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Research Article

Ichneumonid Wasps (Hymenoptera, Ichneumonidae) Parasitizee a Pupae of the Rice Insect Pests (Lepidoptera) in the Hanoi Area

Bui Tuan Viet*

Vietnam Academy of Science and Technology, Vietnam

***Corresponding author**

Bui Tuan Viet, Institute of Ecology an Biological Resources, Vietnam Acedemy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam, Email: btviet@gmail.com

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Abstract

During the years 1980-1989,The surveys of pupa of the rice insect pests (Lepidoptera) in the rice field crops from the Hanoi area identified showed that 12 species of the rice insect pests, which were separated into three different groups: I- Group (Stem bore) including Scirpophaga incertulas, Chilo suppressalis, Sesamia inferens; II-Group (Leaf-folder) including Parnara guttata, Parnara mathias, Cnaphalocrocis medinalis, Brachmia sp, Naranga aenescens; III-Group (Bite ears) including Mythimna separata, Mythimna loryei, Mythimna venalba, Spodoptera litura . From these organisms, which 15 of parasitoid species were found, those species belonging to 5 families in of the order Hymenoptera (Ichneumonidae, Chalcididae, Eulophidae, Elasmidae, Pteromalidae). Nine of these, in which there were 9 of were ichneumonid wasp species: Xanthopimpla flavolineata, Goryphus basilaris, Xanthopimpla punctata, Itoplectis naranyae, Coccygomimus nipponicus, Coccygomimus aethiops, *Phaeogenes sp*., Atanyjoppa akonis, Triptognatus sp. We discuss the general biology, habitat preferences, and host association of the knowledge of three of these parasitoids, (Xanthopimpla flavolineata, *Phaeogenes sp*., and Goryphus basilaris). Including general biology, habitat preferences and host association were indicated and discussed.

INTRODUCTION

Study on conservation and application use of beneficial insects is one of the most important approaches in the biological control, which is considered by many to be the most important phase of applied control to reduce a pest's populations while and avoiding acne a toxicity of pesticides. The Ichneumon wasps are one of the most important parasitic species in the role to that regulate numbers of pest's scale caterpillar populations belong to scale caterpillar (Lepidoptera) [1]. One of them, a large part belongs to subfamily of Ichneumoninae; tribe Pimplini, etc. are specialist parasites of the pupae of caterpillars. There were some of the pupa-parasitizing ichneumonid wasps have been studied and applied effectively in the insect pests control [2,3]. At present (1990) the system taxonomy of Ichneumonid wasps (Ichneumonidae) is not completed in complete reason by due to the a numerous number of species in the group of it [1]. The study on Ichneumonid wasps have been conducted very little in Vietnam, there just some species have been were discovered but there we do not know what is the taxonomy, biology, ecology, and of it or their role on the pest's populations remains unknown regulations. To contribute knowledge of biological control in protecting rice crop from caterpillar pests, we were conduct ding at the project with the title "Icheumonid waps (Hymenoptera, Ichneumonidae) parasitize the pupae of the rice insect pests (Lepidoptera) in the Hanoi area.

This research regarding the role of the pupa-parasitizing ichneumonid wasps (Hymenoptera, Ichneumonidae) in the reduction of the rice insect pests to contributes to the scientific basis to apply the beneficial insects in the integrated pest management (IPM). The research's aim is to survey the species composition component and the functions of pupa-parasitinged ichneumonid wasps in the rice field. Background of the research on the pupa-parasiticzing ichneumonid wasps in the rice field.

Background of the research on the pupa-parasiticzing ichneumonid wasps

Systematic: The largest of the common parasitic species belong to the family Ichneumonidae. It includes numerous species and is regarded as one of the most beneficial families of insects. First of all The Ichneumonidae were has been divided into 13 subfamilies by [4]. After that many authors have published the newer systems of Ichneumonidae [5,6,1,7]. In the system of family Ichneumonidae, the ichneumonid wasp species that parasitizee a host's pupae are belong to three subfamilies: such as Ichneumoninae, Pimplinae (tribe Pimplini), and Mesosteninae (Mesostenini) [1].

General biology: The Pimplinae is unique among ichneumonid subfamilies for its wide range of host associations. This is a reflection of the generally unspecialised mode of development of early stages seen in the the primitive tribe, or ancestral 'grade-group', Ephialtini, in which wasps stiung their prey more or less to death at the time of oviposition, and laywhen the fully yolked egg(s) is laid externally to it [8]. But iIn the tribe Pimplini, the egg is deposited inside of lepidopterous pupa, and the host is normally inactivated soon after attack. In the case of Pimpla species, at least, this is accomplished by the newly hatched parasitoid larva, which quickly migrates to the host's brain [9]; although selective egg placement [10] and injected secretions from the female's accessory glands are also important in helping to overcome the host's defences [11,12]. Such parasitoids, which allow the host practically novery little activity or development after attack, are termed idiobionts [13].

Facultative secondary parasitism within lepidopterous pupae is quite common in the tribe Pimplini, for example and some species of Itoplectis regularly attack fully exposed ichneumonids as well (supseudohperparasitism: [14]. Secondary parasitism and cleptoparasitism are liktlely differentiated when either the host or its primary parasitoid can serve as food. The first instar larvae of Pseudorhyssa areis highly mobile and equipped with large powerful mandibles, enabling themit to frequently kill the rhyssine larvae almost every time [15-17].

A number of studies on the general biology and behavior of parasitic Hymenoptera have described involved species of Pimplinae due to. This is because of the prominence and abundance of some species of it and with the hope that the species could be, flexible nature of some species makes them good experimental animals [8]. The basic requirements as of larvae of most species also render them relatively easy to culture in the laboratory, sometimes on unnatural surrogate hosts such as Pimpla on Tenebrio pupae [18], or even on completely artificial diets as Itoplectis [19].

Like most Hymenoptera, adults of many species depend for their activity on an intake of carbohydrates, and feed on honeydew, nectar [20,21] and sometimes other plant secretions [22]. As usual for synovigenic parasitoids, which produce a succession of fully yolked eggs but normally emerge as adults with relatively undeveloped ovaries, they also feed on individuals of their host groups.

Both churning with the ovipositor and enlarging the resulting wound with the mouthparts [23-25]can contribute to the flow of haemolymph that is imbibed by the female parasitoid. In North America species of Itoplectis regular mutilation and host feeding attack on pupae of the introduced moth Lymantria dispar (Linnaeus) have been found to cause up to 200 times as much mortality as result from actual parasitism [26]. The several laboratory studies correlating adult feeding on either hosts or carbohydrate from plant sources with increase in longevity, fecundity and accessory gland function indicate that undertaking both kinds of feeding is essentially obligatory in many pimplines [24,25,12]. This is known to apply to Pimplini and but further observation is needed on other groups, and especially those that attack hosts deeply concealed in wood, to ascertain the generality of host-feeding in the subfamily.

Adult of pimplines find their hosts by a variety of successive environmental cues. Odours from the general substrate support the host [27], or from symbionts more definitely indicating the presence of a [28], as well as odours and contact chemicals stemming from the host itself [18]. Orientation towards, and recognition of, the searching niche-'host habitat finding'- by parasitic Hymenoptera is usually recognised as clearly mechanistically distinct from the discovery and recognition of an actual host individual [29-31,2,32]. Some pimplines are know to be capable of simple associative learning [33,34], enabling them to concentrate their efforts on the most productive sections of the environment, and this suggestings a mechanism whereby the realized host range of a particular species might differ radically from place to place. As usual for idiobionts, many pimplines have adult flight periods that correspond to peaks of potential host availability rather than being attuned to a particular host species.

Most pimplines are typical haplo-diploid as it typical in Hymenoptera, in which unfertilized eggs give rise to male progeny and fertilised eggs result in females. As is In common with many idiobionts, mated females of several pimpline genera are know to be able to select the sex of their progeny by controlling the access of stored sperm to the egg as it passes down the oviduct; a process that is detectable by direct observation in at least one [35].

The larval adaptations have been discovered in parasitic Hymenoptera as a whole. However, various interesting scraps of information on the larval behavior of particular species are reported in the literature, including the migration of the young larva of Pimpla to the brain of its host [36], and the adaptation for fighting in the of first in star larvae of in the cleptoparasitic Pseudorhyssa [16,17,15]. It has been shown that there are five larval instars in Pimpla [37], the middle three being very similar and hard to distinguish, and this seems likely to be the case for all Pimplinae.

The typical most usual method of overwintering is as a prepupa; though females of a few species, such as Itoplectis maculator [21], and part of Pimpla turionellae [23], overwinter as adults, carrying with them the male's contribution of stored sperm such as Itoplectis maculator [21], in part of Pimpla turionellae [23]. The influences of the host species and of environmental conditions on the onset of winter diapause by the prepupae of Pimpla hypochondriaca have been investigated by [38]. Many of the pimpline species that are known to overwinter as adults have a pronounced reddish coloration, which may be more cryptic than black in the winter months. Another, even clearer, ecological correlate of the reddisch body coloration is an association with reed beds and fens: this is easily seen pimplines, and in fact extends through most groups of parasitic Hyminoptera, but it has not been satisfactorily explained [8].

Research and application of the pupa parasitic ichneumonid wasps: In 1939 there were two pupa parasitic ichneumonid wasps (Xanthopimpla stemmator & Trichospilus diatraeae) , which have been successful applied to protect sugarcan from stembore [39]. In 1979, the ichneumonid wasp Pimpla dispar was imported from Japan into United Stated to protect pine from isect pest, Lymantria dispar. Some of the pupae of parasitic ichneumonid wasp's species have been reared commercially in the manufacture such as Itoplectis naranyae, Coccygomimus dispar [3].

Situation on research of the pupa- parasitizingc ichneumonid wasps in Vietnam: Before 1980, there were a few of ichneumonid species that parasitize the rice pest insect's pests (Lepidoptera) have been recorded in Vietnam, however the biology and, behavior of these ichneumonid wasps have not been studied.

METHOD AND MATERIALS

The duration of the project

From year 1980 to 1989.

Research placeslocalities

The Collecting sites: rice fields in Tu Liem District, Hanoi, and some of extension rice fields from Thai Binh province, Ha Nam Ninh province and Thanh Hoa province and on some vegetable (cabbage) fields in Hanoi to addition.

The experiments have were been conducted in a laboratory of in the Institute of Ecology and Biological Resources, Hanoi, Vietnam.

The Ichneumonid parasitoid specimens have been identified by Kasparyan in the Zoological Institute, Saint Petersburg, Russia in year 1985.

Methodology

A survey on pupae of the rice insect pests (Lepidoptera) have has been conducted by traditional methods involving by hand collecting in every week on two rice crops per year (From March to June for first crop and from August to November for second crop). In addition, during the time of between the two crops mention above, we also went to surveyed in a grass and or vegetable fields for addition. The collected pupae were separated one by one into a tube until to see if a parasitoid to fly emerged (or flight out) up. In A total of 2015 pupae were collected and to observe whether an ichneumonid wasp fly up emerged.

Rearing three parasitoids (*Phaeogenes sp*, Phaeoges plutellae, Xanthopimpla flavolineata, Goryphus basilaris) by their hosts (Cnaphalocrocis medinalis, Brachmia sp., Naranga aenescens, Plutella xylostella) is the method that will adds the most to our knowledge of their general biology, habitat preferences and host association. The host pupae were reared each individually into each a in a vials or a tubes.

The experiments were conducted in an open room of our laboratory, which without an air conditioner, so during the experiment a temperature depends on the season such as: early summer (April- May, 1982): 25 ± 3^{0}C; Autumn (October-November, 1982): 20 ± 2.5^{0}C; Winter (December,1982 - January, 1983): 15 ± 3.5^{0}C

To assess the longevity and fecundity of the ichneumonid wasps. To release a parasitoid couples into a large tube (10 cm in diameter, and 40 cm in length) in which with fresh rice leaves and host pupae (lepedoptera) and a wet cotton of 5% sugar to fed, these sugar, leaves and host pupae were changed daily, until the ichneumonid wasps died. We continue to release a new parasitoid couple into the above large tube in which with all the changed things such as: host pupa, wet cotton of 5% sugar, fresh leave. The total of the parasitoid couples to release is 20 in this experiment.

To assess the developmental time of parasitoid individual as following: To release a parasitoid couple into a large tube (10 cm in diameter, and 40 cm in length) in which with a host- pupae with the same DS. After the parasitoids insert their eggs into host-pupae, which were dissected at the time after the parasitoids insert their egg for the 1st day, 2nd day, 3rd day, 4th day, 5th day, 6th day, to count number of eggs, larva in each host- pupae/ parasitoid. When the parasitoid couples have died, we continue to release the new parasitoid couple into the above large tube and to dissect host pupae and to count a number of eggs, larva at the same time above. The total of parasitoid couple to release is 10 in this experiment.

RESULTS AND DISCUSSION

Component Species composition and assemblage of ichneumonid wasps (Hymenoptera, Ichneumonidae) that parasitize the pupae of the rice insect pests (Lepidoptera) in the Hanoi area

During the time Ito surveyed a pupae of the rice insect pests (Lepidoptera) in Hanoi. There It here were found 12 species of the rice insect pests were found, these 12 species which were separated into three different groups: I- Group (Stem bore) including Scirpophaga incertulas, Chilo suppressalis, Sesamia inferens; II-Group (Leaffolder) including Parnara guttata, Parnara mathias, Cnaphalocrocis medinalis, Brachmia sp., Naranga aenescens; III-Group (Bite ears) including Mythimna separata, Mythimna loryei, Mythimna venalba, Spodoptera litura (see figure 1). From those 12 species above ese, which 15 of parasitoid species were found, they are those species belonging to 5 families of order Hymenoptera (Ichneumonidae, Chalcididae, Eulophidae, Elasmidae, Pteromalidae), in which there were 9 of ichneumonid wasp species: Xanthopimpla flavolineata, Goryphus basilaris, Xanthopimpla punctata, Itoplectis naranyae, Coccygomimus nipponicus, Coccygomimus aethiops, *Phaeogenes sp*, Atanyjoppa akonis, Triptognatus sp (Figure 1). The attacks of these parasitoids on host pupae are different in different by groups of host pupae. Such as I-group pupae were attacked by just 2 parasitoid species, while the II-group pupae were attacked by 9 parasitoid species. For However the III-group pupae, were supposed it were attacked by some of parasitoids mentioned above, but we still do not have any information. Why the does parasitism was differ different between the three of host pupal groups? Because of the Host pupae of I-group are inside of stems, so it is difficult for to ovipositionarity by of parasitoids, while in the case of the II-group, the pupae are inside the leaf folder, into which parasitoids can more easily are easier to attack. In the case of III-group, is that almost host pupae are under soil, which is more difficult for so parasitoids are more difficult to attack see Figure (1).

Biology and behavior of three ichneumon wasps (Hymenoptera, Ichneumonidae) parasite a pupa of the rice insect pests (Lepidoptera)

Biology and behavior of brown wasp, *Phaeogenes sp*

Development: Brown wasp is an endoparasitoid, and their eggs, larvae, and pupae live inside the body of host pupae. The larvae including have heads with big mandibles, a thorax with three segments, and an abdomen with ten segments. At temperature 27 ± 3°C and humidity 85-90%, the time spent in the egg is under 36 hours. The Experiments indicate that the time spent in the last in star of larva is longer than the total time of all previous instars of it. At the three temperature levels, 27 ± 3°C, 20 ± 2.5°C, and 15 ± 3.5°C, the time spent in the pre-adult stage (egg, larva, pupa) is 12.5 days, 23.0 days, 34 days respectively in the female and 11.6 days, 18.5 days, 33.0 days in the male.

Longevity of adult: Laboratory studies indicate that when a temperature is changed to decreased (27 ± 30C; 20 ± 2.5°C; 15 ± 3.5°C) then the longevity of brown wasps to increases (26.3 ± 0.1 days; 33.5 ± 0.1 days; 57.8 ± 0.1 days respectively in male and 28.5 ± 0.1 days; 38.5 ± 0.1 days; 56.8 ± 0.3 days respectively in female) (Table 1).

Laboratory food studies in laboratory indicate that the longevity of brown wasps are is very short (1-2 days) in the condition without food, but when the food are is supplied (5% of sugar) every day, the survivale of them is 26.3 ± 0.3 days in males and 28.5 ± 0.1 days in females at a with the temperature of 27.3 ± 3°C.

Reproduction: Laboratory studies indicate that at the temperature of 27 ± 3°C, humidity 85-90%, the reproduction of brown wasps is 56 ± 6 eggs/female in that laied in the pupa of the rice leaf folder (Cnaphanocrocis medinalis), and it is starts to reproduced after 2 days to mature and reaches a maximum in the middle of her lifespan longevity. The fecundity function of brown wasps is depended on the food supply, the more food supply the more developed eggs. Field observations over of three years (1980, 1981, 1982) indicate that sex ratios (female/male) of brown wasp populations appeared in April, May (1.3; 0.9) are often higher than September, October, November (0.3; 0.25; 0.3). Laboratory studies on the egg laying behavior indicate that an brown wasps sting to the eyes of host pupae firstly make insensible, then to oviposit into the 2nd -,3rd -, 4th- abdominal segments, the average oviparous frequency is with an average of 4 times per a host pupa. Studies on the selection of stages of the host pupae indicate that brown wasps do not oviposit into the

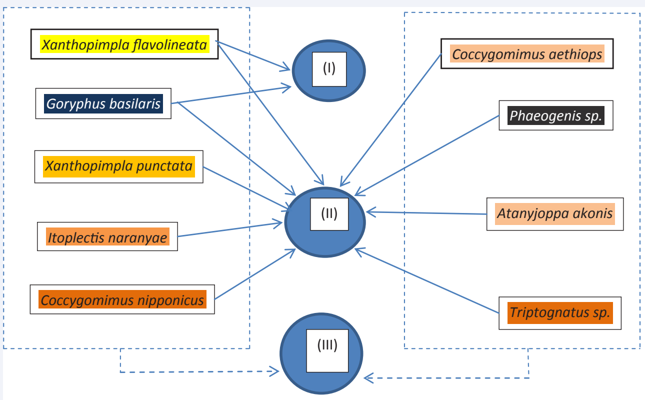

Figure 1 Electrospun nanofibers membrane of poly-ε-caprolactone visualization after 21 days of human Osteoblasts culture (Cells visualization in blue (nucleus /DAPI) and PLL^{FITC} labelled nanofibers in green): colonization and proliferation of osteoblasts into the nanofibers membrane.

Table 1: Influence of temperature on developmental the time of developed stages and longevity of brown.

	Developed stages			Longevity		
Temperature	Sex	Number of individuals	Duration (days)	Sex	Number of individuals	Duration (days)
27 ± 3°C	Female	22	12.5 ± 0.1	Female	25	28.5 ± 0.1
	Male	25	11.6 ± 0.1	Male	29	26.3 ± 0.1
20 ± 2.5°C	Female	14	23.0 ± 0.1	Female	14	38.5 ± 0.1
	Male	12	18.5 ± 0.2	Male	15	33.5 ± 0.1
15 ± 3.5°C	Female	5	34.0 ± 0.1	Female	19	56.8 ± 0.3
	Male	4	33.0 ± 0.1	Male	10	57.8 ± 0.1

Table 2: Distribution of host pupa (Cnaphlocrocis medinalis) and the their parasitism by yellow wasps (Xanthopimpla flavolineata) in the rice fields NN22.

Index	Host pupa (Cnaphalocrocis medinalis)		Parasitism (Xanthopimpla flavolineata)	
Hight (cm)	Number of individuals	% of total collected	Number of the parasited host pupa	% of total collected
4 - 9	110	32.2	5	14
10 - 20	216	63	29	81
21 - 25	15	4.8	2	5
Total	341	100	36	100

host pupae with 5 developed- days old or older. The Most prefer to oviposit into pupae with 2 developed-days old (31%) then she can oviposit into host pupae with 1-, 3-; 4-days; and prepupae, in which its preferences are 25%; 22.2%; 19.2%; and 2.7% respectively (for more detail please see in the part III.)

Biology and behavior of the yellow wasp, Xanthopimpla flavolineata Cam:

Development: The yellow wasp is an end oparasitoid, whose eggs, larvae, and pupae live inside the body of host pupae. Their eggs of yellow wasps haves an oval shape and yellow-white colour, which similar to the eggs of brown wasps. Larvae haves a head with a big mandibles, a thorax with 3 segments, and an abdomen with 10 segments. Larvae haves from 5 to 6 instars, with the last instar (5th -, or 6th instar) duration spent times longer than the time total of all prevous instars [40]. The pupae of yellow wasps haves a yellow colour like the adult. At a temperature of 27 ± 3°C and humidity of 85-90%, the time spent from egg to adult is 11.1 ± 0.5 days in females and 10.5 ± 0.6 days in males.

Longevity of adults: Laboratory studies indicate that at a temperature of 27 ± 3⁰C, the longevity of a yellow wasp adult is 25.5 ± 0.6 days in males and 27.3 ± 0.5 days in females. Food is an important factor to improve the longevity of yellow wasps. In the case of enough food the average longevity of them is 26.4 ± 0.5 days, while it is only 1- 2 days in the case of starvation.

Reproduction: Laboratory studies indicate that at the a temperature of 27 ± 3⁰C, and humidity 85-90%, the reproduction of brown wasps is 36 ± 3 eggs/female that laid in the pupae of the rice leaf folder (Cnaphanocrocis medinalis). The observations over for 3 years (1980; 1981; 1982) to show that the sex rations (female/male) of the yellow wasp populations are 0.14 in April (rice spring crop), that is lower than in August, September, and October, the- summer crop (0.78; 0.7; 0.58 respectively).

Active area of the yellow wasps in the rice fields: The Observations in the rice fields to show that the pupae of rice leaffolders have been parasited by yellow wasps in at various different heights. to indicate that the Most host pupae are parasitized in the level from 10 to 20cm (63 %) were attacked with the highest rate (81%) of by parasitoids, Yellow wasps, then The next most are the second is host pupae in at a the level from 4 to 9cm (32.2%). with rates of the parasitism is 14%. It is interesting that the host pupae in highest level (21-25cm) (4.8%) were little attacked by the parasitoids (5%) see Table (2).

Biology and behavior of the black wasp, Goryphus basilaris Holmg:

Development: The Black wasp is an ectoparasitoid, whose their eggs and, larvae live on the surface of the Body of host pupae. Their eggs have with white-yellow color and are bigger than in size than of the two ichneumon wasps mentioned above. At the temperature 27 ± 3⁰C, RH 85 - 90%, the time spent in the egg stage is 6-12 hours, that shorter than the in case of brown and yellow wasps. Their larvae get a food from the body of host pupae. At a temperature of 27 ± 3⁰ C and RH 85-90%, the time spent in larval stage (3 - 4 days) is shorter than in the brown and yellow wasps. However, the total time spent in egg-, larval-, pupal stages of black wasp is equal in to the brown wasp, so the time spent in the black's pupal stage (8 - 9 days) is longer than in brown and yellow wasps (5 - 6 days).

Longevity of adult: Laboratory studies indicate that at the a temperaature of 27 ± 3⁰C, and humidity of 85-90%, the Longevity of the black wasp is 34 ± 3 days in males and 37 ± 4 days in females. Food is an important factor to improve the longevity of black wasps, whose lifes panit is only 1- 2 days in the case of starvation.

Reproduction: Laboratory studies indicate that at a the temperaeture of 27 ± 3⁰C and, humidity of 85-90%, and additional food, the reproduction of black wasp is 18 ± 3 eggs/female that laied in the pupae of the rice leaffolder (Cnaphanocrocis medinalis). This that is much less than in the Goryphus nurcei (82.4 eggs/femal [41]. In the total of 17 host pupae (Cnaphanocrocis medinalis) that contacted with one black wasp in the experiment, there was just one host pupa (5.9%) that had been revealed one parasitoid to emerge fly up, while there were 8 host pupae (47%) that had been died by attack of the black wasp, so the mortality of host pupae is much higher than the parasitsm ration.

Summaries on general behaviors of ichneumon wasps parasite a pupa of the rice insect pests (lepidoptera): The pupae of the rice insect pests have been parasited by two kinds of parasitoid including indoparasitoids (brown wasp, *Phaeogenes sp*. and yellow wasp, Xanthopimpla flavolineata) and ectoparasitoids (black wasp, Goryphus basilaris). Their larva are very active, because the times spent in the early instars are very fast to becomquickly give way to the last instars, in which the completed larva have enough ability to fight to other one until just one survival individual survives. At the temperature of 27 ± 3⁰C, the time spent in the preadult stage is the same in all of bot he the three species above.

Table 3: Average parasitical ratio of the Brown wasp (Phaeogenes sp.), the Yellow wasp and their assesmblage parasite in the pupae of the rice leaffolder (Cnaphalocrocis medinalis).

Date	Total collected host pupae	Parasitical ratio (%)			
		Phaeogenes sp.	*X. flavolineata*	Other specie	Assemblage
Year 1981					
Spring crop	142	37.4	4.9	4.7	47
Summer crop	495	1.5	14.8	6.9	23.2
Year 1982					
Spring crop	40	43.3	-	5.5	48.8
Summer crop	192	7.5	13.4	9.8	30.7

The male adults often appear earlier than female adults by for one or two days. After appearing from host pupae, the brown- and yellow wasps have been coupled mate immediately, but the black wasps have been coupled mate after appearing for 6 or 7 hours. One male can mate couple with multiple some of females and the opposite, one female can mate couple with multiple some males too. At a the temperature of 27 ± 3^{0}C, the highest reproduction rate is in the brown wasp (56 ± 6 eggs/female), then the lower one is yellow wasp (36 ± 3 eggs/female), then the lowest one is black wasp (18 ± 3 eggs/female). It is Different from the egg-parasitoids, the pupa-parasitoids have started to lay eggs 1 or 2 days in the time after appearing from host pupae for 1 or 2 days, and the highest number of egg are laid in the middle of the lifespan time of longevity. It is interesting that the pupa-parasitoid do not lay eggs in the last instars of pupae or older. The pupa-parasitoids are oliophaga, the range of the host pupa have been attacked by ichneumon wasps are limited in some of families belong to oder Lepidoptera.

Study on the generation of ichneumon wasps (Hymenoptera, Ichneumonidae) in the dynamic of the rice insect pest (Lepidoptera):

The generation of the a Brown wasp, *Phaeogenes sp*: Based on the surveys for three years (1980, 1981, 1982) at the fixed rice fields in Hanoi and at the some of other rice fields from surrounding Hanoi, and the life cycle in the experimental laboratory, we can guess that the brown wasp have about their 7 generations (including 1st -, 2nd -, 3rd -, 8th -, 9th -, 10th -generation and a part of 11th generation) with the that ability to develop in the 5 generations of host pupae (2nd -, 3rd -, 5th -, 6th , and a part of 7th - generation of the rice leaffolders, Cnaphalocrosis medinalis), while their other generations (4th -, 5th -, 6th -7th -, and a part of 11th generation) were moving into the other host pupa (Brachmia sp.) in the weeds (Poaceae). The highest parasitism of host pupae, leaf folder were given by the first and second generation of brown wasp, which that significant lyce to reduce the damage of leaffolders in the winter - spring rice crop. While its paradigm of host pupae is low in the summer-autumn crop, it that gives small significant to reduce the damage of leaf folder, however, its paradigm will be increased in the time of harvest crop (end of October and November).

The generation of the a Yellow wasp, Xanthopimpla flavolineata: To compare with the brown wasp, the date to beginning of the first generation of the yellow wasp is relatively later than the brown wasp, as such as in the end of March or early April the adults of yellow wasps have started to appear the field. Yellow wasps haves three generations in host pupae, leaffolders, from the end of March to the end of May, that belonging to the spring rice crop, and their 5 generations in the summer rice crop, from middle July to early December. During the time from June to early middle July, their 3 generations live partly in a rice seeding and partly in the weeds (Poaceae). The parasitism of the 1st, 2nd, 3rd generation of yellow wasps were very low (2%) in the spring rice crop. The 8th generation has the highest parasitism (38%), but this one was happened at the end of September, the time to harvest the crop, so it was did not at effect to limit the damage done by of the rice leaf folder.

The generation of the black wasp, Goryphus basilaris: The black wasp appears scattered during the time of year with a low density in multiple the different host pupae. Their appearance was ere often later than to compare with the brown and yellow wasps. The highly characteristic of the black wasp is to consume a lot of host pupae as food to live rather than reproduction, so these may be one of significant agents for to reducing the rice insect pests (Lepidoptera)

The integrated role of the pupa-parasitoids to in the limit to damage of the rice insect pests (Lepidoptera): Generally, the single-action of each parasitical species is not significant to limit the damage of the rice insect pests, but their multitudinous-action is significantly. The parasitism of each species was fluctuated in a year by year basis to compare with the parasitism of the entire assemblage of parasitoids. Table (3), shows the average parasitism cal ratios of brown wasps in the spring crop of year 1981 & 1982: were 37.4% & 43.3% respectively. For the and the one of the yellow wasp these were 4.9% & 6% respectively, while the multitudinous parasitism of assemblage of parasitoids was higher and more sustainable (47.2% & 48.8% respectively). The situation of the summer crop of the year 1981 & 1982 was that the single- parasitism of each species was low; however the one of the assemblages of parasite species remained relative significant high (23.2% & 30.7% respectively)

CONCLUSIONS

1. There were 9 of ichneumonid wasp- species (Hymenoptera, Ichneumonidae) that parasitizee the pupae of the rice insect pests (Lepidoptera) in the Hanoi area, in which there were 7 species were discovered for the first time to discover in Vietnam (*Phaeogenes sp*., Xanthopimpla flavolineata, Goryphus basilaris, Itoplectis naranyae, Coccygomymus aethiops, C. Nipponicus, Triptognatus sp.) and the two species (*Phaeogenes sp*., Xanthopimpla flavolineata) are dominant in the rice field. In the three rice insect pest groups (Lepidoptera), the II- group has been parasited by the ichneumon wasps more often than in the other two groups (I- and III- group).

2. The iIchneumonid wasps (Hymenoptera, Ichneumonidae), which parasiteize the pupae of the rice insect pests (Lepidoptera), including endoparasitoids (Phaeoges sp., Xanthopimpla flavolineata, Itoplectis naranyae, Coccygomymus aethiops, C. Nipponicus, Triptognatus sp.) and ectoparasitoid (Goryphus basilaris). In the conditions of: 27 ± 3^0 C, RH = 85-90%, food in addition, and a host pupa - leaf folder (Cnaphlocrocis medinalis), the times spent in the preadult, longevity and average reproduction of three ichneumon wasps was as following:

Brown wasp (*Phaeogenes sp*.), female: 12.5 days, 28.3 days, 56±6 eggs respectively; Male: 11.6 days, 26.5 days respectively.

Yellow wasp (Xanthopimpla flavolineata), female: 11.1 days, 26.5 days, 36 ± 3 eggs respectively; Male: 10.5 days, 25.5 days respectively.

Black wasp (Goryphus basilaris), female: 13 days, 37 days, 18 ± 3 eggs respectively; Male: 12.5 days, 34 days respectively.

The ichneumonid wasps have selected the host pupae at with stages suitable for laying eggs and they have completely avoied to select the host pupa with stages that are not suitable for laying eggs.

3. The Brown wasp (*Phaeogenes sp.*) was very active in the spring rice crop; with at heir parasitism ratio in a range from 20 to 80%, and that relative limits the damage of the rice insect pest, leaf folder. And The Yellow wasp (Xanthopimpla flavolineata) was active in the summer rice crop, but their highest of their parasitism ratio (38%) was in the end of September, so that their effect on limit the damage of leaf folder was relatively a little.

4. Supplement some discussion on the results: we recommend that to preserve the grass close to the rice fields, in which may reserve a resource of pupae parasitoid as brown wasp (*Phaeogenes sp.*) yellow wasp (Xanthopimpla flavolineat) of black wasp (Goryphus basilaris) these parasitoids may good to limited the insect pest population of leaf folder and stem bore of rice 3.5.

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