

Contrasting the foraging behavior of three bee species in alfalfa to predict their impact on selfing rate and gene flow risk

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The movement of pollen from a genetically engineered (GE) field can contaminate seed lots by creating adventitious presence (unwanted GE genes). High selfing negatively impacts yield when high inbreeding depression is present. Methods that help limit gene flow would facilitate the coexistence of different markets. Reduction of selfing would improve yield. In insect-pollinated plants, the foraging behavior of pollinators will influence selfing rate and gene flow. This study examines and contrasts the behavior of three bee species foraging in patches of alfalfa flowers and discusses its impact on selfing and gene flow risk. The three bee species include two social bees: a honey bee, *Apis mellifera*, and a bumble bee, *Bombus impatiens*, and a solitary bee, the alfalfa leafcutting bee, *Megachile rotundata*. Bumble bee and honey bee both visited more flowers per plant, a behavior known to increase geitonogamous (within flower) selfing. Both bumble bee and honey bee exhibit directionality in movement within foraging bouts which increases the net distance traveled. Honey bee preferred some directions, unlike leafcutting bee and bumble bee which were as likely to move in any direction. Based on their foraging behavior, we expect greater selfing with bumble bee and honey bee and greater inbreeding with leafcutting bee. Given the distance traveled between plants, number of flowers visited per plant and directionality of movement, greater gene flow risk is predicted for bumble bee, followed by honey bee and finally leafcutting bee. An understanding of pollinator foraging behavior will facilitate the development of management methods that reduce selfing and gene flow and therefore increase yield and promote the coexistence of different markets.