$	0
$Est^F Est^S$	$\frac{p_m \tau}{2} + (1 - \tau)/4$	$\frac{1}{2}$	$\frac{(1 - p_m) \tau}{2} + (1 - \tau)/4$
$Est^S Est^S$	0	$p_m \tau$	$(1 - p_m) \tau + (1 - \tau)$

where p_m is the frequency of the Est^F allele in successful male gametes and τ is the fraction of offspring produced through outcrossing.

Using these data answer the following questions:

1. What is the outcrossing rate in this experimental population?
2. What is the frequency of the Est^F allele in successful male gametes?
3. What is the frequency of the Est^F allele in maternal plants?
4. What is the inbreeding coefficient in maternal plants?
5. Using what you learn from the paper and from your answers to questions 1-4, what biological process (or processes) might account for differences in allele frequencies between successful male gametes and maternal plants?

Hints

- Use the R script, `selfing.R`, and the accompanying JAGS script `selfing.jags` to estimate outcrossing rates and the frequency of Est^F in successful male gametes.
- You'll need to write your own R script and JAGS script to estimate the frequency of Est^F and the inbreeding coefficient in maternal plants. Use uniform (0, 1) priors on the allele frequency and inbreeding coefficient in your code.

References

- [1] D. J. Schoen and M. T. Clegg. The influence of flower color on outcrossing rate and male reproductive success in *ipomoea purpurea*. *Evolution*, 39:1242–1249, 1985.

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