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BIOLOGICAL ASPECTS OF *Sirex noctilio* F. (Hymenoptera, Siricidae) AND ITS PARASITOID *Ibalia leucospoides* (Hymenoptera, Ibaliidae).

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SUMMARY

These observations were based on infested logs collected from the field in march 1995 and maintained in non-controlled environmental conditions. It was verified that the short cycle occurrence of *Sirex noctilio* and its parasitoid *Ibalia leucospoides* was from April 8th to June 1st 1995. These same logs produced a long cycle generation, that appeared from October 14th to February 4th. The average body length of a short cycle *S. noctilio* adult was of 13,84 cm for females and 10,71 cm for males. *I. leucospoides* adults in the same cycle presented 10,06 cm e 9,35 cm for females and males respectively. Parasitism rate was of 4,85%. Long cycle *S. noctilio* adults measured an average of 26,35 cm for females and 22,53 cm for males. Females and males of *I. leucospoides* measured 12,05 cm and 10,15 cm, respectively. Parasitism rate in this cycle was of 23,45%. It was verified that 8° C was the most recommended temperature for *I. leucospoides* storage, with a survival rate of 100% for up to 35 days, longevity being extended by non-controlled environmental conditions for an average of about 15 to 30 days. It was also verified that feeding did not affect *I. leucospoides* longevity and that in any tested diet the temperature of 12° C was the one with the highest longevity rate (80,20 days).

1. INTRODUCTION

The sirex wasp, *Sirex noctilio* F., originated from Europe, Asia and North Africa (MORGAN, 1968) was reported in southern Brazil in the municipalities of Gramado and Canela, RS in 1988 (Iede et al., 1988; pedrosa-macedo, 1988). It turned into a serious menace to the national forestry sector, having already reached the states of Santa Catarina and Paraná.

Due to the importance of the insect, private companies and public institutions created the National Fund for Sirex Wasp Control (FUNCEMA). FUNCEMA's main objective was of financing the National Program for Sirex Wasp Control (PNCVM) (Iede et al. 1989).

As *S. noctilio* is an exotic species, biological control was emphasized, particularly the use of *Deladenus siricidicola* nematoid. Besides this, the PNCVM foresaw the introduction of *Ibalia leucospoides*, *Rhyssa persuasoria* and *Megarhyssa nortoni*, as they are the species with best possibilities of adapting to Brazilian conditions (Iede et al., 1989). In 1990, after the accidental introduction of *I. leucospoides* was verified, new possibilities of advance in Sirex wasp control appeared

In this study, *Sirex noctilio* and *I. leucospoides* adult population fluctuation in two emergence periods (annual cycle and short cycles), as well as temperature and feeding influences on *I. leucospoides* longevity were investigated.

2. LITERATURE REVIEW

Even before the 1952 Sirex wasp report in southern Tasmania, it was already recognized as a serious menace to Australian *Pinus* plantations, as it had already caused considerable damage in *P. radiata* in New Zealand. In 1961, *S. noctilio* was detected in the australian continent, where the development of a Biological Control Program took place. Its objective was parasitoid collection in pest origin regions, to be laboratory raised and then freed (Taylor, 1976).

One of the parasitoid groups used for sirictdeos control, is the Ibaliidae, which attacks eggs and/or larvae in a first or second instar, mainly because they present a short ovipositor. They are attracted to *Sirex* oviposition roles only when the symbiotic fungus starts to grow which occurs at the same time as host egg eclosion. (Madden, 1968; Spradbery, 1974). The larval period presents four ínstar, three of them occurring inside the host larvae and the fourth in wood galleries (Nutall, 1980). Males start to emerge a few days before females, being small adults between 5,0 mm and 16,0 mm (Nutall, 1980). According to Taylor (1967), *I. leucospoides* disperses through long distances, reproducing intensively when reaching new areas.

Ibalia spp. is the only Siricidade larvae endo-parasitoid found in European, Asian and North American forest regions (Weld, 1952).

According to Weld (1952), Rebuffo (1990), Carvalho (1993) and Klasmer (1996), *I. leucospoides* presently occurs in the following countries: France, England, Germany, Austria, Russia, New Zealand and Australia, including Tasmania, Uruguay, Argentina and Brazil.

According to Weld (1952), *Sirex juvencus, S. noctilio, S. cyaneus, Urocerus gigas* and possibly *Xeris spectrum* are *I. leucospoides* hosts.

The utilization of parasitoids in *S. noctilio* biological control started in New Zealand in 1928, with the successful introduction of *Rhyssa persuasoria*, collected in Europe (Chrystal, 1930; Hanson, 1939). In the same period, *I. leucospoides* was introduced in

England but its establishment was verified only in 1957, after a second introduction in 1950 (Zondag, 1959). According to Taylor, (1976; 1981), *I. leucospoides* was introduced in Tasmania between 1959/60, through collecting in New Zealand.

In South America, *I. leucospoides* was first reported in Uruguay, in 1984, attacking an average 24% of the *S. noctilio* population (Rebuffo, 1988); according to Klasmer (1996), in 1993/94 the attack rate reached 20% in Argentina. In Brazil, the parasitoid was detected in 1990, controlling up to 29,05% of the pest (Carvalho, 1992). In none of these places was there an intentional release of *I. leucospoides* (Iede*, personal communication).

In Brazil this parasitoid occurs in nearly all areas where its host is present. In some cases, they were brought up in laboratory and later released in fields by reforestation companies, with the objective of introducing the parasitoid in areas where it was not yet present or in the attempt to increase parasitism rates (Penteado, 1995).

In many trees, symbiotic fungus growth happens in three to five weeks. But in some cases, due to high wood humidity, fungus development is retarded and Sirex egg eclosion can take more than 12 months. (Spradbery, 1974, quoted by Taylor, 1976).

Carvalho (1992), verified that the duration of the *I. leucospoides* short cycle in Brazil, from the egg to the emergence of the adult, was from 90 to 95 days. On the other hand Chrystal (1930), verified in England, in temperate weather, that the duration of this period was not inferior to three years.

According to Taylor (1966), *I. leucospoides* is one of the most efficient *S. noctilio* parasitoids, due to its high reproductive capacity, independent of having food available or not.

For mass production of *I. leucospoides* the use of small *Pinus taeda* logs that received *S. noctilio* egging with one meter in length and 15 to 20 cm in diameter is recommended. These small logs should be offered to *I. leucospoides* couples, previously mated in glass flasks, preferentially in a controlled cabinet with temperature of 25o C and 70% humidity. Embrapa Florestas* recommends that, as *I. leucospoides* male emergence occurs a few days before females, they should be stocked in a temperature between 4 and 6° C, for up to four weeks, as couples are gradually formed.

Carvalho (1992) discovered that at room temperature, when *I. leucospoides* was fed on honey and water, its longevity increased an average of 15 days for males and 25,1 days for females, longevity of non-fed insects was of 15,2 and 15,9 days for males and females, respectively. In the meantime, Taylor (1967), offering honey and raisins to *I. leucospoides* and I. ensiger adults, verified that these rarely fed themselves. Egg laying was not affected by the absence of food or water.

3. METHODOLOGY

Ibalia leucospoides specimen used in this study were obtained from small 80 cm *Pinus taeda* logs attacked by *Sirex noctilio*, collected in March 1995, at São José do Cerrito, SC. To register the emergence of adults the small logs were put in 200 liter barrels and covered with a net. These barrels were maintained in the Embrapa Florestas entomology laboratory in non controlled environmental conditions (average temperature of 20° C and 68+ 10% of humidity).

Determination of temperature influence on the storage period was done using 10 adults, by treatment, individualized in baquelite flasks of 5 cm in height and 4 cm in diameter. The temperatures of 0, 4, 8 e 12o C were tested, during the periods of 5, 10, 15, 20, 25, 30 and 35 days of storage. BOD incubators that presented a variation of up to +1° C were used.

The influence of food in *I. leucospoides* longevity was observed by offering hydrolyzed protein at 5%, honey at 20% and only water, to just emerged adults, in the temperatures of 12o C, 25° C and room temperature.

4. RESULTS AND DISCUSSION

4.1 Populational Fluctuation of *Sirex noctilio* and *Ibalia leucospoides*

The emergence period of short cycle *Ibalia leucospoides* and *Sirex noctilio*, happened from April 08th to June 1st. From the same logs, long cycle individuals were obtained, emerging from October 14th to February 4th. Iede et al. (1993); Carvalho (1992) and Carvalho et al. (1993), found an shortened emergence period for the two species, from November to May. This difference can be attributed to the annual average temperature, attacked log collection date, as well as log diameter and storage conditions. Average body size of short cycle *S. noctilio* adults was of 10,71 cm and 13,84 cm for males and females, respectively, being the sexual proportion of 1:5,5. In this same cycle, *I. leucospoides* presented an average of 9,35 cm and 10,36 cm for body length, (males and females), in the sexual proportion of 1:8,5. In this period, parasitism rate was of 4,85%.

Long cycle *S. noctilio* adults presented 22,53 cm in length (males) and 26,35 cm (females). As of a *I. leucospoides*, males measured 10,15 cm and females 12,05 cm. Parasitism rate in this cycle was of 23,45%, close to the rates found by Carvalho (1992) and Penteado (1995).

Less than 10% of the individual obtained in the two cycles emerged in the first cycle, being of very small size, its use not being recommendable for parasitoid mass production. For the same reasons, the production of short cycle parasitoids for direct field release is not recommendable (Tables 1, 2,e 3).

4.2 Temperature and storage period influence on *Ibalia leucospoides* longevity

As the temperature of 8o C maintained 100% survival of *I. leucospoides*, in up to 35 days, it was considered the mostly indicated for storage, as it added an average of 15,3 days in life expectancy, in non-controlled conditions of temperature and humidity.

Comparing the 12° C, 25° C and room temperature influence, it was verified that at 12° C, average longevity was of 80,2 days, significantly superior to others. On the other hand, The type of diet did not influence *I. leucospoides* longevity, which is in agreement with TAYLOR (1976) but not with data found by CARVALHO et al. (1992), that verified an increase of 10,1 days in female longevity when fed with a honey solution at 20%.

Table 1. Number of adults and sexual proportion of *Sirex noctilio* and *Ibalia leucospoides*, from logs of *Pinus taeda* collected in March/1995. São José do Cerrito SC. 1996.

Collection Dates	Emergence Periods	*Sirex noctlio*			*Ibalia leucospoides*		
		male	female	Sexual Proportion	male	female	Sexual Proportion
March 1995	April to july/95	349	63	1: 5,5	12	8	1: 1,5
March 1995	Oct/95 to Feb/96	4.384	516	1: 8,5	757	392	1: 1,9

Table 2. Parasitism percentage of *Sirex noctilio* by *Ibalia leucospoides*, from logs of *Pinus taeda*, collected in March/1995. São José do Cerrito SC. 1996.

Sample Collection dates	Emergence periods	(%) Parasitism
March 1995	April to June/1995	4,85
March 1995	Oct/1995 to Feb/1996	23,45

Table 3: Average *Sirex noctilio* and *Ibalia leucospoides* adult body length, from *Pinus taeda* logs, collected in March /1995 at São José do Cerrito SC. 1996.

Sample collection Dates	Emergence Periods	*Sirex noctilio*				*Ibalia leucospoides*			
		male		female		male		female	
		Length. (cm)	D.P.	Length. (cm)	D.P.	Length. (cm)	D.P.	Length. (cm)	D.P.
March/1995	April to july/1995	10,95	1,71	13,83	1,72	9,35	0,94	10,36	1,14
March /1995	Oct/95 to Feb/96	23,60	4,43	26,35	5,11	10,15	1,08	12,05	1,38

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