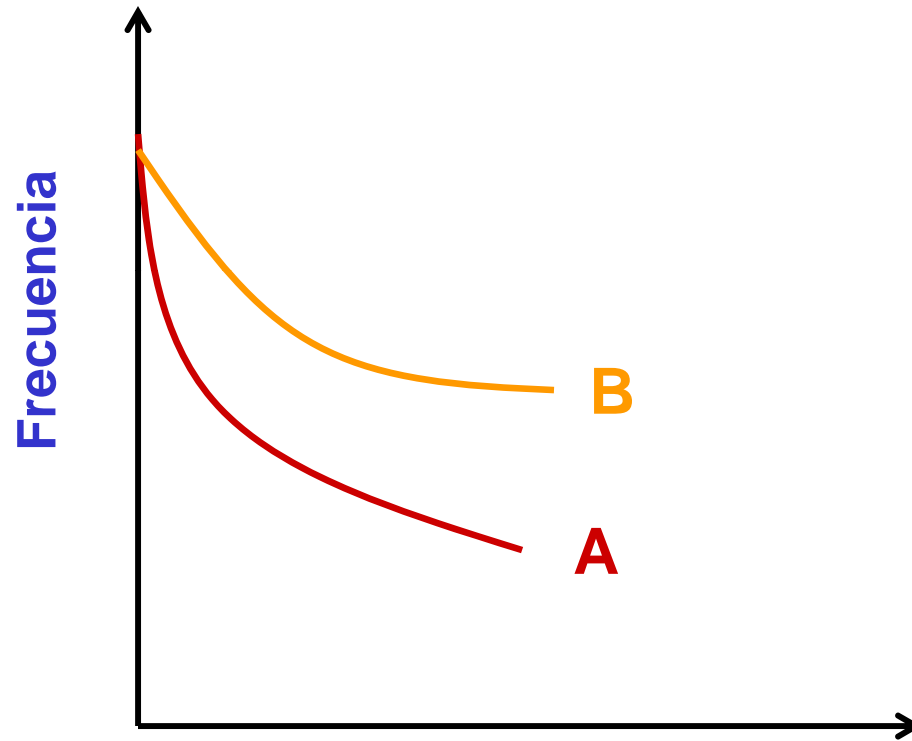


Flujo de polen



A = abejas, dípteros, picaflores territoriales

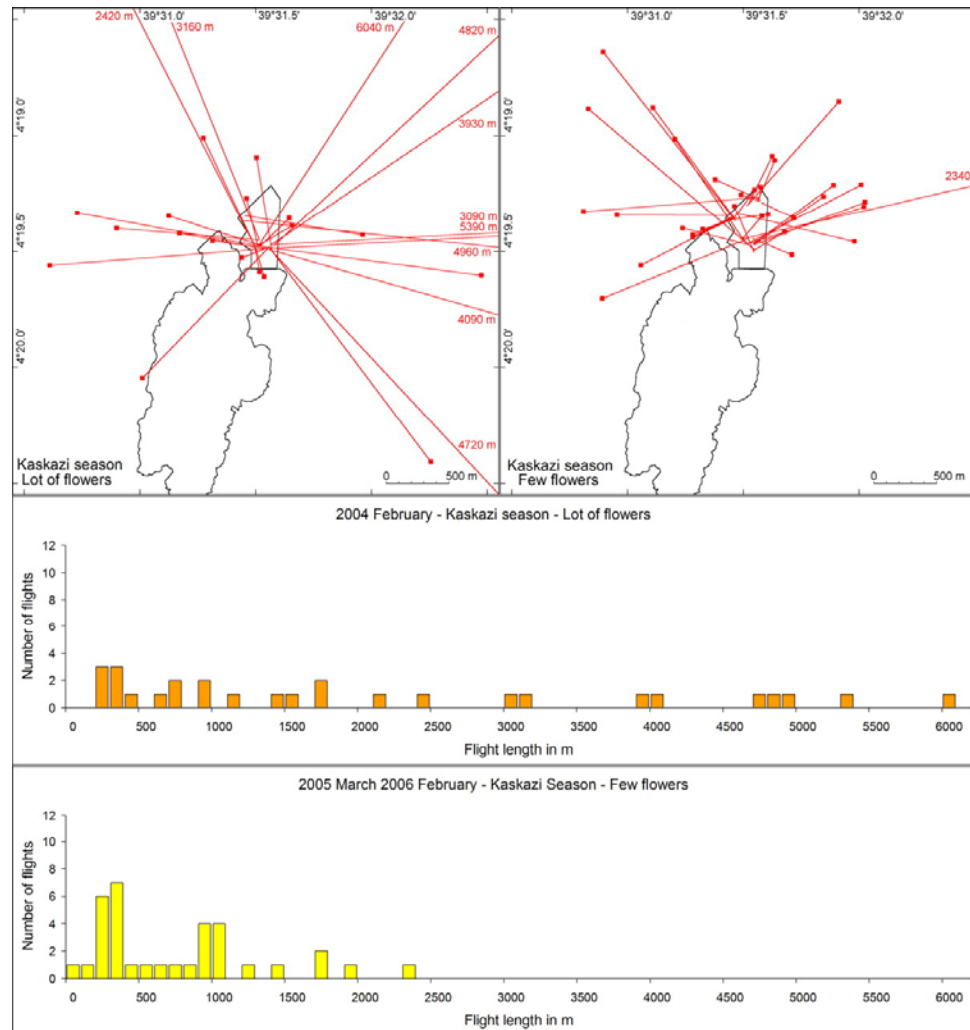
B = lepidópteros, esfíngidos, picaflores heremitas

Xylocopa flavorufa taking off (Upper) and returning to its nest (Lower).



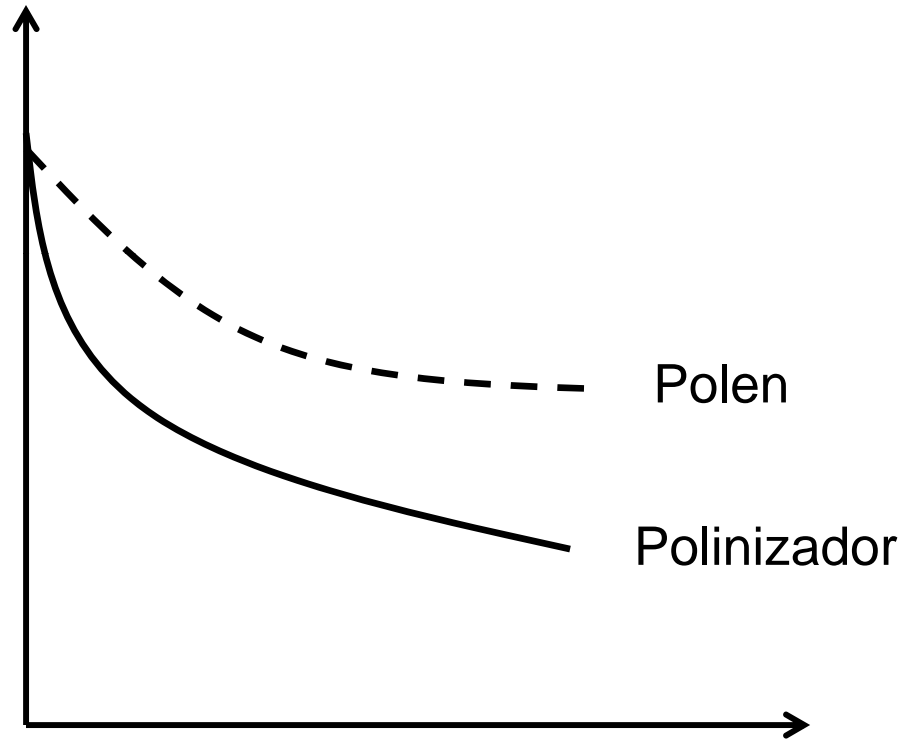
Pasquet, R.S: et al. 2008. Long-distance pollen flow assessment through evaluation of pollinator foraging range suggests transgene escape distances. PNAS 105: 13456–13461.

Bee flights recorded during the Kaskazi season (predominant northeast winds) in 2004 with high density of flowers at the field station (Left), and in 2005 and 2006 with low density of flowers at the field station (Right).



Pasquet R S et al. PNAS 2008;105:13456-13461

“Carryover” (acarreo)



Métodos

- Polvos fluorescentes
- Polimorfismo del polen
- Histoquímicos
- Marcadores genéticos
- Carryover

Box 1. *F*-statistics and indirect estimates of gene flow

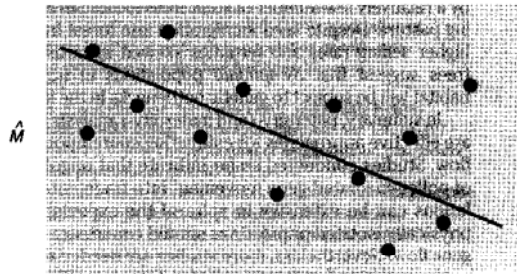
F_{ST} is the correlation between random gametes within subpopulations relative to gametes of a total population. Under Wright's island model of population genetic structure¹, with subpopulations at migration-drift equilibrium, F_{ST} is a function of the average effective number of migrants per generation, $N_e m$, where N_e is the effective subpopulation size and m is the proportion of migrants per generation drawn at random from the whole population. At equilibrium F_{ST} can be estimated for a set of populations as:

$$F_{ST} = \frac{1}{4N_e m + 1} \quad (1)$$

Thus, the effective number of migrants can be estimated from F_{ST} as:

$$N_e m = \frac{1}{4} \left(\frac{1}{F_{ST}} - 1 \right) \quad (2)$$

To test hypotheses concerning spatial patterns of gene migration at various spatial scales, we can use Eqn 2 to estimate the migration between pairs of populations (\hat{M})⁹. If gene exchange among populations conforms to a process of isolation by distance then the effective number of migrants exchanged between populations should be a monotonically decreasing function of interpopulation geographic distances (Figure). (Note: Because these observations lack independence, one should use a Mantel test based on randomization methods to test whether the observed correlation is significantly different from random³³.)



Geographic distance

(Online: Fig. 1)

The concept of isolation by distance was originally coined by Sewall Wright to describe the decreasing probability of mating as distance between parents increases in a continuous population¹. In this scenario, migration is estimated as the variance of the parent-offspring distance, which in turn sets the genetic neighborhood area. Application of the term has expanded, however, to include the negative correlation between gene exchange and geographic distance among subpopulations regardless of population structure. The relationship between estimates of migration and distance has been used to examine migration pathways and landscape context by constraining measurements of geographic distance to follow specific pathways in response to features of the landscape (e.g. Ref. 10).

The availability of molecular markers from biparentally (nuclear) and maternally (organellar) inherited genomes in angiosperms allows us to distinguish historical contributions of seed and pollen to estimated gene flow³² by estimating the ratio of pollen flow to seed flow as:

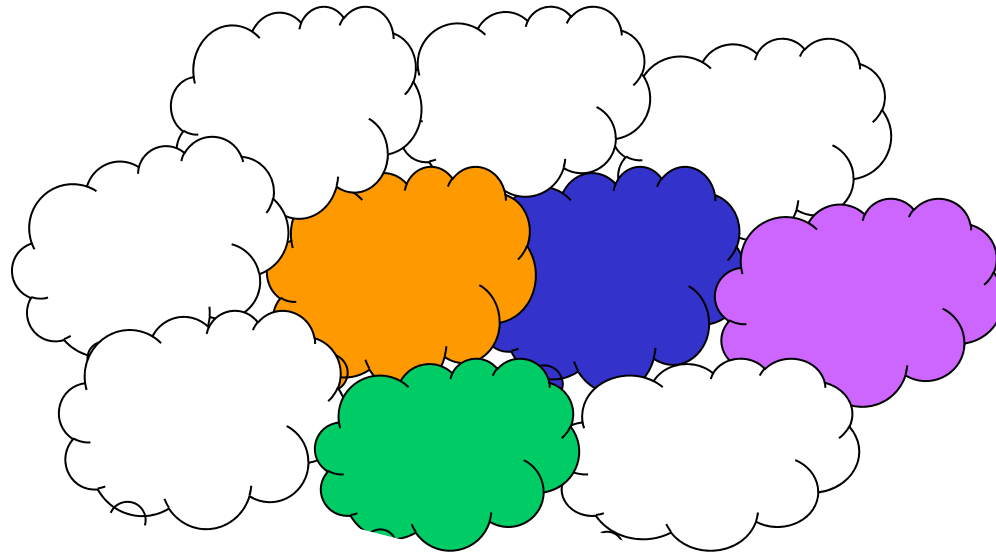
$$\frac{\text{Pollen flow}}{\text{Seed flow}} = \frac{\left(\frac{1}{F_{ST_b}} - 1 \right) - 2 \left(\frac{1}{F_{ST_m}} - 1 \right)}{\left(\frac{1}{F_{ST_m}} - 1 \right)} \quad (3)$$

This equation uses separate fixation indices for biparentally and maternally inherited genomes as indicated by sub-subscripts, b and m, respectively. In general, for studies in which nuclear and organellar genetic structure has been compared, rates of gene flow via pollen have greatly exceeded that via seed^{34,35}.

Sork, V.L., J. Nason, D.R. Campbell, y J.F. Fernandez. 1999. Landscape approaches to historical and contemporary gene flow in plants. *TREE* 14: 219-224.

Causas y consecuencias:

Estructura genética de las poblaciones



Levin, D.A. 1984.
Inbreeding depression
and proximity-dependent
crossing success in
Phlox drummondii.
Evolution 38: 116-127.

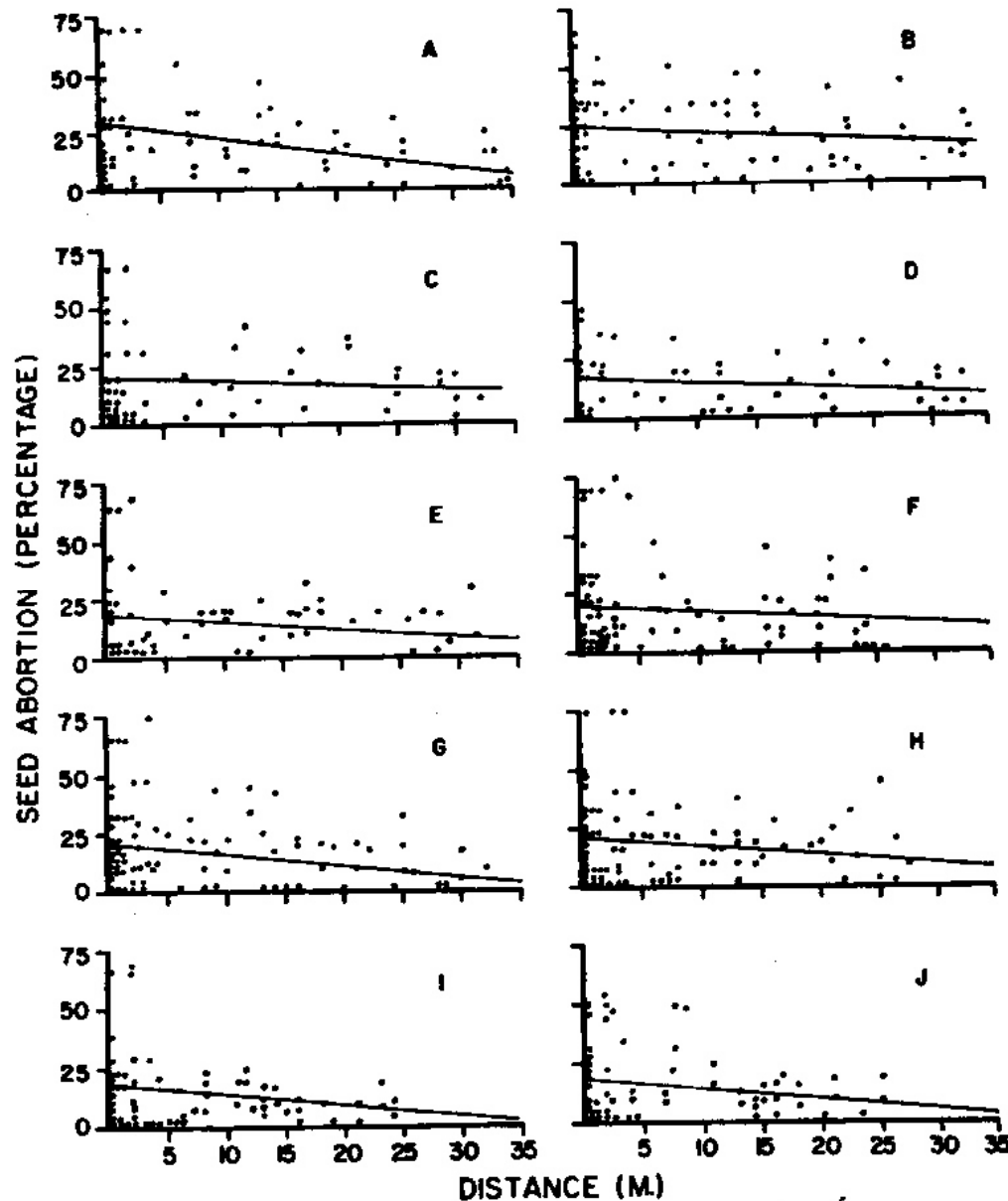


FIG. 2. The relationship between seed abortion and interparent distance in populations of *P. drummondii*. A. 4 mi N Pleasanton; B. 4 mi S Bastrop; C. 1 1/2 mi N Smilley; D. 4 mi NE Nixon; E. 4 mi S Leesville; F. 8 mi NE Floresville; G. 13 mi S Stockdale; H. Lytle; I. Sutherland Springs; J. 5 mi E Nixon. Regression lines are shown for each population.

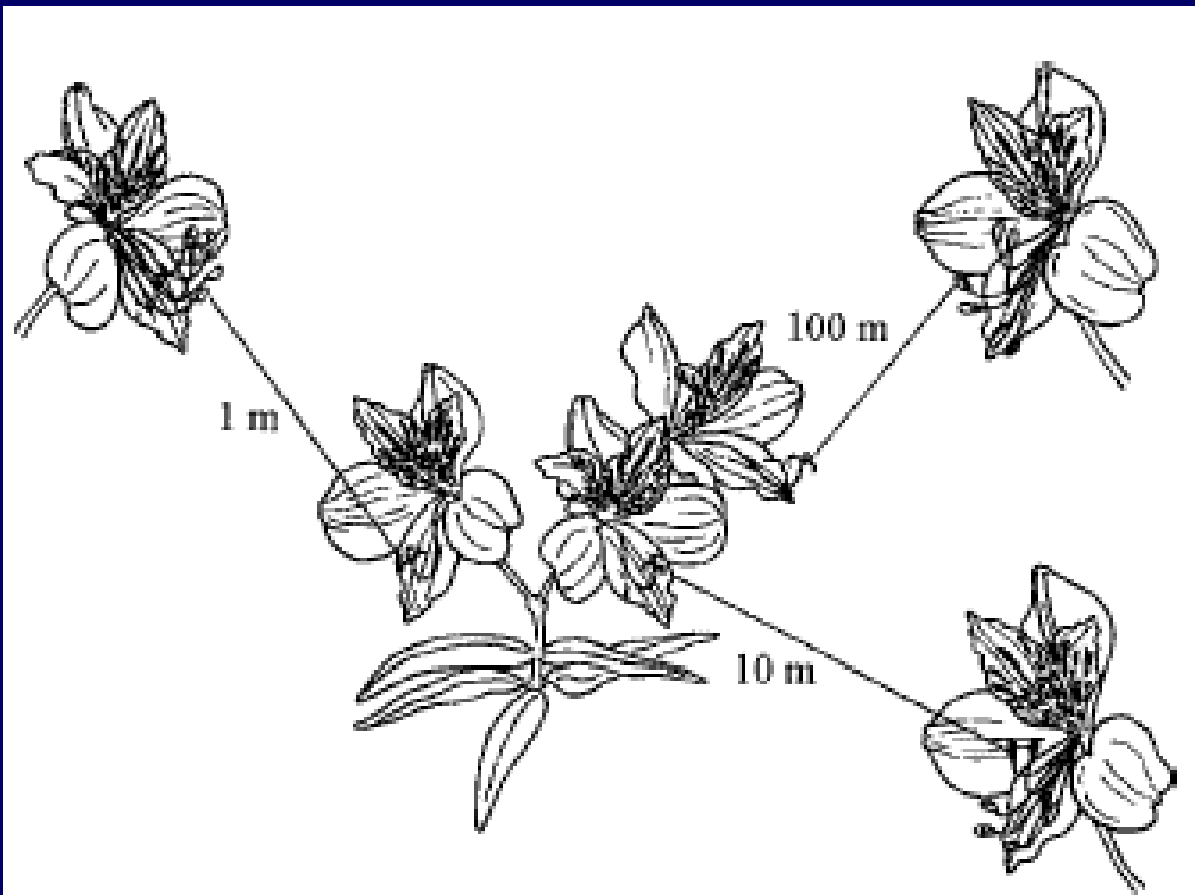


Fig. 1. Scheme depicting the experimental crosses performed in this study.

Souto, C.P., M.A. Aizen y A.C. Premoli. 2002. Effects of crossing distance and genetic relatedness on pollen performance in Alstroemeria aurea (Alstroemeriaceae). *American Journal of Botany* 89: 427-432.

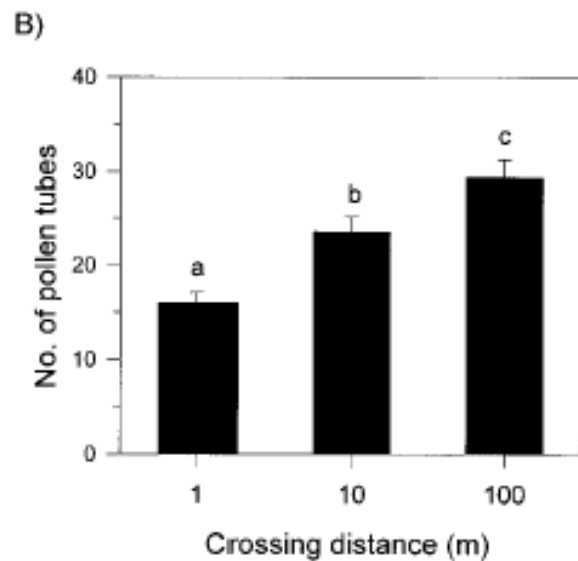
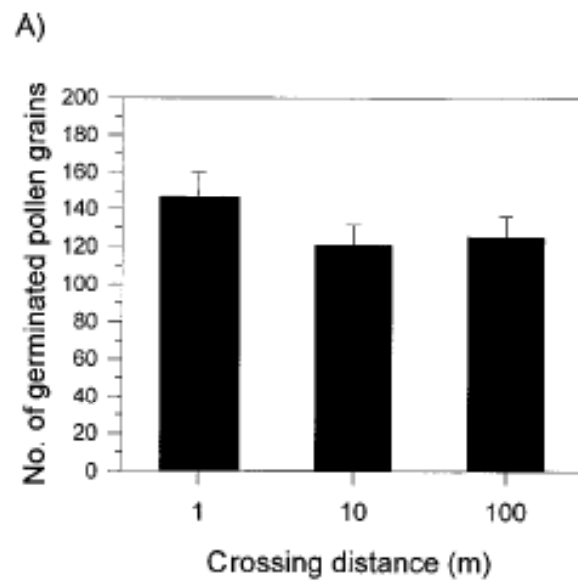


Fig. 2. Back-transformed least squares means + 1 SE for (A) the number of germinated pollen grains after statistically controlling for the total number of grains deposited on the stigma and (B) the number of pollen tubes reaching the base of the style for crosses between mates 1, 10, and 100 m apart. For comparisons that showed overall significant effects (Table 1), means that do not share the same lowercase letter differ significantly (Tukey's test, $P < 0.05$).

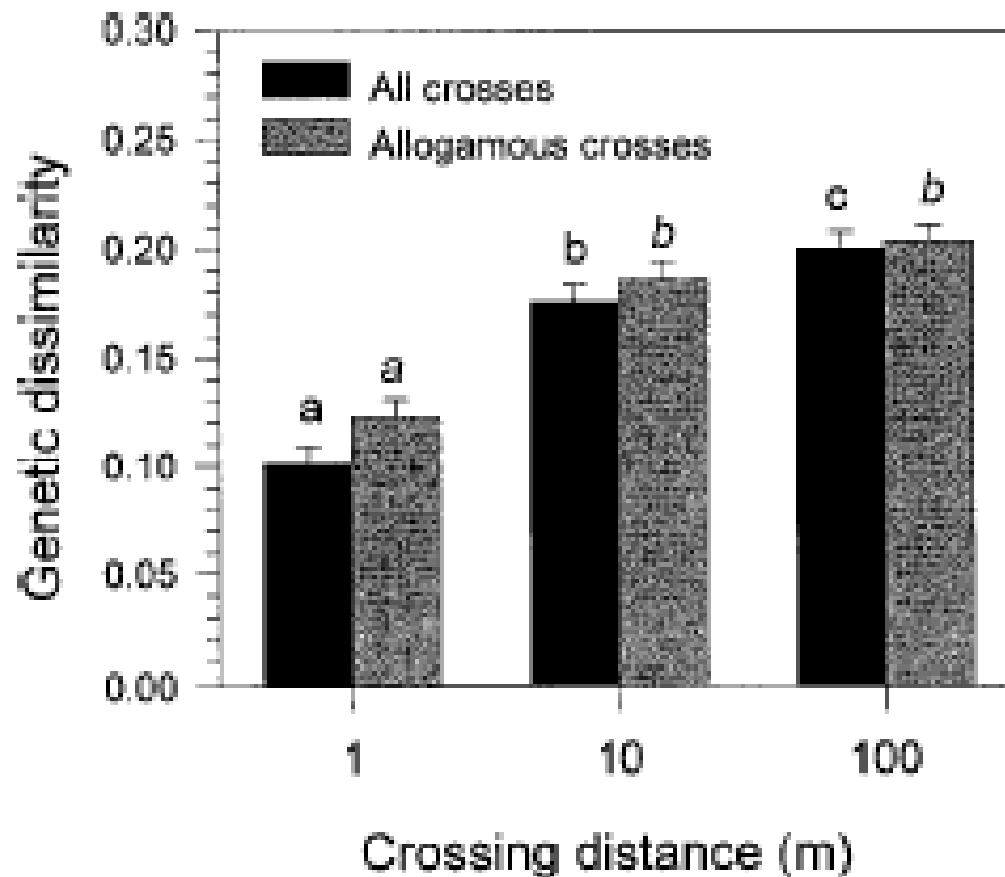


Fig. 3. Least squares means + 1 SE for the degree of genetic dissimilarity between mates 1, 10, and 100 m apart considering all crosses and interclonal crosses only. For comparisons that showed overall significant effects (Table 2), means that do not share the same lowercase letter differ significantly (Tukey's test, $P < 0.05$).

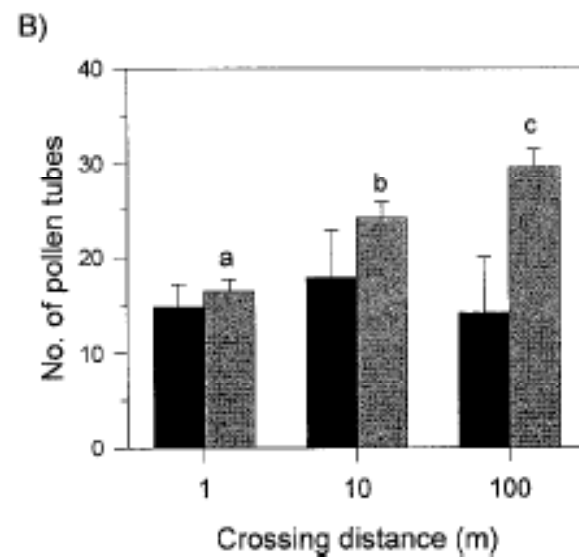
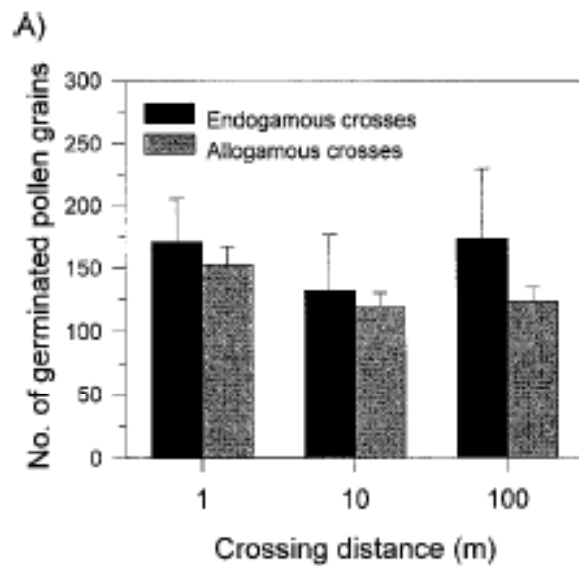


Fig. 4. Back-transformed least squares means + 1 SE for (A) the number of germinated pollen grains after statistically controlling for the total number of grains deposited on the stigma, and (B) the number of pollen tubes reaching the base of the style for allogamous and endogamous crosses separated by 1, 10, and 100 m. For comparisons that showed overall significant effects among distance classes within cross type, means that do not share the same lowercase letter differ significantly (Tukey's test, $P < 0.05$).