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DEVELOPMENT OF LARVAE *TENEBRIO MOLITOR L.* (COLEOPTERA: TENEBRIONIDAE), IN DIFFERENT DIETS AIMING AT THE PRODUCTION OF INSECTS FOR ANIMAL FEED

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GENERAL STRUCTURE

PROJECT SUMMARY/KEYWORDS

The use of insects as ingredients in feed can be promising in the animal nutrition chain, providing a source of nutrients of excellent quality. The aim is to evaluate the development of larvae of tapeworms (Tenebrio molitor L. and Zophobas morio L, Coleoptera: Curculionidae) raised on diets with different amounts of corn bran in order to reduce the production costs of this insect for animal consumption. The experiments will be conducted at the Arthropod Ecology and Behavior Laboratory (LECOM) at the Agricultural Engineering and Sciences Campus (CECA), in an air-conditioned room at 28±2ºC, RH of 70±10% and a 12-hour photophase. The insects will be fed a standard diet consisting of corn and wheat-based growth feed. Pieces of sweet potatoes, potatoes and fresh carrots will be fed to the insects every 48 hours as a source of moisture. The experiment will be conducted in a completely randomized design with five treatments and five replications. The control treatment consists of the same standard insect feeding diet in the laboratory maintenance colony and the other treatments will consist of the addition of corn and wheat-based growth ration to the standard diet. The parameters evaluated will be: duration of the larval period, between oviposition and pupa formation; pupal period, period between pupa formation and adult hatching; and the weight of the pupae, which were weighed individually on a precision scale. For statistical analysis, data means will be subjected to analysis of variance at a significance level of 5%.

OBJECTIVES OF THE RESEARCH PROJECT

General Objective: To evaluate the development of mealworm larvae (T. molitor) raised on diets with different amounts of fattening, pre-initial and growth feed aiming at the nutritional balance for better development of the larvae in the production of this insect for animal consumption.

SPECIFIC OBJECTIVES

a) use edible food sources for mealworms, which are low-cost, enabling the production of these insects on a large scale;

b) obtain a new mealworm ration that provides a greater number of larvae with greater body weight and in a shorter time;

c) provide insects (in whole, dehydrated form and insect meal) with ideal bromatological and mineral values so that they can be used as components for animal feed.

SPECIFIC OBJECTIVE OF THE STUDENT ACTIVITY PLAN

Evaluate the development of mealworm larvae of the species: *Tenebrio molitor* (also popularly known as mealworms and mealworms), created in different percentages of the mixture used to compose the standard diet, aiming to reduce the production costs of this insect for animal consumption.

DETAIL STEPS OF THE STUDENT ACTIVITY PLAN

EXECUTED DURING THE PERIOD (September/2020–JANUARY/2021), AIMING TO ACHIEVE THE OBJECTIVES OF THE RESEARCH PROJECT

The experiments were conducted at the Arthropod Ecology and Behavior Laboratory

(LECOM) of the Agricultural Sciences Center (CECA) in Rio Largo, AL. The insects used for the experiments came from pre-established breeding at LECOM. Breeding was initiated and maintained under laboratory conditions (25 ± 2 °C, 60 ± 10% RH and 12 h photoperiod).

Randomized plastic pots were used, measuring 10.8cm x 4.4cm x 6.7cm, covered with a net, inside, the feed mixtures were placed in portions of 100g, being formulated in the following portions:

t1 - (100% Fattening);

t2 - (15% fattening + 70% Pre-initial + 15% growth);

t3 - (40% Fattening + 30% Pre-initial + 30% growth);

t4 - (30% Fattening + 20% Pre-initial + 50% growth);

t5 - (20% Fattening + 40% Pre-initial + 40% growth);

A total of 20 couples was placed in them and remained for approximately 72 hours for egg laying. Afterwards, the couples were removed, leaving the eggs in the pots for approximately 4 months until they reached the larval stage. Once the larval stage was reached, the food was removed for counting, followed by weighing the larvae. After these processes, the larvae were placed in the greenhouse and then weighed. Nutritional analysis is under way.

Figure 1: Collection and separation of larvae

Figure 2. Separating the pots with the feed

PRESENTATION AND DISCUSSION OF MAIN RESULTS OBTAINED DURING THE FIRST SEMESTER OF THE RESEARCH.

Positive results were observed in relation to maintenance, due to its great ease of propagation, in addition to its high survival rate without changing food.

After 4 months of experiment with *Tenebrio molitor L.,* the data in the table above were obtained, which shows the number of larvae and their weight, before and after placing them in the greenhouse.

T1	T1a	T1b	T1c	T1d	T1e
Larvae	18	19	23	24	X
Pre-greenhouse weight (g); (alive)	0,71	0,87	0,89	1,07	X
Post-green House weight (g)	0,29	0,4	0,41	0,507	X
T2	T2a	T2b	T2c	T2d	T2e
Larvae	53	48	65	X	X
Pre-green House weight (g)	2,4	2,35	2,7	X	X
Post-green House weight (g)	1,01	1,08	1,35	X	X
T3	T3a	T3b	T3c	T3d	T3e
Larvae	42	40	33	36	X
Pre-green House weight (g)	1,75	1,73	1,6	1,44	X
Post-green House weight (g)	0,48	0,66	0,43	0,3	X
T4	T4a	T4b	T4c	T4d	T4e
Larvae	87	90	55	97	X
Pre-green House weight (g)	3,6	3,4	2,2	3	X
Post-green House weight (g)	1,33	1,24	0,77	1,16	X
T4	T5a	T5b	T5c	T5d	T5e
Larvae	59	71	69	63	X
Pre-green House weight (g)	2	2,4	2,1	2,9	X
Post-green House weight (g)	0,91	1,1	0,95	1,44	X

Table 1: source, author.

SCHEDULE OF ACTIVITIES: EXAMPLE:

ACTIVITIES (*)	**SEP.**	**OCT.**	**NOV.**	**DEC.**	**JAN.**	**FEB.**	**MARCH**	**APRIL**	**MAY**	**JUNE**	**JULY**	**AUG**
SURVEY OF EXISTING BIBLIOGRAPHY	X	X	X	X	X	X	X	X	X	X	X	X
(Performed)	OK	OK	OK	OK	OK	OK	OK					
ACQUISITION OF INGREDIENTS AND PREPARATION OF FEED		X	X	X	X	X	X	X	X	X	X	X
(Performed)	OK	OK	OK	OK	OK	OK	OK					
MAINTENANCE OF TENEBRIO MOLITOR L. (COLEOPTERA: CURCULIONIDAE) BREEDIN**G**	X	X	X	X	X	X	X	X	X	X	X	
Activity 3 (Performed)	OK	OK	OK	OK	OK	OK	OK					
BIOLOGICAL AND NUTRITIONAL ANALYSIS OF INSECTS **(Pre-defined)**				X	X	X	X	X	X	X	X	
Activity (Performed)												
STATISTICAL ANALYSIS OF THE RESULTS OBTAINED										X	X	X

PREPARATION OF REPORTS (PARTIAL AND FINAL) AND PREPARATION OF POSTER FOR PRESENTATION AT MEETINGS, CONGRESS AND OTHER MEANS OF DISSEMINATION											X	X

(*) Activities planned in the project such as: literature review, field work, laboratory measurements, interviews, etc. Note: If a certain step was not carried out, justify it.

LIST THE MAIN POSITIVE AND NEGATIVE FACTORS THAT INTERFERED IN CONDUCTING THE PROJECT AND ACTIVITY PLAN

The following items can be cited as Positive Factors:

– For small productions, a few hours per week are dedicated to handling. Easy maintenance and breeding of Tenebrio molitor L.

- Possibility of using leftover vegetables and fruits as a source of moisture for insects.

The following Negative Factors can be indicated;

- At one point, some pots were infested with weevils present in the feed, causing some deaths of larvae. Evaluate measures against predators.

- The moisture source was offered once a month.

- Need to use masks as the waste has fine grain size, therefore, it is necessary to use masks to protect the health of the operator when handling insects.