

OR025*Honeybees balance essential fatty acids and suffer cognitively from deficiency***Sharoni Shafir**, Yael Katz, Shlomi Zarchin, Arnon Dag

Honeybees depend on pollen for many nutrients, including essential linolenic and linoleic fatty acids (eFA). We tested whether honeybee (*Apis mellifera*) foragers complement a deficiency in an eFA when foraging for pollen and the effect of such deficiency on cognitive performance. Colonies were maintained in netted enclosures to control their diets. In the first experiment, colonies were deprived of pollen for a week, and then allowed to forage for several days for only one pollen. Marked foragers were allowed to forage from a single pollen dish and we monitored their round dance at an observation hive. Then the dish was replaced by another pollen. We presented three pollens repeatedly in pseudorandom order: the same pollen fed during the previous days, another pollen similar in eFA composition, or a complementary pollen rich in the eFA lacking from the pollen fed during the previous days. Dance rates were highest for the complementary pollen showing that foragers evaluated them as more attractive, regardless of floral pollen identity. In the second experiment, we used soy-flour based artificial diets enriched by vegetable oils, either poor (corn and sesame) or rich (flax and sage) in linolenic acid. Colonies were fed for several weeks one of four treatments: corn, sesame, a mixture of the four oils, or a pollen control. We then tested by proboscis-extension conditioning olfactory and tactile learning of nurse bees, which were raised on the examined diets. Learning performance in the two linolenic acid deprived groups was greatly impaired relative to the other two groups. We conclude that maintaining proper linolenic acid levels is critical for proper cognitive function, and that foragers can assess pollen eFA composition and selectively recruit foragers to sources that complement colony needs. This study highlights the importance of balanced eFA diet in honeybee natural and artificial diets.