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Full Length Research Paper

Entomofauna of *Cucumeropsis mannii* Naudin, its impact on plant yield and some aspects of the biology of *Dacus bivitattus* (Diptera: Tephritidae)

André Fomekong[1]*, Jean Messi[1], Sévilor Kekeunou[1], Fernand-Nestor Tchuenguem-Fohouo[2], Joseph Lebel Tamesse[3]

[1]Department of Animal Biology and Physiology, Faculty of Science, University of Yaounde Cameroon.
[2]Department of Biological Sciences, Faculty of Science, University of Ngaoundere, Cameroon
[3]Department of Biological Sciences, National Higher Teacher's Training School, University of Yaounde Cameroon.

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***Cucumeropsis mannii* Naudin, (Cucurbitaceae) is cultivated in Africa for its important seeds used as food and in the traditional medicine. This work carried out in Yaoundé (Cameroon) focuses on the study of the entomofauna of *C . mannii*, on the impact of insects on plant yield; we studied also some aspects of the biology of *Dacus bivitattus,* main pest of this plant. Insect captured, breeding and identification were conducted from March to August 2001. The results permitted us to note that on *C. mannii* the entomofauna included 36 families. Within this fauna, there were various pests, predators, pollinators and nectarivorous. Among the 36 families recorded, 30 were collected on the leaves, 6 on the stems, 6 on the flowers and 2 on the fruits. The total number of fruits and their diameter were higher in unprotected plots than in protected one. The fruit of *C. mannii* was a feeding and egg laying site for *D. bivitattus*. The total number of laying spots on a single fruit can reach the number of 20. Larval development took place inside the fruit; before pupation period, the last larval stage changed its coloration to milky white aspect and measured 9 to 10.5 mm in length. These larvae at this stage were mobile. The average time for pupation was 8.3 days. The youngest fruits were more attacked by flies than the older ones. These results constitute an important asset in the research of the protective strategy against natural pest of *C. mannii*.**

Key words: Entomofauna, pests, *D. bivitattus*, yield, *C. mannii,* pollination.

INTRODUCTION

Cucumeropsis mannii is cultivated in Africa for its seeds which are sold almost three times more expensive than cocoa and about seven times more expensive than coffee (Zoro et al., 2003). Seeds of C*. mannii* constitute an important lipids and proteins source (Achu et al., 2005; Ponka et al., 2006; Achigan et al., 2006). Seeds of *C. mannii* are used to prepare dough or a sauce; it has an important value in the African traditional societies (Zoro et al., 2003; Ponka et al., 2005) . Also, these seeds are an excellent vermifuge and its oil favours blood circulation (SAILD, 2001). The therapeutic used and food importance of cucumber in Africa in general and Cameroon in particular make this crop, a potentially important source in the improvement of the income and livelihood of the farmers.

In African agro-ecosystems, cultivation of C. *mannii* is usually associated to banana plants, corn and cassava (Westphall et al., 1981). In these natural systems of production, several factors limit the yield of cucumber. Depredations due to insects and micro-organisms can cause losses exceeding 80%. Micro-organisms are responsible of symptoms such as withering, chloroses and leaves stain. Attacks on the fruits are very serious and are usually of fungi origin characterized by varying rots at the level of the stem (Collingwood and al., 1984; Anonymous, 2003).In Senegal, fungal attacks of cucurbitaceous

*Corresponding author: E-mail: afomekong3000@yahoo.fr

plants are especially due to fusarium (fusariose) and pythium (rot of stems) (Collingwood et al., 1984).

Some studies have been done on the Cucurbitaceae entomofauna in the tropical zone. According to Blancard et al. (1991), the main pests of Cucurbitaceae are acarids, aphids, aleurods, thrips, noctuidae and borers. Thrips induce terminal bud distortions; aphids provoke distortions and leaves yellowing. The stained fruits rot or fall because of weevils, chrysomelidea, flies and bugs (Appert and Deuse, 1988). Aphids and aleurods produce the miellat responsible for fungal growth and the leaves attacked are covered by fumagine. Aphids are otherwise vector of virus. Until now, insecticides are main's crop protective means in the tropical zone (Bani, 1990; Kekeunou et al., 2006). But, because of their harmful effects on the environment, their utilization became weakly recommended and the development of new pest control became a priority (Kekeunou et al., 2006). The biodiversity of various pests and the study of the factors that can influence the pest status are some of the important assets in the development of good strategy of profitable and less harmful to the environment (Kekeunou et al., 2006).

The objectives of the present work were to: (1) contribute to the study of *C*. *mannii* entomofauna; (2) estimate the impact of insects on *C*. *mannii* yield; (3) determine some aspects of the biology of *D. bivitattus* in the view of developing an integrated pest management strategy against pests of this important plant in Cameroon.

MATERIAL AND METHODS

Site of study

The study was carried out in the forest zone of the Southern Cameroon (3°27'-4°10'N and 11°32'-11°49'E), precisely in Yaoundé. This is an urban zone with a relief characterized by an alternation of hills and lowland areas with swamps at some areas. Vegetation is very disturbed at some sites because of urbanization; it belongs to the semi - deciduous forest domain (Bruneau, 1999). The rainfall here is bimodal (Guinean type) including four seasons with two unequal dry and rainy seasons. The small rainy season (March to June) is followed by a small dry season (July to August), and then the bigger rainy season (September to November) is followed by the bigger dry season (November to March) (Bruneau, 1999). Rainfall can reach 2000 mm per year and temperatures are from 22 to 29°C. The habitat is varied and the degree of urbanization varies from one district to another.

Cucumeropsis mannii

Observations have been carried out in a farm containing *C*. *mannii* plants. *C. mannii* is an indigenous species in West and Central Africa notably in the humid tropical regions (Jeffrey and Okoli, 1990). This plant is widespread, often cultivated in all tropical Africa as far as Angola. It is not found in Madagascar, South Africa, or in the dry areas of Sudan and Ethiopia (Keraudren, 1990). In Cameroon, this species is mostly cultivated in the southern lowland plateau, the coastal area and the highland plateau of the Western Cameroon (Achu and al., 2006). In the classification of Grossheim and Emberger (1967) and of Jeffrey (1990), *C*. *mannii* is a trailing herbaceous plant, monoïc, to robust stem, branched out and structural some scattered hairs; leaves are for a long time stalked; the leafstalk is 5 - 12 cm long; the membranous limb too rigid, whole, palmate, long and 10 - 15 cm large to the adult state. Male inflorescences grouped in panicle at the end of a 3 - 4 cm long, spindly common stalk, of 10 - 15 flowers. Female flowers are lone and develop in the male inflorescence axis with a very small pedicel. The fruit is ovoid, smooth, with a length of 25 - 30 cm and is 10 cm in diameter. The seeds are white, oval, attenuated at the top, 2 mm thick, with thin sites but without margin.

Experimental design

In a more than 5 years old fallow (650 m^2), we delimited 3 plots (A, B, C). Plots A and B were adjacent and of equal measurements (12 m^2 for each). Plot C had a larger surface area measuring 626 m^2. Clearing and ploughing of the experimental areas took place before the 15th of March 2001. After clearing, each plot was subdivided in line separated by 70 cm. In each plot, sowing took place in March, after the first rains. The seeds of *C. mannii* were planted following a spacing of 50 cm on each line at a rate of two per seed hole of 3 cm depth. In this essay, we practiced a monoculture. Plot A was protected from insects using plastic netting, with fine mesh (1 mm^2). Plots B and C were unprotected.

Study of entomofauna and insects activities on *C*. *mannii*

We carried out direct captures and observations in each of the plots (A, B, C) (as from growth to harvest) at an interval of 3 times per week. For each day of observation, we surveyed during three times intervals: 7 - 9, 11 - 13 and 15 - 17 h. Insects were located on the stems, leaves and flowers. Insects captured were with the help of a mouth vacuum cleaner or using a fine grips and their conservation took place in the pillbox containing 70% ethanol. During observations, we noted (1) the activity of insects on the various parts of the plant (depredation, pollination etc...) and (2) the state of the fruits (wounds, punctures, rot and drying).

Activity of *D. bivitattus* has been assessed in the plots C and B. After the harvest, we noted the fruits diameter and the number of healthy fruits, attacked or damaged in plot C. In plot B anteroposterior length of fruits were measured. The measurements permitted to subdivide the fruits in 4 categories: category A, 1 - 5 cm in length; category B, 6 - 10 cm; category C, 11 - 15 cm; category D, 16 cm and more. We noted the number of healthy fruits otherwise regularly, attacked or damaged as well as the percentage of attacks for every category of fruits. Fruits were known as healthy when they do not carry any wound or puncture generated by a pest. They were known as damaged when rotten or decaying completely following the punctures of laying or the development of larvae in the fruit. The percentage of attack was evaluated while comparing the number of fruits attacked to the total number of fruits of the category considered.

Study of *C. mannii* yield

Thirteen weeks after flowering with the majority of fruits being mature, we carried out harvesting in the 3 plots. The following parameters were noted for each fruit: (1) diameters; (2) weight; (3) number of good seeds; (4) and the percentage of abortive seeds. For the first three parameters, the averages allowed us to compare the various plots. For the 4th parameter studied, the percentages were compared. These tests permitted us to appreciate the impact of pests on the yield of *C*. *mannii.*

Study of some aspect *Dacus bivitattus* biology

From July 6th to August 14th 2001, 6 breeding sets of *D. bivitattus* were carried out in the laboratory of Zoology of the University of Yaoundé I. 40 attacked fruits carrying punctures of laying of flies were taken from the exposed plots and placed in empty plastic bottles of 1.5 L whose anterior portion was cut so as to widen the opening (One fruit per bottle). The bottom of the bottle was filled with dry ground so as to absorb the water resulting from the decaying of the fruits. Thus, we observed larvae until pupal ecdysis. The observations started as soon as the fruits started decaying. The development of the flies was followed by hatching up to molting. The adults that emerged were captured and preserved in dry cups.

Insect identification

The collected insects were identified in the laboratory of Zoology of the University of Yaoundé I. We used the identification key of Delvare and Arbelenc (1986) adapted to insects of the tropical zones. Our identifications were confirmed by other specialists in the laboratory of Entomology of the International Institute of Tropical Agriculture (IITA) in Nkolbisson, Yaoundé.

Data analysis

Statistical analyses were carried out using SPSS software. The averages were compared by the Kruskall-Wallis and Mann-Whitney non parametric tests. All probabilities were appreciated at 5%.

RESULTS

Entomofauna of *Cucumeropsis mannii*

List of the orders and families identified: The list of the insects constituting the entomofauna of *C. mannii* is provided in Table 1. The C. *mannii* entomofauna revealed 36 insects families among which 7 were Coleoptera (Chrysomelidae, Coccinellidae, Cucurlionidae, Cerambycidae, Tenebrionidae, Bruchidae, Cleridae), 12 were Hemiptera (Pentatomidae, Coreidae, Pyrrhocoridae, Tingidae, Reduviidae, Dinidoridae, Alydidae, Miridae, Largidae, Lygaiidae, Membracidae, Cercopidae), 5 were Hymenoptera (Vespidae, Formicidae, Apidae, Braconidae, Eumenidae) 4 were Orthoptera (Acrididae, Tetrigidae, Pyrgomorphidae, Gryllidae), 3 were Odonata (Anisoptera, Gomphidae, Coenagrionidae), 2 were Diptera (Tephritidae, Diopsidae), 2 were Lepidoptera (Acreaidae, Pieridae) and 1 was Dictyoptera (Mantidae) (Table 1). In this entomofauna, depredators (12 families) and predators (6 families) were more represented. Few were pollinators (3 families) and nectarivorous (1 family) (Table 1) . Among the 36 recorded families listed, 30 were collected on the leaves, 6 on the stems, 6 on the flowers and 2 on the fruits (Table 1).

Depredators

On leaves, the depredator species identified were Coleoptera (Chrysomelidae, Cucurlionidae, Cerambicydae, Tenebrionidae and Cleridae), Hemi ptera (Pyrrhocoridae Pentatomidae), Hymenoptera (Formicidae Orthoptera (Acrididae, Pyrgomorphidae and Gryllidae and Diptera (Tephritidae) (Table 1). These insects induced various alterations notably punctures, screenings, lacerations and perforations. Among the Orthoptera, *Atractomorpha acutipennis* (Pyrgomorphidae) and *Zonocerus variegatus* (Pyrgomorphidae) were most numerous; they induce more or less important damages. These damages included screenings, lacerations and perforations. Of all families of Coleoptera identified, only one species of depredator namely *Ootheca* sp. (Chrysomelidae) that perforate the leaves was found. On the stems, we found biting-sucker (Dinidoridae) and crushers such as Manti-dae, Formicidae, Anisoptera, Gomphidae and Coenagrionodae.

The flowers were attacked by depredators belonging to families of Chrysomelidae and Formicidae. The cases of depredation observed on the flowers were especially due to *Ootheca* sp. (Coleoptera: Chrysomelidae). Vespidae (*Polistes* sp.), Apidae *Apis mellifera adansonii* and Acreaidae (*Acreas* sp.) and the Pieridae present on the flowers had a pollinating activity (Table 1). The nectarivorous observed were all Pieridae (Lepidoptera) (Table 1).

The fruits were attacked by two insects species: *Dysdercus voelkeri* (Hem *Dysdercus voelkeri* iptera: Pyrrhocoridae) and *Dacus bivitattus* (Diptera: Tephritidae). *Dacus bivitattus* was the most dangerous species. A fruit can receive more than 20 punctures of laying per day which cause its deterioration.

Predators

Predators recorded among the entomofauna of *C. mannii*, were in search of their preys. They included particularly Mantidae, Coccinellidae, Reduviidae and Odonates. These predators attack the depredators found on *C. mannii*.

Pollinator and pollinivorous

This refers to *Apis mellifera adansonii* (Apidae) which collects pollen and nectar; butterflies, ants and wasps which lick or collect nectar and accidentally the pollen; Acreaidae and Pieridae which collect pollen.

Insects with unknown activities

The activities of several insects remained undetermined: they included species of Bruchidae (Coleoptera), of *Cletus* sp. (Coreidae), of Tingidae, Pentatomidae, Alydidae, Miridae, Largidae, Membracidae, Lygaiidae, Cercopidae, *Crematogaster* sp. (Formicidae), of Braconidae, Eumenidae (Hymenoptera), Tetrigidae, Gryllidae and Diopsidae.

Table 1 Insects recorded on the various organs of *C*. *mannii* and their agronomic status in an experi mental field in Nkolbisson (Cameroon) in 2001.

Orders	**Families**	**Species**	**Organs**	**Status**
Dictyoptera	Mantidae		Leaf	Predator
			Stem	Predator
Coleoptera	Chrysomelidae	*Ootheca* sp.	Leaf	Depredator
			Fleur	Depredator
	Coccinellidae	nd	Leaf	Predator
	Cucurlionidae	nd	Leaf	Depredator
	Cerambacydae	nd	Leaf	Depredator
	Tenebrionidae	nd	Leaf	Depredator
	Bruchidae	nd	Leaf	nd
	Cleridae	nd	Leaf	Depredator
Hemiptera	Pentatomidae	nd	Stem	Depredator
	Coreidae	*Cletus* sp.	Leaf	nd
	Pyrrhocoridae	*Dysdercus voelkersi*	Fruit	Depredator
	Tingidae	nd	Leaf	nd
	Reduviidae	nd	Leaf	Predator
	Dinidoridae	*Coridius xanthopterus*	Leaf	Depredator
	Alydidae	nd	Leaf	nd
	Miridae	nd	Leaf	nd
	Largidae	nd	Leaf	nd
	Lygaiidae	nd	Leaf	nd
	Membracidae	nd	Leaf	nd
	Cercopidae	nd	Leaf	nd
Hymenoptera	Vespidae	*Polistes* sp.	Flower	Pollinisator
	Formicidae	*Camponotus* sp.	Stem	Depredator
			Leaf	Depredator
			Flower	Depredator
		Crematogaster sp.		nd
	Apidae	*Apis mellifera*	Flower	Pollinisator
	Braconidae	nd	Leaf	nd
	Eumenidae	nd	Leaf	nd
Orthoptera	Acrididae	*Heterptemis coriloniana*	Leaf	Depredator
	Tetrigidae	nd		nd
	Pyrgomorphidae	*Zonocerus variegatus*	Leaf	Depredator
		Atractomorpha acutipennis		nd
	Gryllidae	nd	Leaf	Depredator
Odonata	Anisoptera	nd	Stem	Predator
			Leaf	Predator
	Gomphidae	nd	Stem	Predator
			Leaf	Predator
	Coenagrionidae	nd	Stem	Predator
			Leaf	Predator
Diptera	Tephritidae	*Dacus bivitattus*	Fruit	Depredator
			Leaf	nd
	Diopsidae		Leaf	nd
Lepidoptera	Acreaidae	*Acreas* sp.	Flower	Pollinisator
	Pieridae		Flower	Nectarivorous

nd **=** not determined

Table 2. Size of fruits and aspect of *C. mannii* seed in an experimental field in Nkolbisson (Cameroon) in 2001.

Studied parameter	Fruits of protected plot (n=11)	Fruits of unprotected plot (n=20)	U- Value	p Value
Diameter of fruit (cm) per plot	7.11±1.4	8.42 ± 1.52	55	<0.02
Number of seeds (g) per fruit	83.9± 55.94	108.65±56.53	83.5	0.27
Weight of seeds (g) per fruit	32.07±21.4	43.73±22.95	81	0.23
Number of good seeds per plot	72.63 ±50.17	87.4 ±52.64	88.5	0.37
% abortive seeds per plot	78.6 ± 27.31	78.56 ±19.3	109	0.96

n = number. 'p' is a value of probability of Mann Whitney test. U= value of Mann Whitney test.

Impact of entomofauna on C. *mannii* yield

In plot A (protected by netting with fine mesh) and plot B (unprotected), we respectively harvested 11 and 20 fruits. The nonparametric test of Mann Whitney shows that the number and the diameter of the fruits are larger in the unprotected plot than in the protected one (Table 2). The experimental sets do not have a significant influence on the number and weight of seeds on like on the number of good seed (Table 2).

Some aspects of *D. bivitattus* biology on *C. mannii*

Laying

The fruit of *C. mannii* was a laying site for *D. bivitattus*, the female lays its eggs inside the fruit. To deposit its eggs, the female inserts the terminal part of the abdomen in the fruit. This laying behavior was at the origin of the wounds (perforations of fruit). When the attacks were severe during a day, the number of wounds on the same fruit could reach 8. The total number of laying punctures on a fruit can reach 20.

Hatching

Eggs layed inside the fruit. They developed themselves until hatching. It was after the putrefaction of the fruit that larva was visible. From laying to hatching, there elapse a period whose duration depends on the environment and the state of degradation of the fruits. In the laboratory at temperature varying between 25 and 27°C, the minimal duration of *C . mannii* fruit degradation was 4 days and the maximum was 8 days (average, 6 days).

Larval development and pupation

Larval development proceeds in the fruit. The stage 1 larva was whitish, its anterior part slim with oral hooks of black color, whereas the posterior part is truncated. In this association, the host plant not only provides the habitat, but also food necessary for the growth and development of the larvae.

In the laboratory, the larva at its last stage leaves the fruit by the open parts after deterioration of the fruit and penetrates in majority into the layer of the ground contained in the plastic cup or on the walls of cups. Towards the approaches of the transformation into pupa, the larvae at last stages became white milky and measured 9-10.5 mm long; they are then very mobile and react to touch by jumps.

The duration of pupation was 3 to 17 days with an average of 8.3 days. Before molting, the pupa was whitish and measured 5-6 mm. As time elapse, the pupa became dark and ends up blackening completely.

Influence of *D. bivitattus* depredatory activity on fruits of *C. mannii*

In plot C, we respectively harvested 246 healthy fruits and 130 fruits carrying the signs of attacks of flies (Table 3). Comparison of the diameter of fruits, the average number of seeds and the percentage of abortive seeds of *C. mannii* noted in healthy and attacked fruits is presented in table 3. It results from this table that the differences of all the parameters studied are very highly significant. The fruits attacked by the flies have a diameter, an average number of seeds and a weight of the seeds weaker than those of the healthy fruits. The number of abortive seeds was higher for the fruits attacked than for the healthy fruits. The percentage of abortive seeds was on the other hand higher in the attacked fruits than in the healthy ones (Table 3).

We noted that the young fruits (category A) were more attacked by the flies than those of categories B, C, D (Table 4). The fruits of the category C were less attacked. The sensitivity of the various sizes of fruits of *C. mannii* were presented in the following descending order: size C (90.5%), size B (72.3%), size D (71.1%) and size A (46.4%) (Table 4). We also noted that more than six punctures of laying on the same young fruit result in the death of the fruit.

DISCUSSION

The study of the *C. mannii* entomofauna revealed the presence of 36 insects families among which, 7 were Coleoptera, 12 Hemiptera, 5 Hymenoptera, 4 Orthoptera,

Table 3. Fruits size and state of the seeds of *C. mannii* in an experimental field exposed to *D. bivitattus* to Nkolbisson (Cameroon) in 2001.

Studied Parameters	Non attacked seeds		Attacked seeds		U-value	p-value
	Total number	Average	Total number	Average		
Fruit diameter (cm)	246	9.21±1.57	130	8.22±1.24	9938.5	0.0001
Seed number	246	160.02±70.28	130	131.96±71.55	12084	0.0001
Seed weight (g)	246	55.1±25.57	130	35.73±19.43	8946	0.0001
Good seed number	246	144.04±67.09	130	73.27±54.13	6582.5	0.0001
% Abortive seeds	246	11.04±8.91	130	45.93±24.1	1898.5	0.0001

n = number, 'p' is the value of the probability of the Mann Whitney test. U = value of the Mann Whitney test.

Table 4 Influence of the size of *C. mannii* on the rate of attack of the fruits in an experimental field in Nkolbisson (Cameroon) en 2001.

	Dimensions of the fruits of *C. mannii*				X^2 value	P value
	A (1-5cm)	B (6-10cm)	C (11-16cm)	D(16cm et plus)		
Healthy fruits	13.6 a	4.9 b	5.3 b	3.7 c	10.32	0.002
Attacked Fruits	23.6 a	14 b	5.9 c	13.9 b	16.97	0.0001
Damaged Fruits	10 a	9.1 a	5.3 b	10.1 a	7.7	0.05
% attacked fruits	46.4 b	72.3 a	90.5 a	71.1 a	11.8	0.008

The same letters indicate a non significant difference. 'p' is the value of the probability of the Kruskal Wallis test.

3 Odonata, 2 Diptera, 2 Lepidoptera and 1 Dictyoptera. This result is different from that of Blancard (1998) who found that Cucurbitaceae entomofauna belonged to Hemiptera, Diptera, Thysanoptera and Lepidoptera orders. The results showed that depredators (12 families) and predators (6 families) are the most represented in *C. mannii* entomofauna. Few were pollinators (3 families) and of nectarivorous (1 family) . We notice that among the 36 listed families, 30 were collected on the leaves whereas stems and flowers kept only 6 and fruits 2. This result highlights the phyllophagous behavior of insects of *C. mannii* entomofauna. This phyllophagous behavior is noted in other groups of insects particularly in the grasshoppers (Duranton et al., 1987). The leaves seem more solicited in the depredatory activity of insects because of their turgescences. Indeed, the leaves are tenderer than the stems and the fruits.

The study also showed an increase of seed number and weight that is considered by Bergeg and Mc Gregor (1999) like an increase of yield. In the protected and unprotected plots we harvested 11 and 20 fruits respecttively and the diameter 7.11 ± 1.4 against 8.42 ± 1.5 of fruits were bigger in the unprotected plot than in the protected one. It further revealed that pollination were insufficient in the protected plot. These results also showed that the importance of pollination in the unprotected plot could conceal the negative insect pest influence that dragged in the remainder of the field (plot 3) the rate of reduction of the number of seeds to about 17.5% between healthy fruit share and share of fruits attacked. In the unprotected plot the activity of anthophyllous insects had a positive impact on the yield in term of fruit (45%). The growth of the average seed number of share 1 and 2 was of about 13.6%. These results were in agreement with the works of Remacle (1990) who showed that, the insufficiency of pollination influences agricultural product quality. The role of pollinators insects noted in this study is closed to that noted on maize by Tchuenguem (1993) and Tchuenguem et al. (2002).

The study also showed that, the post embryonic development of *D. bivitattus* is carried out in the fruit. These results corroborate those of Lavabre (1970). The fruit provides to the larva, sugars and the necessary fatty acids to its development. Indeed, the pulp of C. *mannii* is very energizing and rich in proteins; it possesses a strong content in mineral salts and in A, B1, B2 and C vitamins (SAILD, 2001). The influence of nutritional food value on flies of fruits has been studied by many authors. The presence of a small quantity of iso-caproic acidic and cholesterol is very beneficial for the population of larvae of *Dacus*. In the same way, the mixture of linoléic acidic (present in the seed) (Kapseu, 1993) and of cholesterol in active equal proportion in a meaningful way the pupa development (Kanthi and Pant, 1988). Some quantities of sugar (present in the seed (Dupriez and De Leener, 1983) permit the growth and the maximum development of *Dacus cucurbitae* larvae (Achala and Srivastava, 1989) . Stimulation effects of seed linoléic and iso-caproic acids added to one of the cholesterol drives to achieving a positive influence on the behavior during appreciation of its ability to digest or to absorb lipids (Kanthi and Pant, 1988). Our observations on the importance of nutrients on the development of *D. bivitattus*, pest of *C. mannii* agree with those of Kanthi and Pant (1988); these authors showed indeed that the association of several fatty acids to the glycerol influenced the survival and the development of the fly meaningfully in laboratory. The host plant plays a primordial role in the embryonic development of flies. The knowledge of the food regime can permit to determine its potential host's plants as recognized by Faraenkel and Blevett (1988).

Knowledge of the life cycle of pests is very important on an economic point of view. The data presented by many authors among whom Lavabre (1992) and Dupriez and De Leener (1987) show that in nature, only the larvae don't reproduce; the adults reproduce by laying eggs.

Conclusion

The study showed that *C. mannii* entomofauna is rich and diversified. The entomofauna is rich in depredator insects which especially attack the leaves. Extremely harmful species such as *D. bivitattus* are responsible for the majority of damages observed on the fruits and making them unsuitable for consumption. The presence of pollinator insects has a positive action on the variation of the number of fruits, 11 against 20 and of the diameter, 7.11 ± 1.4 against 8.42 ± 1.52, but it does not increase in a meaningful way the global yield because of the action of depredators. These results are useful in the research of the strategies of protection of cucumber against pests which are its natural enemies. However, successful research strategies require further findings on other aspects of the bio-ecology of the major pests such as *D. bivitattus.* This could further be experienced on the family Dinidoridae and particularly on the species *Coridius xanthopterus*, that bites and sucks the *C. mannii* plant resulting to its dryness.

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