

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support and EVA Systems (6)

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GROUND TRIALS FOR MINI SPACE FARM

Abstract

The self-sufficient food system to be used in space is still pending and without it, the permanent habitable bases on the moon and Mars will be impossible. An innovative self-sufficient food system—named Mini Space Farm, was created by rearing 6 kinds of small recycling animals (RA), edible animals (EA) and plants in the human living space environment. All the bio-wastes will be recycled to be used effectively as food.

In order to verify the feasibility of this proposal, trials on the ground were undertaken to rear one of the RA-House Fly Larvae (HFL) to capture the nutrients from bio-waste and then use the HFL as feed for one of the EA-quails. These trials are all designed to simulate the supply of waste in Space. After 26 harvest cycles of rearing tests (each harvest cycle for 4 days reared), 3 gram of HF eggs can harvest average 618g of fresh HFL daily from recycling wastes (feces + urine) of two adult persons and 60 quails, combined with 250g wheat bran, the HFL body weight increase 200 times within 4 days; the average fresh yield is around 700g/ m².d

which is 70 times than of the Chinese Super Rice. The HFL nutrients is much better than rice, even than the meat, 618g HFL contain 111g crude protein and 31g crude fat and other nutrients.

98 quails were fed daily through a full generation cycle from egg to egg, two groups were divided at random after 20 days commercial feedstuff (CF) fed since hatching. Then the following 28 tested days, the average daily fed of 60 quails with 618g living HFL,each 10.3g HFL + 20g CF; the 38 quails fed 40g CF alone as control group. The HFL fed group daily weight gain averaged 353g, the average body daily weight gain was 30% higher, the egg weight was 10% higher than CF group. Accordingly egg-laying rate 80%, 60 quails can lay 48 eggs with 514g daily for human food.

These trails demonstrate that HFL is a most effective species for recycling nutrients from the dirty wastes issued from human, animal and space crop. HFL is an enticing feed for most EA, resulting in fast production of the nutritious and delicious foods such as the quail and its eggs for humans in space.