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1. INTRODUCTION

A **parasitoid** is an organism that lives in close association with its host and at the host's expense, and which sooner or later kills it. Parasitoidism is a major evolutionary strategies within parasitism, distinguished by the fatal prognosis for the host, which makes the strategy close to predation.
The main difference between a parasitoid and a parasite proper consists in the evolution of the trophic relationship. The parasitoid establishes a trophic relationship with the host that is completely independent of the physiology of the host, feeding itself indifferently on its tissues. This relationship has an analogy with predation and is in fact exhausted with the death of the victim, almost always before he has achieved complete development.
A second characteristic is the affinity between the parasitoid and the host.
In parasitoidism the phylogenetic relationship between host and parasitoid is at the class level, but there are also cases of closer relationships, at the level of order or family, up to the extreme case of autoparasitism, in which host and parasitoid belong to the same species . Also in this case we can find an analogy with cannibalism, behavior that occurs within predation relationships.
Parasitoids are widely used in biological control strategies as natural enemies of pests in order to reduce pesticides. Thus, the understanding of parasitoids' behaviors in microgravity conditions is crucial tomake space farming increasingly feasible.
For our experiment we decided to use the parasitoid *Anagyruspseudococci*, a natural enemy of mealybugs, that can be easily purchased in companies rearing natural enemies (insects and mites) for the biocontrol. Mealybugs can be easy reared on potatoes sprouts, and *A. pseudococci* has limited size (2 mm). In this way we can reproduce a natural ecosystem consisting inplants, pests, and natural enemies in a small volume such as ZR-SAT.
For our experiment we decided to use as a parasitoid, the Lasioptera Berlesiana, and as a host, the Bactrocera Olea, commonly called olive fly.

2. MISSION OBJECTIVES

Studying the host-seeking behavior of the **parasitoid** *A. pseudococci* both in orbit and on earth.
The host-seeking behavior of a parasitoid is affected by a number of stimuli related to the host including:

- Chemical cues
- Mechanical cues (e.g. vibrations, sounds)
- Colors
- Temperature

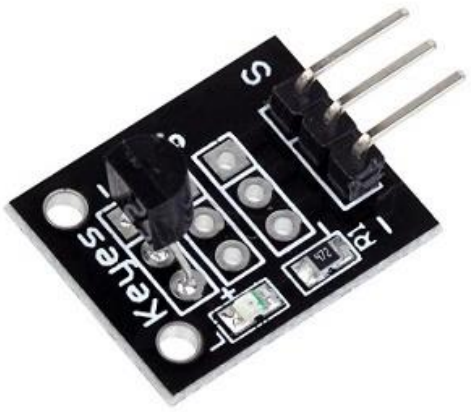
The effect of microgravity on such stimuli can modify the stereotyped host-seeking behavior of the parasitoid bringing to new behavior all adaptations.
Then compare the results obtained taking into account the differences between the two environments to understand the different behaviors of insects

3. DESCRIPTION OF EXPERIMENT

Inside a container, housed in the 624cm^3 space, two test tubes will be placed, one with the host (approximately 10) the other with the parasite (approximately 10). At a certain moment the two test tubes will be opened so that there is contact between the two populations. Cameras will monitor what happens.
Initially the parasitoid and the host must be separated. To do this, we will use a transparent plate that will allow us to see what happens on both sides and observe their behavior.
At a later time the plate will be removed and we will look again what happens.
A twin experiment will be performed on Earth. Because it will not be possible to get back the samples for a chemical study on the ground, it will be necessary to take measurements on macro quantities on the Cubes at and send the results to Earth.

Arduino Uno's Main Features

The Arduino Uno is a microcontroller board based on the Atmega328. Arduino is an opensource, prototyping platform and its simplicity makes it ideal for hobbyists to use as well as professionals. The Arduino Uno has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to DC adapter or battery to get started. The Arduino Uno differs from all preceding boards in that it does not use the FTDI UTB-to-serial driver chip. Instead, it features the Atmega8U2 microcontroller chip programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Arduino Uno and version 1.0will be the reference versions of Arduno, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform. The Arduino open-sourced IDE drivers can be downloaded for free and we have created a download and installation tutorial for the Windows XP platform.
Arduino Uno consumes about 51,5 mA when the LED is turned on, so with a 1000 mA battery you could power Arduino for about 20 hours.
To observe the behavior of the two insects, we will use two small cameras positioned so as to be able to have a complete view of the cube-sat.
They will be accompanied by some sensors (compatible with Arduino uno)
which will record the temperature and humidity of the environment, the movements of the subjects and the presence of a magnetic field
KY-001: Temperature sensor



1-Wire sensor based on the DS18B20 chip; it is able to detect temperatures in the range -55 ° C ~ + 125 ° C, with an approximation of +/- 0.5 ° C and a precision of 9-bit ~ 12-bit.

Specifications
• Power supply: 3V ~ 5V
• Temperature detection range: -55 ° C ~ + 125 ° C
• Accuracy: 9-bit ~ 12-bit

KY003: Hall effect sensor for magnetic field detection