Honey bee lines selected for high propolis production also have superior hygienic behavior and increased honey and pollen stores

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Received November 1, 2013  
Accepted December 16, 2013  
Published December 19, 2013  
DOI http://dx.doi.org/10.4238/2013.December.19.12

ABSTRACT. Honey bees use propolis to defend against invaders and disease organisms. As some colonies produce much more propolis than others, we investigated whether propolis collecting is associated with disease resistance traits, including hygienic behavior and resistance to the parasitic bee mite, \textit{Varroa destructor}. The three highest (HP) and three lowest propolis-producing (LP) colonies among 36 Africanized honey bee colonies were initially selected. Queens and drones from these colonies were crossed through artificial insemination to produce five colonies of each of the following crosses: HP$\varphi$ X HP$\delta$, LP$\varphi$ X HP$\delta$, HP$\varphi$ X LP$\delta$, and LP$\varphi$ X LP$\delta$. Colonies headed by HP$\varphi$ X HP$\delta$ queens produced significantly more propolis than those with HP$\varphi$ X LP$\delta$, and LP$\varphi$ X HP$\delta$ queens and these in turn produced significantly more propolis than those headed by LP$\varphi$ X LP$\delta$ queens. The brood cell
uncapping rate of the high-propolis-producing colonies in the hygienic behavior test was significantly superior to that of the other groups. The LP X LP group was significantly less hygienic than the two HP X LP crosses, based on the evaluation of the rate of removal of pin-killed pupae. The HP X HP colonies were significantly more hygienic than the other crosses. No significant differences were found in mite infestation rates among the groups of colonies; although overall, colony infestation rates were quite low (1.0 to 3.2 mites per 100 brood cells), which could have masked such effects. Honey and pollen stores were significantly and positively correlated with propolis production.

**Key words:** Controlled mating; Propolis production; Cleaning behavior; *Varroa destructor*