Paper ID: 82866
oral
student

27th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Interactive Presentations - 27th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (IP)

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SPACE BEES - COMPARISON OF BREEDING METHODS AND THE TOP CHOICE OF SPECIES WITH THE GREATEST POTENTIAL TO POLLINATE EXTRATERRESTRIAL CROPS

Abstract

To make long-term extraterrestrial settlement possible, there is a need to provide stable and efficient food production on-site at the beyond-Earth location. One of the ecosystem services enhancing crop yields (in terms of their amount and quality) is insect pollination. In natural conditions, pollination is provided mostly by bees of approximately 20,000 species distributed worldwide. The work compares the current state of knowledge on breeding possibilities of the best biologically known bees' representatives, such as honey bee (*Apis mellifera*), buff-tailed bumblebee (*Bombus terrestris*), and red mason bee (*Osmia bicornis*). These species differ significantly in their biology and thus their potential for use as pollinators of extraterrestrial crops varies.

Compared bee species have (1) various life strategies - respectively eusocial, social, and solitary; (2) time and labor consumption along with the required knowledge and skills of a breeder to provide welfare and enable the production of successive generations - from very high to low; (3) differences in behavior - from aggressiveness (posing the threat of stinging that can cause an allergic reaction - even death if medical help is not provided) to complete gentleness; (4) nesting requirements; (5) life cycle; and (6) pollination efficiency (along with the type of pollination, pollen collection - in baskets or on scopa, the number of individuals needed to pollinate the crop).

The presented current state of knowledge, while limited, indicates that it is possible to transport bees to extraterrestrial stations. However, the conditions that prevail in extraterrestrial greenhouses affect the biology of insects and can impair their reproduction, and thus the ability to develop subsequent generations. Therefore, it is so important to select and conduct deepened research on bee species with low requirements and not particularly vulnerable to altered conditions. A good choice will make it easier to provide bees with adequate protection and life support during the space journey and further for nesting, feeding, and reproduction - keeping in mind that pollination is a by-product of bees' life strategy. Basic technical needs analysis - such as transportation or nest requirements - was made to present the top choice of species with the greatest potential to pollinate extraterrestrial crops.