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NOTES ON THE BIOLOGICAL BEHAVIOUR OF THE PREDACIOUS MITE *Cunaxa capreolus* BERLESE (ACARI: PROSTIGMATA: CUNAXIDAE)

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ABSTRACT

This study aimed to investigate the effect of three diets namely collembola *Neanurodes* sp., free living nematode, *Rhabditella muscicola* Chitwood and acarid mite, *Tyrophagous putrescentaie* (Schrank) on the biological aspects of the predacious cunaxid mite, *Cunaxa capreolus* Berlese at laboratory conditions (25 & 30 ± 2 ° C and 70 ± 5 % R.H.). From the study, it was obvious that the different biological aspects of the predator were significantly affected by feeding on the different diets. Collembola proved to be the suitable prey as resulted in more deposited eggs and longer life span. Considering the total reducing and non-reducing sugar contents of the different diets, the acarid mite, had the highest amount followed by collembola and free living nematode. Generally, collembola was the best prey where it contained the highest total sugar followed by free nematode and acarid mite. Also it was noticed that the collembola contained higher relative concentration of glucose contents followed by free nematode and acarid mite .The study denoted that the commonest amino acids which found in the predacious mite and the tested preys were Aspartic, Glycine and Cystine . On the other hand, Therionine, Tryptophan and Hydroxy-prolin were the lowest amino acids presented in the tested organisms. The highest relative concentration and fraction of amino acids contents were noticed in Aspartic acid . Hence, the collembola was noticed to be the best prey used.

INTRODUCTION

Family Cunaxidae (Acari: Bdelloidea) includes many species which known by their wide predatory habits, (Smiley, 1975 and El-Khateeb, 1998), where the majority of these species appear to be predators on small insects inhabiting leaves, litter, dry or damp humus and straw (Baker and Wharton, 1952); or animal droppings and in the top soil surface (El-Bishlawy and Rakha, 1983). They are free livings and cosmopolitan in distribution: some colonize greenhouse pot cultures of root-knot nematodes (Walter and Kaplan, 1991). Investigations to evaluate their occurrence,predacious efficiency, prey preference and their role in biological control were carried out by Soliman *et al.* (1975), Zaher *et al.* (1975), Nassar (1976) and El-Bishlawy (1978). In the presence of more than two prey species, a generalist predator should select the one that assures higher fitness (Charnov, 1976) Therefore, the prey preference of a predator may be affected not only by the characteristics of a prey item as food, but also by the microenvironment or architecture produced by a prey species (Furuichi *et al* 2005). The aim of this work is focused on the role of three different preys (insect, nematode and mite) and the factors that affect on the biological aspects of the predaceous mite *Cunaxa capreolus* at 25 and 30 $\pm$ 2 °C and 70 $\pm$ 5 % relative humidity in the laboratory.

MATERIALS AND METHODS

Predator main culture:

The predatory mite, *Cunaxa capreolus* Berlese was reared on the free living nematode, *Rhabditella musciola* Chitwood. For establishing the main culture, adult females were placed in the plastic cells (closed round plastic containers, 2.5 cm diameter), with a layer of mixture of plaster of Paris and Charcoal (9: 1) on its bottom to depth of 0.5 cm. Water drops were added when needed. For individual rearing, newly deposited eggs were transferred each to a rearing plastic cell. Each newly hatched larva was supplied with prey (which put on glass cover) and devoured ones were replaced daily till reaching maturity. Emerged females were allowed to mate and monitored for oviposition. All biological aspects were recorded twice daily during the predator's development and daily over the female oviposition period .

Food sources:

Insect (collembola, *Neanurodes* sp.), nematode species (*Rhabditella muscicola*) and mite *Tyrophagus putrescentiae* (Schrank) were used as preys for rearing as they were collected from soil of cotton plants at Qaha Research Station, Plant Protection Research Institute), Qaluobia Governorate. A Pure culture of the tested prey, *Neanurodes* sp.cultured on decaying mashed potatoe and maintained in cups containing potatoe slides. Thus, this food was ready to be used as prey. Nematode were isolated and maintained in Petri-dishes 9 cm in diameter containing potatoes slides according to Abou El-Sood (1992). Water was added daily to maintain suitable moisture for the nematode development. Relative humidity was monitored and maintained around 75 % inside the incubator at 25 °C using saturated salt solution (NaCl) . On the other hand the pure culture of the acarid mite, *T. putrescentiae* was collected and maintained on yeast powder The preys Petri-dishs were left three days in natural conditions before predator began to fed on it. Individuals of collembola were extracted from soil of cotton plants by Tullgeren funnel and reared in cages and small pieces of potatoe were added daily to collembola as a food source. The preys and the predator were placed together in a transparent plastic container and kept at 25 and 30 $\pm$ 2 °C and 75 $\pm$ 5 % relative humidity for biological behavior study.

Chemical analysis

Fraction of amino acids:

Fraction of amino acids were extracted from tested samples according to Shade *et al*. (2002) as follows: 20 ml gm of each sample was taken and soaked separately in 75 % ethanol (100 ml). After 24 hr. the samples were ground and filtered. The residue was washed with a few ml of 75 % ethanol and the volume was made up to 100 ml. The separation of amino acids was accomplished with a ODS. C 18 (amino acids were examined using a HPLC system (hp 1050) with a UV detector 5 um.4 x 250 mm) column at 254 nm. The mobile phase consist of two eluent acetonitrile/tetrahydrofuran (90/10 v/v.); and tetrahydrofuran/water (5/95 V/V.). 32 % of solution one and 68 % of second solution with 0.3 ml acetic acid and pH adjusted 5.15 with 1 M NaOH. The flow rate was 1.5 ml/min. The column temperature varied from 60 ° C with an injection volume of 10 ul (Gertz, 1990).

Total soluble sugars and reducing and non-reducing sugars:

Total soluble and reducing sugars were determined calorimetrically using the modified picric acid method described by Thomas and Dutcher (1924) as follows: fifteen ml gms of sample taken and then incubated for 15 days at 25 ± 2 °C. Each treatment was plunged immediately into 95 % boiling ethanol for 10 minutes to kill the living tissues. The samples were then resumed for 10 -12 hrs in a Soxhelt unit using 75 % ethanol. The obtained ethanol extracts were filtered and evaporated to near dryness on a rotary evaporator at 60 °C. The dried residue was re-dissolved in 6 ml of isopropyl alcohol 50 % and used to determine sugars content.

Reagents used

(A) Picrate–picric: The picrate –picric reagent was prepared by adding thirty six gm of picric acid to 500 ml of 1.0 % solution of sodium hydroxide and 400 ml of hot distilled water. The mixture was shaken occasionally until the picric acid was dissolved, then cooled and diluted to one liter.

(B) Sodium carbonate: Sodium carbonate reagent was prepared by dissolving twenty gm of sodium carbonate in 100 ml of distilled water.

Determination of total soluble sugars:

For total soluble sugars estimation, approximately 0.8 ml of each sample extract was placed in a test tube containing 5 ml of distilled water and 4 ml of picrate/picric reagent. Then, the mixture was boiled for 10 min in a water- bath. After cooling, one ml of sodium carbonate reagent was added and the mixture was boiled again for 10 min. After cooling, the tubes were diluted to 50 ml with distilled water, the developed color was measured using a spectrophotometer at 540 nm.

Determination of reducing sugars:

The previously mentioned technique was also applied except that picate-picric reagent and sodium carbonate were added together at the same time and boiled only for 10 min. The reducing sugars content was calculated using a glucose standard curve at the same previous wave length

Determination of non–reducing sugar contents:

Non- reducing sugars content was calculated as the difference between the total soluble sugars and reducing ones.

Glucose content:

Extraction will be done for 10 ml gm tissue per sample was homogenized with acetonitrile/water (76/24,v/v). the extract was filtered through a Whatman filter paper and micro filter 0.45 µm partitioned three times with ethyl alcohol and stored in vials. HPLC analysis was used to glucose determined in the extracts Analysis of glucose was performed on a model (hp 1050) HPLC equipped with UV detector. Separations and determinations were performed on APS column (4.6 X 200 mm). The mobile phase was the same one which used in extraction. UV detector was 192 nm and 2 ml/min flow rate according to (Gertz, 1990)

RESULTS AND DISCUSSION

Behavior:

Field observation showed that the predatory mite *Cunaxa capreolus* was usually found around their prey individuals(active) only. When touching the prey, it quickly moved backward to attack it. The predator seized firmly the prey with the aid of its raptorial palps, then inserted its chelicerae in any part of the body and sucked its contents. Life history of *C. capreolus* female pass through one larval and three nymphal stages before reaching adulthood, while male has one larval and two nymphal stages. Before transferring to the ensuing stage, active immature individuals usually enters a resting or quiescent stage namely the pre-protonymphal, pre-deutonymphal, pre-tritonymphal and pre-adult stage. It worth noting that cannibalism occurred in the case of food shortage.

Mating:

The mating process is necessary for individual production in this mite. Laboratory observations showed the adults tended to mate immediately after their emergence. The male able to copulate three females, but the female accepted only one copulation. Just before mating, the male showed more activity by running around the female, then it manipulated itself underneath the female, bending its opithosomal region upward and forward to meet that of female, copulation usually lasted about 5 minutes.

Oviposition:

Female usually deposited its eggs singly. Newly laid eggs are creamy in their color, change by egg development to just before hatching.

Hatching:

As incubation proceeds, the embryo grows and limits itself to any of the eggs sides, then a longitudinal slit occurs medially and hatching larva crawls outside the egg shell.

Moulting:

Before molting, any immature stages enters into a quiescent state during which it stops feeding and movement. It stretches its chelicerae, palps backwardly along the sides of the body. Immediately before molting a dorsal transverse rupture occurs between the propodosoma and hysterosoma. The mite tries to disengage itself from the old skin by twisting movements and subsequently withdraws the forelegs and the anterior part of the body outside. Afterwards, it crawls forwardly trying to get ride of the posterior part of the exuviae. Color of the newly emerged individuals is usually orange, then changes gradually darker after feeding

Incubation period:

As can be seen in Table (1) the incubation period differed significantly between the predator fed on collembola and other diets The eggs which gave rise to females took period longer than those of males for hatching to larvae and also the incubation period of the eggs lasted time shorter at 30 °C than those at 25 °C This period was 4.78, 4.47 and 3.98 days at 25 °C for female changed to 4.3, 4.0 and 3.5 for male at the same conditions, when mites fed on collembola, nematode and acarid mite, respectively, but this period lasted 4.2, 3.9 and 3.5 days for female and 3.8, 3.5 and 3.2 days for male at 30 °C when the predaceous mite fed on the aforementioned preys, respectively. The statistical analysis of obtained data using L. S. D at 0.05 level showed that there were highly significant differences between the mites fed on collembola and other diets at different teted temperatures.

Life cycle.

From obtained data in Table (1), it was observed that life cycle lasted 23.3, 21.58 and 20.1 days and 15.3, 14.5 and 13.3 days for female and male, respectively at 25° C . On the other hand these periods lasted 20.0, 20.5 and 18.0 and 13.2, 12.5 and 11.5 days for female and male, at 30° C when fed on the previously mentioned preys, respectively. L.S.D. at 0.05 level = 0.0741

Table (1): Duration of the developmental periods of the predaceous mite *Cunaxa capreolus* Berlese when fed on different diets

Period		25 °C			30 °C		
		A	B	C	A	B	C
Incubation	♀	4.78 ± 0.09 (4.6 - 4.9)	4.47 ±0.05 (4.4-4.5)	3.98 ±0.1 (3.8-4.1)	4.2 ± 0.1 (4.2 4.3)	3.89 ±0.32 (3.5 -4.5)	3.5 ±0.05 (3.4 -3.6)
	♂	4.3±0.1 (4.2-4.3)	4.0 ±0.1 (3.8-4.1)	3.5±0.1 (3.3-3.6)	3.8 · 0.1 (3.7 3.8)	3.49 ±0.2 (3.3 -3.5)	3.2 ±0.11 (3.1 -3.3)
Life cycle	♀	23.3 ±0.2 (23 - 23.6)	21.58± 0.1 (21.4-21.8)	20.1±0.6 (19.6-21.7)	20.0±0.1 (19.8-20.1)	20.5±0.1 (20.3 -2 0.6)	18.0±0.1 (17.8-18.2)
	♂	15.3±0.0 (15.2-15.4)	14.5±0.1 (14.3-14.7)	13.3 ± 0.2 (13.1-13.5)	13.2±0.1 (13.0-13.4)	12.5±0.1 (12.3-12.7)	11.5± 0.1 (11.3-11.7)
Longevity	♀	30.7±0.1 (30.5-30.9)	28.3 ± 2.4 (21.5 - 29.5	26.8 ± 0.8 (25-28)	25.24 ±0.1 (25-25.4)	23.0 ± 0.06 (23 -23.2)	21.0 ±0.5 (20 -22)
	♂	22.7 ±0.1 (22.5-22.8)	20.93±0.3 (20.2 - 21.1	20.0 ± 0.1 (20-20.4)	21.4 ±0.04 (21.3 -21.5)	20.08±0.3 (19.8- 21.0)	17.98± 0.1 (17.6-18.2)
Life span	♀	54.3±1.2 (52-56)	50.15±0.4 (49.6-50.8)	47.0 ± 0.1 (46.9 -47.2)	45.1±0.4 (44.8 - 46.0)	43.59±0.3 (43.2-44.5)	39.10±0.2 (38.7-39.3)
	♂	38.1±0.3 (37.5-38.6)	35.6 ± 0.2 (35.2-35.8)	32.9 ± 1.2 (29.5 - 33.5)	34.19±0.2 (34.0-34.6)	33.5±0.1 32.3-33.7)	29.5±0.1 (29.3-29.7)

A = Collembola B = Free living nematode C = Acarid mite
L.S.D. at 0.05 for temperature effect
Incubation period = 0.0407 ***
Life cycle period = 0.0741 ***
Life span period = 0.1989 ***

Preoviposition, oviposition and postoviposition periods:

Mated females of *C. capreolus* were randomly collected from the stock cultures. Twenty *C. caprolus* females were introduced onto the rearing cages and preys each were introduced onto rearing cages, all of which were maintained under the same laboratory conditions mentioned before and recording the periods before egg laying (preoviposition), oviposition and postoviposition. From data in Table (2), it was noticed that theses three periods were longer when the predator fed on collembola in comparison with those reared on nematode and acarid mite at 25 and 30 ° C.

Table (2): Effect of different diets on the longevity and fecundity of *Cunaxa capreolus* female at 25 and 30 °C and 70 % R.H.

Aspect	25 °C			30 °C		
	A	B	C	A	B	C
Preoviposition period	3.2 ± 0.05 (3.1 -3.3)	2.0 ± 0.1 (1.8 – 2.2)	2.5 ± 0.1 (2.4 – 2.6)	2.6 ± 0.01 (2.5 -2.7)	1.8 ± 0.1 (1.5 - 2.0)	1.5 ± 0.1 (1.3 1.7)
Oviposition period	24.2 ± 0.8 (23 – 26)	23.49 ± 0.2 (23 - 23.7)	21.99 ± 0.2 (21.5–22.3)	20.2 + 0.4 (20 – 21)	20.0 ± 0.05 (19.9 – 20.1)	18.02 ± 0.01 (17.9 – 18.2)
Postoviposition period	3.5 ± 0.1 (3.4 – 3.6)	2.51 ± 0.01 () 2.4 – 2.6)	2.52 ± 0.1 (2.4 – 2.7)	2.6 ± 0.1 (2.4 – 2.8)	1.22 ± 0.01 (1.1 – 1.4)	1.51 ± 0.01 (1.4 – 1.6)
Fecundity (Eggs)	40.12 ± 1.2 (38 – 42)	36.0 ± 0.6 (35 - 37)	32.6 ± 1.3 (30 – 35)	44.4 ± 0.84 (43 – 46)	38.9 ± 0.6 (38 – 40.0)	35.8 ± 0.8 (34 – 37)

A = Collembola B = Free living nematode C = Acarid mite

Longevity:

The adult female and male of *C. capreolus* changed according to the kind of food and temperature and this clearly observed in Table (1). The longest longevity period for the predator was observed when the adult female fed on collembola 30.7 days at 25 °C, but the lowest one was noticed at 30 °C for male when fed on acarid mit 17.98 days .

Fecundity:

Female of *C. capreolus* usually deposited its eggs singly in protected places. The number of eggs laid by *C.capreolus* differed significantly between the mites fed on collembola and other diets, Table (2). The average number of eggs were 40.1 on collembola, 36.0 eggs on free living nematode and 32.6 eggs on acarid mite at 25 °C changed to 44.4, 38.9 and 35.8 eggs on the same order of diets mentioned before at 30 °C.

Life span:

Accordingly, the total life span of *C. capreolus* was highly significantly affected by rearing on different diets at different temperatures. The longest period of this mite was 54.3 days when the female fed on collembola at 25 ° C changed to 29.5 days (the lowest period) when the male fed on acarid mite at 30 °C . L.S.D. at 0.05 level = 0.1989

Total reducing and non-reducing sugar contents:

Considering the reducing and non-reducing sugar contents, Table (3) showed that the acarid mite, *Tyrophagus putrescentiae* had the highest amount of reducing sugar (0.219 mg/g fresh weight) followed by the cunaxid mite, collembola and free living nematode 0.166, 0.130 and 0.100 mg/g fresh weigh, respectively. On the other hand, the non-reducing sugar contents of collembola was the highest one (0.216 mg/g fresh weigh) followed by free living nematode (0.150 mg/g fresh weigh), and the cunaxid mite (0.135 mg/g fresh weigh), but the acarid mite was the lowest one (0.011 mg/g fresh weight). Generally, collembola was the highest prey containing total sugar (0.349 mg/g fresh wegh) followed by free nematode (0.261 mg/g fresh weigh and acarid mite (0.230 mg/g fresh weigh). Hence, the collombola was the best prey containing the total sugar.

Table (3): Total reducing and non reducing sugar contents

Sample	Sugar contents (mg/g fresh weigh)		
	Total sugar	Reducing sugar	Non-reducing sugar
Cunaxid mite	0.301	0.166	0.135
Collembola	0.346	0.130	0.216
Free living nematode	0.250	0.100	0.150
Acarid mite	0.230	0.219	0.011

Relative concentration of glucose content:

As shown in data Table (4), it was noticed that the cunaxid mite had the highest relative concentration of glucose contents (97.10 %). On the other hand the collembola as diet contained highest relative concentration of glucose contents (72.70 %) followed by acarid mite (65.18 %) and free living nematode (60.70%)

Table (4): Relative concentration of glucose content (%)

Sample	Relative concentration of glucose content (%)
Cunaxid mite	97.10
Collembola	72.70
Free living nematode	60.70
Acarid mite	65.18

Relative concentration and fraction of free amino acids contents

As shown in Table (5) the commonest amino acids found in the predacious mite and the tested preys were Aspartic, Glycine and Cysteine. On the other hand Therionine, Tryptophan and Hydroxy-prolin were the lowest amino acids presented in the tested organisms. The highest relative concentration and fraction of amino acids contents was noticed in Aspartic acid where, it was 20.80, 30.02, 42.00 and 36.14 in the cunaxid mite, collembola, free living nematode and the acarid mite, respectively. Statistically significant deviation existed between the amino acid estimated in the different tested preys. From the resulted analysis, it can be noticed that the collembola contained the highest contents of total sugar and high relative concentration of glucose content, and this may be the reason for which the collembola was the best prey for the predatory mite, *C. capreolus*

Table (5): Relative concentration and fraction of free amino acids content

Amino acids	Rt.	Relative concentration and fraction of free amino acids			
		Cunaxid mite	Collembola	Free living nematode	Acarid mite
Serine	1.30	3.54	4.60	-	11.78
Aspartic	1.11	20.80	30.02	42.00	36.11
Threonine	1.60	-	-	-	2.24
Glycine	1.46	1.69	4.30	2.70	4.70
Valine	3.00	0.014	-	0.48	0.141
Leucine	3.95	-	-	-	0.245
Proline	1.84	7.70	10.76	-	2.12
Glutamic	1.41	3.11	3.44	4.90	-
Tryptophan	3.40	-	-	0.61	-
Alanine	6.19	2.11	-	-	0.034
Cysteine	4.25	0.187	0.105	0.057	5.29
Cystine	4.86	3.00	-	-	0.60
Histidine	7.80	-	11.88	6.27	-
Phenyl-alanine	5.36	-	-	0.020	10.00
Hydroxy-proline	8.33	-	-	-	12.55
Tyrosine	9.52	7.80	0.21	0.115	-
Methionine	2.06	-	-	8.08	4.00
Arginine	1.75	2.51	4.11	3.20	-

In this respect, Soliman *et al.* (1975) found that the predator life span was negatively correlated with temperature. The generation period ranged from 24.8 to 64.2 days when temperature changed from 30 ° C to 15 °C. and the predator fed on the book lice, also the female predator deposited an average of 24.6, 30.7, 40.7, and 43.5 eggs at 15, 20, 25, and 30 °C on the same diet. Zaher *et al.* (1975) stated that this predator failed to develop on diets of plant material, but developed equally well on diets of book lice (Psocoptera) or of the citrus brown mite, *Eutetranychus orientalis* Klein which were eaten in their active stages and not as eggs. Nassar (1976) mentioned that the female immature stage of *Cunaxa setirotris* (Hermann), generation period, adult longevity and life span changed from 26.4 to 13.0, from 44.8 to 21.8 and from 51.7 to 32.1 days when temperature changed from 20 °C to 30 ° C, respectively,when this predatory mite reared on *Tetranychus arabicus* Attiah.

El-Bishlawy (1978) assured that the cunaxid mite, *Neocunaxoides* sp. passes through larva and three nymphal stages before reaching adult. It might be considered a fairly good predator of *Tyrophagus putrescentiae* as adult predator female consumed an average of 35.7 individuals per week when fed on this acarine prey.

The *coleoscirine* cunaxid *Coleoscirus simplex* (Ewing) colonizes greenhouse pot cultures of rootknot nematodes (*Meloidogyne* spp.) in Orlando, Florida, where it preyed on vermiform nematodes and soil arthropods, Walter and Kaplan (1991).This was the first report of nematophagy in a cunaxid mite. Mating was required for oviposition in *C. simplex*. An average of 4.4 eggs was laid per day and mean generation time was 14.3 days at 28 ° C The authors added that the coleoscirine *Neoscirula* sp. and the cunaxoidine *Pulaeus* sp. also fed on both arthropods and nematodes, but 3 species in the Cunaxinae, *Dactyloscirus inermis, Dactyloscirus* sp. and *Cunaxa* sp., fed only on arthropods.

Also, the obtained results are similar to those of El-Khateeb (1998), where she mentioned that low temperature decreased female fecundity of *Cunaxa setirostris* (Hermann) as the total number of deposited eggs per female in 10 days decreased from 22 to 2 eggs and from 17 to 0 eggs after one to four weeks of storage at 10 and 5 °C, respectively On the other hand, Gomaa (1998) studied the chemical analysis of different preys to show the effect of the chemical constituents of the different preys on all activity of five predaceous mites, *Dendrolaelaps aegypticus* Metwally and Mersal, *Protogamasellus discorus* Manson, *Proctolaelaps orientalis* (Nasr), *Hypoaspis queenslandicus* (Womersly) and *Androlaelaps reticulates* Hafez, El-Badry and Nasr She recorded fifteen amino acids in both free living nematodes and organic manure, but other tested preys contained fourteen amino acids.The obtained results in this study proved the prescence of only 11 amino acids in the tested free living nematode. She added that the larvae of *Musca domestica* L. contained the highest percent of 11 amino acid. Also, the astigmatid mite *Rhizoglyphus robini* Claparede contained the highest percent of two amino acid i..e. Serine and Alanine. On the other hand, the free living nematode contained the lowest percent of 13 amino acid.

Ghallab (2002) studied the biological aspects on three cunaxid species, *Coleoscirus simplex* (Ewing), *C. tuberculatus* Den Heyer and *Pulaus subterraneus* Berlese when reared on the free-living nematode, *Rhabditella muscicola* under laboratory condition at 27 ± 1 °C and 75 - 80 % R. H. She mentioned that the average life cycle of female was more longer than that of male being 12.8, 13.1 and 15.6 days of *C. simplex, C. tuberculatus* and *Pulaeus subterraneus* female, respectively., while those of male were 12, 11.7 and 13.4 days, respectively.

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ملاحظات على المظاهر البيولوجية للاكاروس المفترس ***Cunaxa capreolus* Berlese**
(اكارى – كوناكسيدى)

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تهدف هذه الدراسة الى دراسة مدى تأثير ثلاث أغذية مختلفة وهى حشرة الكوليمبولا *Neanurodes* sp والنيماتودا الحرة المعيشة *Rhabditella muscicola* Chitwood و الاكاروس الاكاريدى (Schrank) *Tyrophagous putrescentaie* على المظاهر البيولوجية للاكاروي المفترس *Cunaxa capereolus* Berlese التابع لفصيلة Cunaxidae وذلك عند ظروف المعمل المختلفة ٢٥ و ٣٠ ±٢ ° م ورطوبة نسبية مقدارها ٧٠ ±٥ % . ولقد اتضح من الدراسة ان المظاهر البيولوجية للاكاروس المفترس قد تأثرت بصورة معنوية عند التغذية على الفرائس المختلفة. و أن حشرة

الكوليمبولا كانت افضل الفرائس مقارنة بباقى الفرائس المستخدمة عند ٢٥ و ٣٠ م° حيث أن التغذية على هذة الحشرة اعطى عددا من البيض وفترة حياة للمفترس بنسبة عالية عن باقى الفرائس وعند الاخذ فى الاعتبار المحتوى الكلى للسكريات المختزلة وغير المختزلة وجد ان الاكاروس الأكاريدى يحتوى على اعلى كمية (محتوى) يليه حشرة الكولومبولا ثم النيماتودا الحرة وعموما كانت الكولومبولا أعلى فريسة احتواءا على السكريات الكلية يليها النيماتودا الحرة المعيشة ثم الاكاروس الاكاريدى. أيضا احتوت الكولومبولا على أعلى تركيز نسبى من المحتوى الجلوكوزى يليها النيماتودا الحرة ثم الاكاروس الاكاريدى واتضح من الدراسة ايضا ان الأحماض الأمينية المنتشرة بصورة عالية والموجودة فى الاكاروس المفترس والفرائس المختلفة كانت الاسبرتك - الجليسين - السيستين كانت اكثر انتشارا ومن ناحية اخرى كانت الاحماض الأمينية الثيريونين - التربتوفان - الهيدروكسى برولين كانت اقل الأحماض الامينية تواجدا اما بالنسبة لاعلى تركيز نسبى والمحتوى الكلى للاحماض الامينية فقد لوحظت فى الحمض الامينى اسبرتيك. ومن هنا يتضح ان حشرة الكوليمبولا كانت افضل الفرائس المستخدمة.