Entomophagy and space agriculture

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Supplying food for human occupants remains one of the primary issues in engineering space habitation. Evidently, for long-term occupation on a distant planet, it is necessary to start agriculture on site. Historically, humans have consumed a variety of animals, and it is required to fill our nutritional need when they live in space. Among many candidate group and species of animal to breed in space agriculture, insects are of great interest since they have a number of advantages over mammals and other vertebrates or invertebrates. About 70-75% of animal species is insects, and they play an important role in materials recycle loop of terrestrial biosphere at their various niche. For space agriculture, we propose several insect species, such as the silkworm, *Bombyx mori*, the drugstore beetle, *Stegobium paniceum*, and the termite, *Macrotermes subhyalinus*. Among many advantages, these insects do not compete with human in terms of food resources, but convert inedible biomass or waste into an edible food source for human. The silkworm has been domesticated since 5,000 years ago in China. Silk moth has lost capability of flying after its domestication history. This feature is advantageous in control of their breeding. Silkworm larvae eat specifically mulberry leaves, and metamorphose in their cocoon. Silk fiber obtained from cocoon can be used to manufacture textile. Farming system of the drugstore beetle has been well established. Both the drugstore beetle and the termite are capable to convert cellulose or other inedible biomass efficiently to animal proteins. Pupae or larvae of the candidate insect species can be eaten by humans and other animals such as the chicken, *Gallus gallus*. Nutritional value of insects is examined and accessed whether they could be an alternate of vertebrates meat. Even insects do not fully offer the nutrients obtained from the vertebrate meat or avian eggs, they would replace a great amount of them. Based on the nutritional requirements for human diet, a model recipe is formulated for the modern way of insect eating. Entomophagy could be a promising part of the foods habit that adapt to space habitation. Insects, as a member of agro-ecosystem, will recycle materials, process waste, serve as food and feed, and pollinate plants. The design of such systems will also provide insight into improving the management of Earth's biosphere for its sustainable civilization. Entomophagy may very well prove to be a key idea in solving the world's food problems, to which we are facing now.