

Pollinator-Driven Nonrandom Mating Impacts in Red Clover Polycross Progeny

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In wind pollinated grass synthetic polycross mating systems, nonrandom proximity-based mating and its effect on the genetic structure of subsequent generations has been studied extensively. However, similar proximal, nonrandom mating in insect-mediated forage legume synthetic polycrosses has been largely overlooked. While anecdotal observations of pollinator-driven nonrandom mating are mentioned to a limited degree in alfalfa (*Medicago sativa* L.), and even less so in red clover (*Trifolium pratense* L.), the extent to which pollinator behavior drives nonrandom mating and increases inbreeding in subsequent generations has not yet been quantified. This study aims to do so by exploring empirically observed inbreeding based on full-sibling, half-sibling, and unrelated progeny frequencies in thirty-three diploid red clover polycrosses. Compared with progeny frequencies and effective polycross sizes expected under both uniform (i.e. random mating) and Weibull fecundity models, a significant excess of full siblings is observed, regardless of polycross size (Figure 1). This is compelling evidence that pollinator preferences contribute to increased instances of proximal, nonrandom mating events. However, these excess full siblings do not significantly increase the coefficient of inbreeding relative to that predicted by the existing Weibull fecundity model, which provides fairly accurate estimates of effective polycross sizes. Ultimately, pollinator-driven, proximal nonrandom mating leads to an increased frequency of full siblings, but it does not significantly contribute to increased inbreeding or smaller effective polycross sizes beyond that accounted for in existing models of nonuniform fecundity in red clover.

Figure 1. Relationship between full sibling frequencies and effective polycross size as observed and predicted by the uniform and Weibull models. Full sibling frequencies observed are significantly greater than that expected by both uniform ($p < 0.001$) and Weibull ($p < 0.001$) models regardless of effective polycross size.

