Bee's Spa: An Artificial Mud Puddle for Highland Beekeeping to Reduce Bee Mortality During Drought Stress

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Drought stress, one of the most critical factors affecting leading to the decline of honey bee (Apis mellifera) populations worldwide, is regarded as a potential threat to species extinction and global food security. From our observation, highland honey bees in drought expressed their behavior to sip water and dissolved nutrients from sweats, tears or excretions owing to micronutrient lacks that are usually acquired from natural mud puddle. This project thus aims to develop artificial mud puddle for highland beekeeping to reduce bee mortality during drought stress. The artificial mud puddle was made from 500 g of local soil mixed with NaCl, cockle shell powder and organic matters (yeast fermented pineapple peel or banana peel, and rice wine residual) in various ratios to imitate natural mud puddle. The artificial mud puddle that could lure bees the most was made of soil mixed with 1: 5: 10 of NaCl: shell powder: yeast fermented pineapple. Bee's spa, an innovation to provide mud puddle for bees using various sensors and Arduino microcontroller to control conditions suitable for foraging behaviors has been developed. Bee's spa was set up in highland beekeeping for three months. The results showed that foraging behaviors increased while stress of the bees decreased. The reduction in gene expression and gut microbiota were closely related to fasting stress. Bee mortality was 4.4-fold decreased while bee product was 2.6-fold increased. This innovation solves the problems of highland beekeeping and develops sustainable agriculture leading to food security for the world.

Awards Won:
Second Award of $2,000