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"INTEGRATED CONTROL OF CORYTHUCA CILIATA"

GROUPE DE TRAVAIL O.I.L.B./S.R.O.P.

"LUTTE INTEGREE CONTRE CORYTHUCA CILIATA"

1st Meeting - 1ere Réunion
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THE APPEARANCE OF CORYTHUCA IN EUROPE AND THE ACTIVITIES TO COORDINATE THE RESEARCH WORK ON THIS INSECT IN EUROPE

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As it is well known Corythuca ciliata, which we can call the sycamore lace bug, la tingidae del platano, le tigre, oder die Platanen Netzwanze, was first found in Padova, Italy in 1964 (Servadei, 1966). We found this bug in Yugoslavia in the year 1970 (Maceljski, Balarin,1972). It is important to stress that this finding was made in Zagreb about 200 km from Italy in spite the fact that between Zagreb and Italy the bug was not yet present. This fact shows the expressed property of this insect to be spread by human beings and vehicles.

It is necessary to point out again an other important property of the sycamore lace bug. Appart of being an phytophagous insect and an agent spreading plant diseases, this bug is molesting human beings making unagreable the staying in infested parks and in the vicinity of infested trees. The massive entering through windows is disturbing people living or working in quarters near sycamore trees. Some nonconfirmed data about stinging human beings and the finding of Dr. Sidor of the presence of Trypanosoma in the bugs make this specific role of the sycamore lace bug being also directly nuisible to human beings even more important.

Coming back to the spread in Europe, in France the sycamore lace bug was found in 1975 (D'Aguilar, Pralavorio, Rabasse, Mounton, 1977) and in Hungary in the year 1976 (Min. of Agriculture, 1976).

Soon after the discovery in Yugoslavia, considering the probable fast spreading through Europe and the nuisibility of this insect, we started our activity to cooperate with many specialists in Europe and in the U.S. From the first publications in Italy, Yugoslavia and France we have seen that practically everybody is starting from the begining with the same or at least a similar research programm. We thougt that such duplicate or even multiplicate research work is a big los of vaiable time. As we have realised that a simple chemical control of this insect is not possible we thought that only a biological control or an integrated approach to the control of the sycamore lace bug will solve the problem of this insect in Europe.

After some consultations with Dr Mathys, president of the EPPO, and exchange of letters with some italian and french colegues, we organised a meeting of interested specialists in Perpignan during the Circummediterranean Conference. This meeting hold May 28th 1981 was attended by specialists from France, Spain and Yugoslavia. We decided tu make a proposition to the IOBC/WPRS to create a working group "Integrated control of the sycamore lace bug". This proposition was supported by some italian colegues who were not attending the meeting in Perpignan but have written their agreement.

During this meeting the colegues from Spain informed us about the apparition of the bug in the year 1979 in Catalonia and Girona in a very strong intensity.

In autemn 1982 we have found the lace bug in Radkersburg in south east Austria, but the first official funding in Austria was registered far more to the west in Klagenfurt in 1983(Höpoltseder,1984).

In Switzerland the bug was registered in 1983. far in the north in Basel (Wicki,1983), which finding shows also the spread of this insect in the Federal Republic Germany.

Because of the spread in Hungary we suspect the presence in Tschecoslowakia, and because of our finding only 20 km from the foumanian frontier some years ago we suspect the presence in

Roumania. As the bug is spread in eastern Serbia it is probably that it is present in Bulgaria also. Greece, Portugal and the URSS are also endangered by the sycamore lace bug.

All together we could summarise that the sycamore lace bug is at the moment present in Italy, Yugoslavia, France, Spain, Switzerland, Federal Republic Germany, Austria, Hungary and Roumania, and probably in Tchecoslowakia and Bulgaria. So they are infested nine to eleven countries which fact confirm that we were right to anticipate the fast spread of this insect through Europe and the need to cooperate efforts of all countries in order to find out an acceptable method to control the sycamore lace bug.

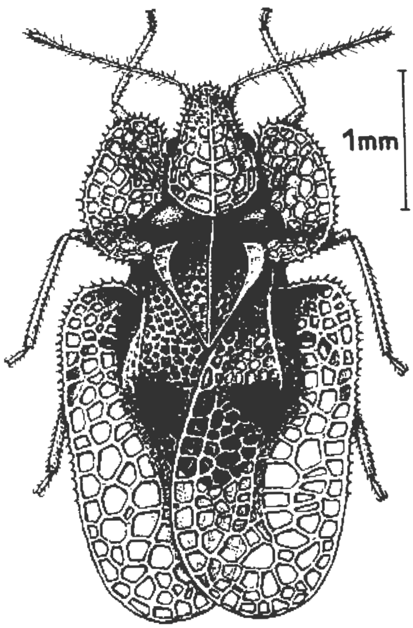
The General Assembly of the IOBC in Antibes hold in October 1981 has accepted our proposition made in Perpignan, and the Executive Comitee of the IOBC/WPRS on its meeting hold 21-22 January 1982 has created a study group named in english "Integrated control against Corythuca ciliata" and in french "Lutte biologique contre Corythuca ciliata". I was appointed as convenor of this study group.

I asked prof. Alessandra Arzone from the University of Torino and Mister Gerard Euverte from INRA, Station de recherches forestiere Avignon, to help to make a programm of work for the working group. Both agreed, and with a great help from prof. Carlo Vidano from Torino during a meeting in Torino hold the 3 and 4 february 1982 we made such a programm and submitted it to the Executive comitee of the IOBC/WPRS. I must express my thankfullness to prof. Arzone, prof. Vidano and Mr Euverte for their grat role in making this programm, and to our colegue Euverte for preparing this report in the definitive french version also.

IOBC/WPRS accepted our programm and in the year 1982 our working group named "Integrated control against Corythuca ciliata" was created and I was appointed as convenor.

Untill the first meeting the record of the meeting in Perpignan, the programm of research work proposed by the study group, a methodik for investigation of the demographic of the bug made by Mr Euverte and an provisional bibliographie of publications on Corythuca ciliata in Europe were distributed among interested specialists.

I expect from this first meeting here in Zagreb that we will learn the role of the sycamore lace bug and the achievements in the research done on this insect in all main european countries infested by this insect. Based on this achievements it will be possible to make a joint programm of future research work and I hope that it will be possible to make a provisory recommendation for a control of the sycamore lace bug in the practise.



SPREADING AND IMPORTANCE OF CORYTHUCA CILIATA (SAY) IN ITALY TWENTY YEARS LATER

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Corythucha ciliata (Say) was found for the first time in Italy in winter 1964 under the bark of plane-trees in a square in Padua (Servadei, 1966). From that first small source of infestation, the species spread over the whole peninsula. In a quick succession it was reported in vaster areas in the regions of Venetia, Lombardy, Emilia-Romagna, Liguria (Bin, 1968-69), in Genoa and other Ligurian sites, Tuscany in the town of Massa (Binaghi, 1970), in Florence and in the zone of Versilia (Corenich, 1972), Friuli-Venezia Giulia (Millo, 1972), Piedmont (Arzone, 1973), Latium (Damiano, 1974), Apulia and Calabria (Monaco, 1975). In 1978, there were not yet any sure notes on its presence in Sicily and Sardinia (Tiberi et al., 1978). The fears of a probable imminent diffusion into the two islands, that were pointed out at that time, are confirmed nowadays by verbal contacts with colleagues working there (Barbagallo, in litteris; Prota, in litteris).

The infestations of C. ciliata soon appeared alarming because serious phytopathological consequences were to be foreseen owing to the intensity of the symptoms. The responsibles of Gardens and Avenues Services in the large towns, where plane is the main tree for street borderings, appeared particularly worried. The chromatic alterations caused in leaves were very evident, but the physiological damage seemed much more serious. The subtraction of a great quantity of cytoplasmatic contents from the leaves, and especially of chloroplasts, induced physiological disorders that concerned the vegetative state and the increase in wood. The troubles caused to plants by the adults must be added to those of all larval instars. The

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adults, disturbed by rustling of the foliage or by other causes, left the leaves and flew down landing on anything, also on people, even invading the houses nearby. Though cautiously accepting rare notes of stings on man (Hoffman-Richard, 1953), one could not underestimate the trouble the adults caused to the inhabitants, who are always prejudiced and suspicious towards insects.

As it usually happens for biotic entities incidentally introduced into new areals, this plant-sucker arrived in Italy without the biocenotic complex that restrained the infestations in the land of origin. Moreover, the scarce notes on endemic parasites adapted to it referred uniquely to two predators, the insect Orius laticollis Reut. and the mite Blattisocius sp. (Bin, l.c.), which did not seem to carry out a remarkable action on the plant-sucker's populations.

In 1972 in Turin (Piedmont), a meeting was held on "The ill plant in town" with the participation of many researchers. For the first time, 15,000 planes of this town were declared to be in danger because of the nearctic Tingid (Ugolini, 1972; Vidano, 1972). In 1978, the "Day in defence of the plane-tree", held in Forte dei Marmi (Tuscany), confirmed the negative effect of the new plant-sucker (Tiberi et al., l.c.) which was even suspected to be vector of the ascomycete fungus Ceratocystis fimbriata (Ell. and Halst.) Davidson f. platani Walter, reported for Italy in the meantime (Panconesi, 1972).

The seriousness of this problem stimulated biological, ecological and ethological researches. The phenological cycle revealed to be of 3 generations in Emilia (Bin, l.c.) and of 2 generations in Piedmont, with adults of the first generation from end June to mid August and adults of the second generation living on leaves or under the bark from mid August to end June of the following year (Arzone, 1975). Prolificity (about 70 eggs per female), speed and ways of spreading (at least 100 km a year, covered both actively and passively), and population density (150-200 adults per leaf in the case of strong infestation) were evaluated; the feeding behaviour was observed and described (Arzone, 1973, 1975).

The defense prospects of the involved plants immediately showed to be very difficult. Chemical control, through contact insecticides, which is already aleatory due to the gradualness of births and to the mobility of adults, or through systemic and cytotropic insecticides (Binaghi, l.c.; Damiano, l.c.; Monaco, l.c.), appeared incongruous from the economic and sanitary points of view, keeping in consideration the number, size and site of the plants to treat. For the same reasons, also treatments against overwintering adults under the bark was utopian. Recently, a trunc injection method was tested (Kovacs et al., 1984); this method would offer more guarantees for environmental protection.

Meanwhile, in the eastern part of Venetia, a high parasitization of overwintering adults, caused by the fungus Beauveria bassiana (Bals.) Vuill., was ascertained. However, this deuteromycete, that had killed even 100% of the overwintering adults in some trees, did not seem able to restrain summer populations (Girolami and De Battisti, 1979).

In Italy, infestations of C. ciliata continued to be a serious phytopathological problem especially in large towns where numerous planes in the avenues were dechlorophyllated, mortified, weakened, and predisposed to attacks of other pests. The solution of this important problem was repetitively forwarded by means of accurate studies on the epidemiology of this species to be done in Europe and in America in order to find effective parasites and predators (Vidano, l.c.; Arzone, 1973, 1975).

Researchers of the Institute of agricultural Entomology in Turin positively accepted the invitation of prof. Maceljski to take part in the Study Group on the subject "Biological control of Corythucha ciliata". During the meeting held in Turin on 3 and 4 February 1982 with participations from Jugoslavia, France and Italy, the bases of the Work Group OILB/WPRS "Integrated control of Corythucha ciliata" were laid and today we are celebrating its first meeting.

In the meantime, the Institute of agricultural Entomology in Turin began a research program on natural enemies of C. ciliata that is starting to give some first results. On this topic, the collaboration with the Institute of agricultural Microbiology is revealing particularly profitable for the identification of the several fungi, isolated from the adults, that are now tested in laboratory and in field as possible parasites of C. ciliata.

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THE RESULTS OF INVESTIGATIONS DONE ON *CORYTHUCA CILIATA* IN YUGOSLAVIA FROM 1970 ON

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In Yugoslavia we have established the presence of Corythuca ciliata in Zagreb, in the year 1970 (Maceljski, Balarin, 1972/1). From then on we have started some investigations on the insect.

In our first two publications (Maceljski, Balarin,1972/2, 1974) we stated that this insect is spread only in some isolated parts of northwest Yugoslavia. We gave description of all development stages of the bug and of the destructive effect of adults and larvae on the leaves. Based on data of american authors we gave a survey of host-plants, but some of them, as the mulberry tree, we checked with negative results. Data of the first appearance of all stages were given, of the duration of development of every stage, of the number of generations, of the sexual index and some others. We raised the question why the adults are already entering under the bark for overwintering during high temperature at the end of august. We gave data of the high mortality of overwintering adults. In these publications, literature data about a very small number of natural enemies found in the U.S. were given too. We gave some results of laboratory trials with insecticides of lower toxicity from which most have shown satisfactory results. But already then we concluded that it is neeessary to try to bring this insect under control by biological means.

In two publications (Maceljski, Balarin, 1975, Balarin, Maceljski, 1980) we stated the results of our investigations of the efficiency of chemical control of the sycamore lace bug. We tried winter treatments, so as treatments during vegetations. In spite of a high efficiency of many tested insecticides during vegetation we concluded that because of toxicological, ecological and technical reasons the best possibility to lessen the number of bugs is by spraying the trunk covered with bark during the entering of adults in autemm and their coming out in spring. For this purpose we have recommended a combination of residual insecticides such as pirethroids and of dichlorvos which is, due to its volatility, easy entering under the bark. But this solution was thought to be only provisional untill new possibilities of biological or integrated control will be found.

In one publication (Maceljski, Balarin, 1977) we established that some most usual predatory bugs present in Yugoslavia such as Nabis pseudoferus, Rhinocoris iracundus iracundus and Himacerus mirmicoides are in the laboratory very effective sucking on the sycamore lace bug. Nabis pseudoferus is daily sucking 3,1-5,7, mostly between 4,6 do 5,1 bugs. Himacerus mirmicoides is sucking between 1,6 do 7,5 on average 2,6 bugs daily. Appart from these predacious bugs, very efficient were Mantis spp. which were daily devouring untill 13, on average 3,5 to 7 sycamore bugs.

The first results of our close cooperation with specialists from the U.S.* in finding natural enemies in the U.S. were given in 1981 (Maceljski, 1981), and all results of two surveys made in the U.S. were published in 1983 (Maceljski, Balarin, 1983). During two surveys in the U.S. we have found 20 insects and two mites as possible natural enemies of the sycamore lace bug. Among them many do not exists in Europe and are potentially of interest as species which could be introduced in Europe if their suitability for this purpose will be determined.

In our surveys made in the U.S. in 1979. and in the 1981 we have found the following insects and mites:

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* Partially supported a cording to PL 480. Identifications made by the USDA

Insects and mites found in the U.S. on leaves infested with the bug in 1979 and 1981

THYSANOPTERA

Leptothrips mali (Fitch)

HETEROPTERA, Miridae

Reuteria sp. (probably bifurcata Knight)

Deraeocoris sp. (probably nebulosus Uhler)

Anthocoridae

Orius insidiosus (Say)

Reduviidae

Zelus sp.

Sinea spinipes (F.)

Sinea sp. (probably diadema (F.))

Arilus cristatus (L.)

Coreidae

Acanthocephalus terminalis (Dallas)

Pentatomidae

Podisus sp.

COLEOPTERA, Coccinellidae

Coleomegilla maculata lengi Timber

Adalia bipunctata (L.)

Neoharmonia venusta venusta (Melch)

Olla V - nigrum (Mulsant)

Hyperaspis binotata (Say)

Cleridae

Phyllobaenus sp. (probably mirus (Walcott)

NEUROPTERA, Chrysopidae

Chrysopa carnea (Group)

Chrysopa quadripunctata Burn.

HYMENOPTERA, Eulophidae

Pediobius sp.

Tetrastichus sp.

ACARINA, Erythraeidae

Leptus sp.

Balaustium sp.

It should be emphasized that in some locations in the U.S. traces of a high degree of infestation were found, but only a small number of bugs along with a large number of predators was determined.

Our contacts with north american specialists raised an interess for the sycamore lace bug also among them. Some started investigations due to which the natural enemies of the sycamore lace bug present in the U.S. are now much better known than before.

During the last years we have investigated the presence of natural enemies in Yugoslavia also.

<u>Insects found in Yugoslavia during winter under bark</u>

	81/82	83/84
<u>HETEROPTERA, Miridae</u>		
Deraeocoris (Knightocapsus) lutescens (Schl.)	+	+
<u>Anthocoridae</u>		
Orius spp.	+	+
<u>Aradidae</u>		
Aradus brenskei Rt.		+
<u>HETEROPTERA, Lygaeidae</u>		
Kleidocerys trucatelus ericae (Hv.)		+
Scolopostethus pictus (Schl.)		+
<u>Pentatomidae</u>		
Rhaphigaster nebulosa Pol.		+
<u>COLEOPTERA, Coccinellidae</u>		
Chilocorus bipustulatus L.	+	+
Adalia bipunctata Lin.	+	+
Coccinella quadripunctata Pont.	+	
Coccinella quadripunctata ab. sedecimpunctata Weise		+
<u>Dermestidae</u>-larvae	+	
<u>Staphylinidae</u>-larvae	+	
<u>Carabidae</u>		
Dromius quadrinotatus Panz.		+

Besides insects, we found many spiders in places of hibernation of the bug (Balarin, Polenc 1984). All together 23 species of spiders were identified. The species of spiders (Aranae) found under the bark of the sycamore tree were:

<u>Dyctinidae</u>
Dyctina arudinacea L.
<u>Theridiidae</u>
Theridion notatum L. syn. Th. sisyphium (Clerck)
Theridion denticulatum Walckenaer, inadult
Theridion lunatum (Oliv.)
Theridion tinctum Walckenaer
Theridion pallens Blackwall
Theridion varians Hahn
Steatode bipunctata L.
<u>Micryphantidae</u>
Entelecara sp.
Moebelia pencillata Westring
<u>Araneidae</u>
Araneus umbraticus Clerck syn. A. sexpunctatus L.
<u>Gnaphosidae</u>
Scotophaeus sp. inadult
<u>Clubionidae</u>
Clubiona sp. inadult
Clubiona terrestris Westring
Micaria subopaca Westring
Chiracanthium mildei L. Koch
Harpectea sp.
<u>Anyphaenidae</u>
Anyphaena accentuata Walckenaer
Micrommata viridissima Degeer
<u>Thomisidae</u>
Philodromus sp. inadult
Oxyptila sp. inadult
<u>Salticidae</u>
Salticus scenicus Clerck
Marpissa muscosa Clerck

This scientific research from 1982 on was partially supported by means of the RSIZ for scientific work for Croatia and the Joint Yugoslav-american board.

In our laboratory we made feeding trials with some of these species. The spiders Chiracanthium mildei and Theridion lunatum were feeding voraciously with the sycamore lace bug during 42-70 days. During this period one specimen of those species was devouring 217-564 bugs, in average 3,1 do 9,3 per day. The average feeding rate of C. mildei was 8,2 and of T. lunatum 3,1 per day. We think that spiders are very important factors in regulating the density of population of the bug.

It was not untill 1980 that we have noticed the presence of Beauveria on bugs during their overwintering period. The rate of mortality due to this fungus was less then 5%.

During the winter 1983/84 we have found that this fungus caused a mortality of overwintering bugs between 24,1 and 33,5% but only where the sycamore trees were close together. On the contrary, on nearby planted individual trees the mortality rate was between 10 and 15%. On some roads in Zagreb where sycamore trees are planted on both sides we did not register the presence of Beauveria at all. Thus the microclimatic conditions are deciding upon the intensity of appearance and importance of the fungus Beuveria.

Appart from our publications, Tomić and Mihajlović (1974) have found larvae of Chrysopa spp. feeding on larvae of the sycamore lace bug and Vasić (1985, 1980) published results of trials with chemical insecticides done in Beograd. Sidor (1983) who has found some pathogens is having a independent communication.

In our research we have established that natural enemies are more aboundant on sycamore trees grown near bushes or other trees, then on those grown on grassland,over flower beds and especially on asphalted surfaces. It would be interesting to consider the possibility of improving the conditions for natural enemies by growing small bushes under the sycamore trees as a part of an integrated control programm against this pest.

We ought to point out that we were not able to find natural enemies of the bug on infested leaves during the vegetation. If they are present, they are insignificant. This fact is putting the stress on the necessity to examine the benefit and the possibility to introduce enemies from the U.S. It is understandable that such introduction would be possible only after investigations of the host range will shows that such introduction will not endanger beneficial insects in Europe. As such investigations of natural enemies of the bug present in U.S. must be done in the U.S., we ought to continue our untill yet very good cooperation with specialists from this country and to discuss the possibility to send one younger specialist from Europe to carry on these investigations in the U.S.

During all years of our research done on the lace bug we have found many bugs on leaves of Tilia species. We hav found not only adults but larvae and their secrete To establish the possibility that linden can be a host plant we have made many laboratory trials and trials with small cages attached to individual leaves of linden trees in the nature.

In spite of the fact that the lace bug females deposited eggs on linden leaves, that adults lived as much as 21 days on these leaves but larvae only 4-5 days, no signs of feeding were established. So we can now deny our suspicion that the linden tree is a host plant of this insect, and confirm that the sycamore (plane) trees are the only so far known host of Corythuca ciliata in Europe.

These are the results of research achieved in Jugoslavia untill now. We think that with these results we have done our share for a mutual programm of further research work, with a final aim to make possible an integrated control of the sycamore lace bug.

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SYNTHESES DES OBSERVATIONS SUR LA BIOLOGIE DE CORYTHUCA CILIATA SAY DANS LA VENETIE

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Activité printannière-estivale

La sortie des adultes hivernants de dessous les plaques se vérifie lors des premières journées tièdes de printemps, et dès la fin mars on peut observer quelques exemplaires stationner à l'extérieur des rhytidomes du Platane. Dans les conditions ambiantes considérées, la plupart des adultes hivernants sortent des abris lorsque le Platane a déjà produit 2-3 feuilles, dans la seconde décade d'avril.

Les données recueillies en 1983 concernant le rapport femelles/mâles observable sous les feuilles, après la remontée, indiquent une valeur moyenne de 2,49 sur un échantillon total de 307 adultes. Chaque échantillon a fourni les résultats indiqués dans le tableau A.

Le rapport confirme, même au niveau des feuilles, un plus grand nombre de femelles par rapport aux mâles, que l'on a également pu constater dans la population hivernante sous les plaques.

Les oeufs pondus dès les premiers jours de mai par les femelles hivernantes donnent origine à la première génération, laquelle, à travers deux stades de larves et trois stades nymphaux atteint le stade adulte à partir de la mi-juin jusqu'à la fin du mois d'août; la seconde génération, dérivant d'oeufs pondus, d'après nos observations, de fin juin à la deuxième décade de septembre, se complète à partir de la troisième décade de juillet jusqu'à la troisième décade d'octobre; les oeufs de la troisième génération sont pondus dès le début du mois d'août jusqu'à la fin de septembre au moins; les adultes apparaissent au début de septembre et les éclosions se poursuivent jusqu'à la chute des dernières feuilles se trouvant encore sur les surgeons c'est-à-dire à mi-novembre (voir tableau B).

Le cycle biologique de la C.ciliata peut par conséquent être défini à trois générations dans les conditions ambiantes considérées et durant la période , examinée avec d'amples superpositions de différents stades de la fin du printemps à l'automne.

D'une manière générale, le développement d'oeuf à adulte s'achève dans le délai d'une période comprise entre 3 et 5 semaines, selon les facteurs du milieu ambiant. L'incubation dure 10-15 jours tandis que les larves deviennent nymphes en 8-14 jours. De ces dernières naissent les adultes après 4-10 jours; pour la mue, les stades préimaginaux se disposent de préférence le long des nervures principales des feuilles en laissant une trace d'exuvies sur celles-ci. Pour 4 ou 5 jours après leur sortie sont plus mous et translucides et sont en mesure de pondre une semaine après l'éclosion. Des pontes tardives (en septembre) comportent une prolongation de la période requise pour le développement d'oeuf à l'adulte jusqu'à 7 semaines, essentiellement due au plus grand laps de temps s'écoulant entre le dernier stade nymphal et l'éclosion successive de l'adulte qui peut même se produire 25-30 jours après.

Les premiers stades préimaginaux commencent à se nourrir sur la feuille même où ont été déposés les germes et ont une tendance grégaire. Il est alors possible de remarquer des agrégats sous le partie inferieure des feuilles, d'abord bruns et au fur et à mesure de plus en plus foncés avec la succession des mues. Ensuite, après avoir atteint le quatrième ou le cinquième stade préimaginal, reconnaissable d'après les évidentes ébauches alaires, les insectes colonisent d'autres feuilles en déambulant le long du bourgeon, vers la partie terminal.

Cette tendance est confirmée par la distribution le long du bourgeon des adultes échantillonnés au cours du printemps 1983: sur la figure 1 on peut remarquer que la feuille basale de même que la feuille médiane résultent toujours les moins infestées. On peut par conséquent estimer suffisamment représentatifs des échantillons formés par les feuilles apicales et subapicales ouvertes, détachées de boutures de tête de croissance.

En ce qui concerne l'aspect quantitatif de la fécondité des femelles de I et II génération, les résultats que nous avons obtenus sont illustrés dans le tableau C : on a considéré des échantillons de 10 ou 20 femelles isolés sous tulle placés sur des bourgeons en croissance active.

Ces résultats indiqueraient une fécondité moyenne d'environ 100 oeufs par femelle avec de considérables écarts: le plus grand nombre atteint, 171,8 oeufs par femelle est similaire à celui de la fécondité moyenne observée (166,5 oeufs par femelle) au cours d'expériences effectuées par d'autres Auteurs, par ailleurs dans des conditions standard (27 degrés centigrades).

Toujours au cours de tests ayant pour but d'apprécier la fécondité, on a remarqué que des adultes sortis du cocon début septembre ou les mois suivants, qu'il s'agisse de la deuxième ou de la troisième génération, ne pondent pas quoique s'étant accouplés. De toute évidence les femelles n'avaient pas atteint leur maturité sexuelle. On peut donc considérer que durant la période comprise entre fin juillet, au cours de laquelle les adultes de la deuxième génération sont en mesure de pondre, et le début du mois de septembre, les paramètres climatiques et peut-être biochimique du "pabulum" subissent certaines modifications capables de s'opposer au développement des gonades chez les femelles.

De tests de longévité effectués sur 3 échantillons de 100 adultes venant de sortir du cocon de première génération, chacun placé dans les manchons le 22 juillet 1983, il résulte que le 7 septembre le pourcentage de survivance était de l'ordre de 11% en moyenne sur un total de 300 adultes au départ (chaque échantillon présentait respectivement 4-12-18% de survivants): cela prouve qu'il est donc possible que même des adultes appartenant à la première génération participent à la migration. Deux autres facteurs contribuant à l'augmentation de la populations hivernante sont les dernières éclosions de la deuxième génération qui se poursuivent, d'après nos observations, au moins jusqu'à la fin du mois d'octobre, de même que les adultes de la troisième génération, lesquels commencent à sortir du cocon durant la première décade de septembre et continuent jusqu'à l'effeuillaison complète qui se produit dans la troisième décade de novembre.

Hivernage

A ce sujet, la recherche a eu pour but d'observer les lieux de prédilection, le rapport des sexes et la mortalité.

Distribution de la population hivernante sous les écorces

Les données recueilliesdurant l'hiver 1981/82 ont été transcrites pour chaque subdivision, par unité de surface, de manière à ne pas tenir compte des différents diamètres des plantes; les données sont regroupées dans le tableau D.

De l'analyse statistique, effectuée après transformation des données en racine carrée, il résulte que les insectes se distribuent, selon des différences très significatives, de préférence dans les deux secteurs essentiellement exposés au nord, et sans tenir compte de la hauteur du sol tandis qu'il n'existe pas de différences entre quadrants appartenant à la même exposition, essentiellement axée nord-sud (Fig.2); les adultes préfèrent en outre se distribuer sur les hauteurs comprises entre 1 et 3 mètres par rapport aux hauteurs supérieures et inférieures, considérées réunies en groupes.

La recherche a servi à déterminer les zones d'arbre sur lesquelles effectuer un échantillonnage afin d'obtenir une appréciation vraisemblable de la population se trouvant sous les rhytidomes; les parties exposées au nord, quoique plus humides et moins ensoleillées, sont l'habitat où résultent par ailleurs moins accusées les excursions de température et humidité.

Les données recueillies durant la période hivernale 1982/83, après relative analyse statistique, ont confirmé la différence, extrêmement significative, existant entre la quantité de la population hivernant au sud et la quantité de celle hivernant au nord. On a également vu combien est siginificative la différence entre un échantillonnage effectué au-dessus, au-dessous et au niveau de 2 mètres. Le choix de la superficie à échantillonner pour chaque secteur (c'est-à-dire 1 décimètre carré de rhytidome) s'est en outre révélé approprié car les résultats concordent avec ceux obtenus l'année précédente avec l'écorçage total (Fig.3).

On peut par conséquent indiquer comme représentatif de la population hivernante un échantillon de 1 décimètre carré de surface couverte de rhytidome choisi selon l'exposition astronomique au nord, immédiatement au-dessus du deuxième mètre de hauteur du sol.

Rapport numérique entre les deux sexes

Au cours de l'hiver 1982/83, durant le comptage relatif à la distribution de la population hivernante, on a procédé à la détermination du rapport des sexes; on a également effectué des relevés, dans ce même but, dans différentes avenues de Padoue.. Les résultats sont indiqués dans le tableau E.

Mortalité à la fin de l'hiver

Dans le tableau F on indique les résultats des trois hivers d'observation. La variabilité existant entre les données est probablement due à la différente structure des plaques de rhytidome: en effet, comme déjà observé au cours d'une étude précédente (Girolami V., De Battisti R. 1979), des plaques peu épaisses et soulevées représentent un endroit d'hivernage plus favorable en raison de la moindre humidité et de la moindre mortalité due à la *Beauveria bassiana* (Balsamo) Vuill., champignon deutéromycète entomophage et polyphage.

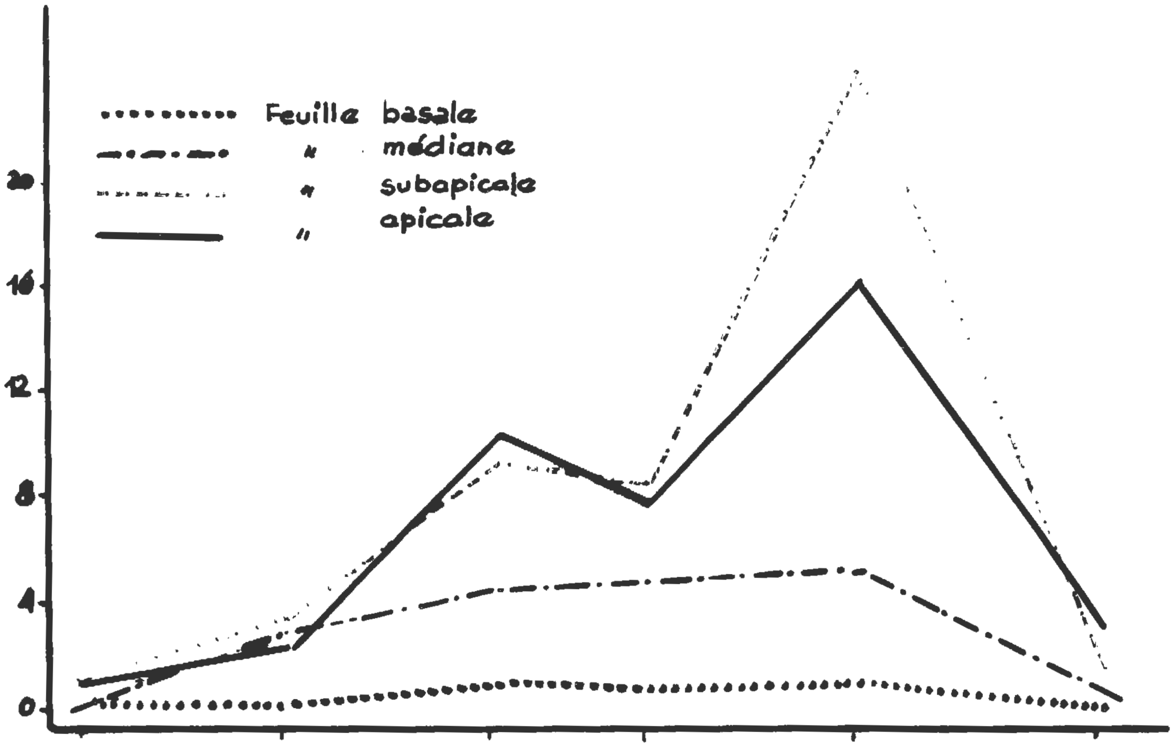

Fig. 1.- Variations du nombre moyen d'exemplaires de C. ciliata sur feuilles à différents niveaux du bourgeon durant la périod 25 mai - 3 septembre 1983.

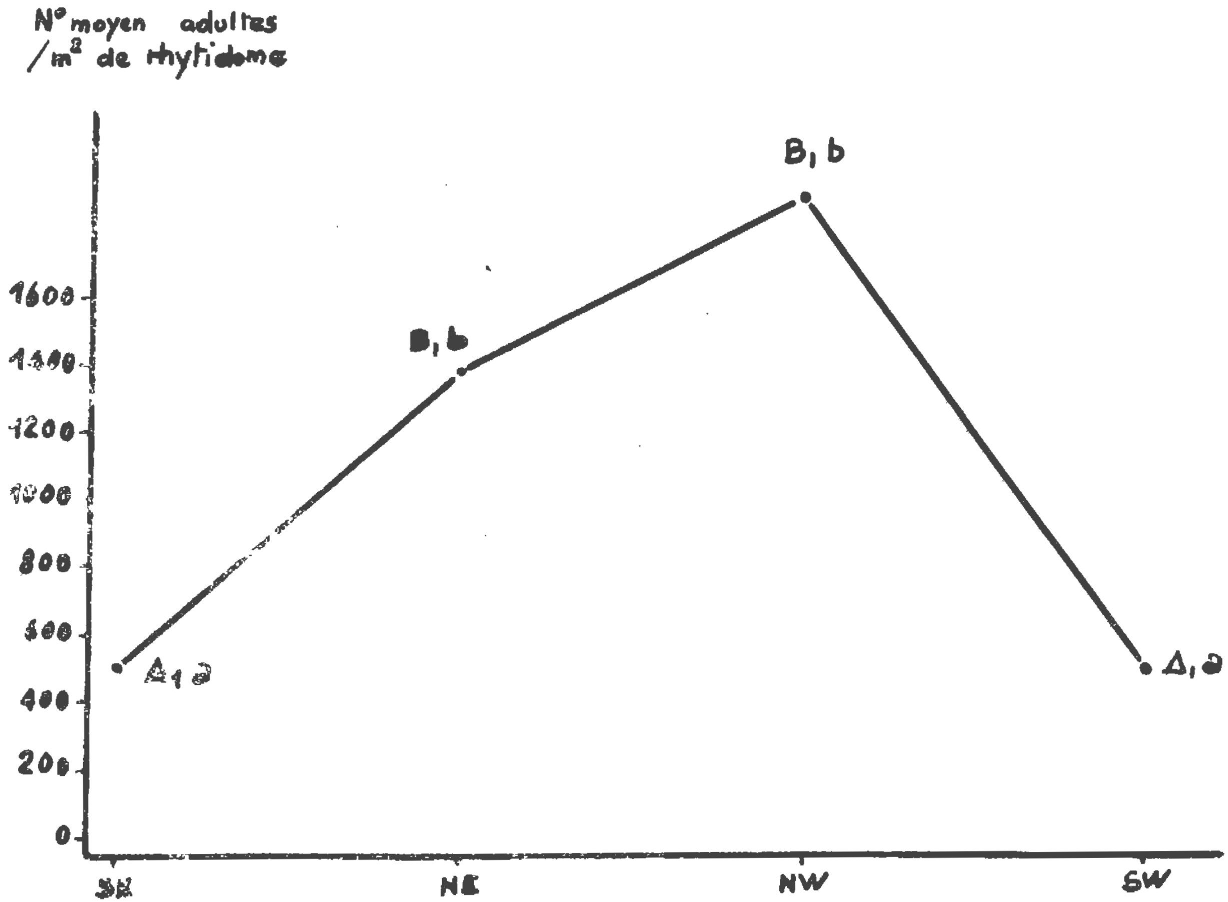

Fig. 2 - Influence des différentes expositions astronomiques (NE - SE - SW - NW) sur la distribution de la population de la <u>C. ciliata</u> sous les rhytidomes.

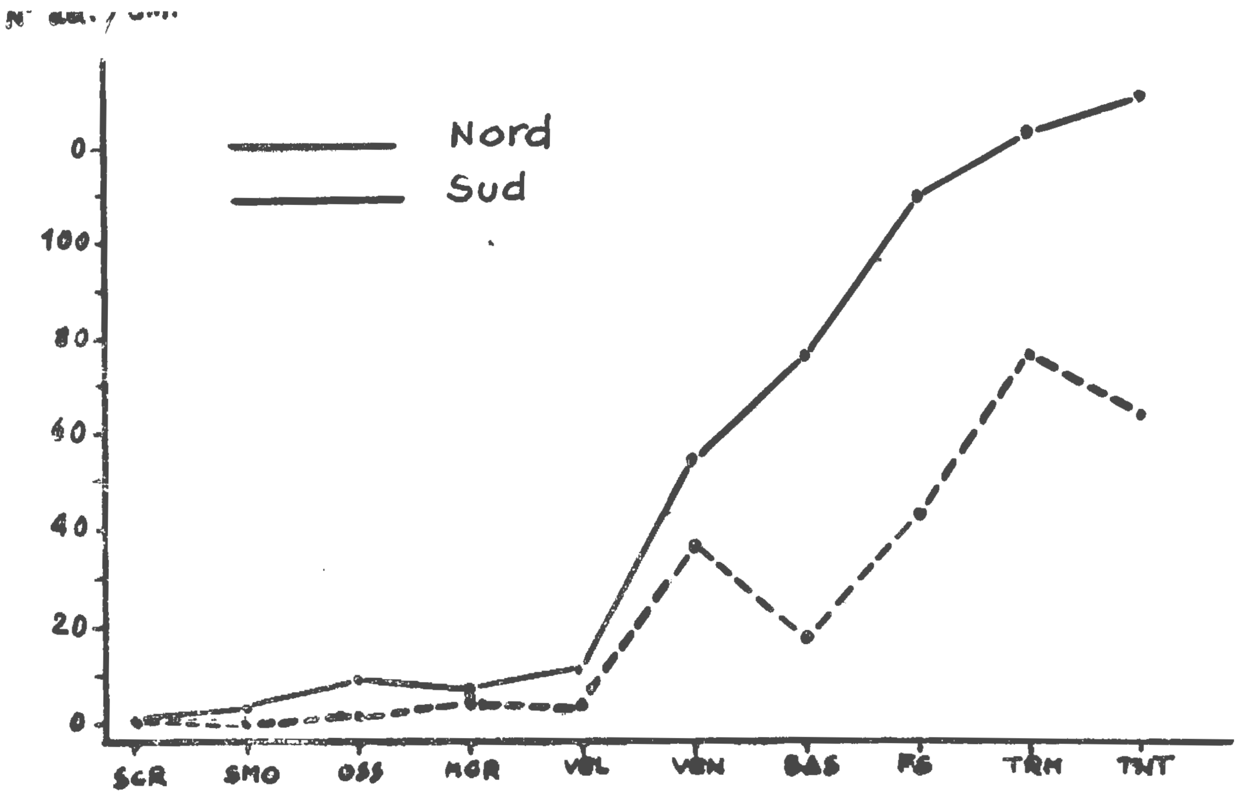

Fig. 3 - Nombre d'adultes par dm² (selon l'exposition) relevés durant l'hiver 1982-83 dans de nombreuses avenues de villes de la Vénétie. On a examiné 6 arbres dans chaque avenue.

ECHANTILLON	DATE DE L'ECHANTILLONAGE 1983	QUANTITE'	♀ ♂
1	28.4	45	2.00
2	2.5	82	2.28
3	4.5	56	1.33
4	10.5	46	3.20
5	8.6	78	3.64

TAB. Δ. - Rápport entre femelles et mâles présents sous les feuilles après la remontée en 1983

LOCALISATION	GÉNÉRATION	[illegible]	MAI	JUIN	JUILLET	AOÛT	[illegible]	[illegible]	[illegible]
RHYTIDOME / FEUILLES		$\Delta\Delta\Delta_{sv}$ $\Delta\Delta$	$\Delta\Delta\Delta$	$\Delta\Delta\Delta_{sv}$	$\Delta\Delta\Delta_{sv}$				
FEUILLES	1ª		UUU N	UUU NN ΔΔ	UUU NNN ΔΔΔ	NN ΔΔΔ			
	2ª			U	UUU NNN Δ	UUU NNN ΔΔΔ	UU NN ΔΔΔ	N ΔΔΔ	
	3ª					UUU NN	UUU NNN ΔΔΔ	NNN ΔΔΔ	N ΔΔ
RHYTIDOME						Δ_{sv}	$\Delta\Delta\Delta_{sv}$	$\Delta\Delta\Delta_{sv}$	$\Delta\Delta\Delta_{sv}$

Δ_{sv} = Adultes hivernants U = Oeufs

N = larves et nymphes Δ = adultes

TAB. B.- Schéma de cycle biologique de la <u>C. ciliata</u> en Vénétie - Période 1982 - 1983

GENERATION D'APPARTENANCE DE L'ECHANTILLON	COMPOSITION DE L'ECHANTILLON	DURÉE DU TEST	TOTAL OEUFS PONDUS	MOYENNE PAR FEMELLE
① Iª	20♀ 20♂	21.VI - 3.VIII 1982	2012	100.6
② Iª	10♀ 10♂	21.VI - 22.VII 1983	296	29.6
③ Iª	10♀ 10♂	27.VI - 8.VIII 1983	1718	171.8
④ Iª	10♀ 10♂	4.VII - 8.VIII 1983	941	94.1
⑤ IIª	20♀ 20♂	23.VII - 24.VIII 1982	1886	94.3

Tab. C.- Résultats des tests de fécondité sur femelles de Iª et IIª génération durant une période de deux ans (1982 - 83) á Padoue.

HIVER	[illegible]	QUANTITÉ	MORTALITÉ POURCENTAGE
1981/1982	①	183	25
	②	6.693	46.8
	③	2.157	41
	④	10.123	43.8
		TOT. 19.056	44.4
1982/1983	①	695	49
	②	514	50
	③	216	82
	④	963	85
		TOT. 2.388	67
1983/1984	①	300	62
	②	300	16
		TOT. 600	39.3

Tab. F.- Mortalité observée chez les adultes hivernants.

ARBRE (1)

	SE	NE	NO	SO	
E	0.95	1.10	0.53	0.50	0.77
D	0.15	0.40	0.11	0.15	0.2
C	0.35	0.10	0.03	0.42	0,23
B	0.12	0.18	0.18	0.19	0.17
A	0.08	0.31	0.26	0.18	0.21
TOT.	0.33	0,42	0.22	0.29	0.32

ARBRE (2)

	SE	NE	NO	SO	
E	9.48	5.54	7.90	4.28	6.8
D	3.35	6.46	6.55	4.06	5.10
C	11.29	12.00	19.26	2.37	11.23
B	8.11	16.05	25.74	15.31	16.30
A	2.69	9.72	10.69	4.53	6.90
TOT.	6.98	9.95	14.03	6.11	9.27

ARBRE (3)

	SE	NE	NO	SO	
E	–	2.21	2.86	1.82	2.20
D	2.11	3.31	2.98	1.45	2.46
C	1.85	3.53	13.96	3.49	5.71
B	4.00	6.73	9.80	1.87	5.6
A	2.05	5,09	4.03	0.32	2.87
TOT.	2.50	4.17	6.73	1.73	3.78

ARBRE (4)

	SE	NE	NO	SO	
D	3.46	16.93	25.31	4.86	12.64
C	6.15	32.98	54.03	8.22	25.35
B	9.09	42.03	44.83	5.71	25.41
A	4.71	5.69	22.6	4.66	9.39
TOT.	5.85	24.41	36.69	5.83	18.20

Tab. D.- Distribution des adultes hivernants sous les écorces de 4 arbres. Données exprimées comme moyenne d'individus par dm² de surface selon l'exposition et la hauteur du sol. (tronçons de 1 m. à partir du collet).

ORIGINE DE L'ECHANTILLON	QUANTITÉ	♀ / ♂
PADOVA	1534	1.98
BASSANO	1651	2.12
THIENE	601	1.16
	TOT. 3786	1.86

Tab. E - Rapport des sexes chez les adultes hivernant sous les écorces.

PRELIMINARY REPORTS ON NATURAL ENEMIES OF CORYTHUCA CILIATA (SAY) IN ITALY

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Investigations are in progress to ascertain what indigenous parasites had adapted to *Corythucha ciliata* (Say), a species of nearctic origin reported in 1966 on plane-tree in Italy (Servadei, 1966). Such investigations took origin from the ascertainment that the plane-trees spread in natural ecosystems resulted less heavily infestated than the ones situated in town avenues. They were conducted in Piedmont and enabled to reveal the presence of animal and vegetable enemies that carry on their activity under the plane's bark during the overwintering period, or on the foliage during both the Tingid's development and reproductive period.

Among animal enemies, many insect and mite species confirmed their predatory activity on *C. ciliata* also in laboratory.

The insect species, determined until now, are listed in Tab. I. For each one, data are given on the ontogenetic stages in which they manifest their predatory action and also on the stages in which *C. ciliata* is more often affected by the attacks.

Several mite and spider species seem to be enemies of *C. ciliata* both on the leaves and under the bark of plane-trees. They prey especially on adults which are emptied or wrapped up in silk threads. The determination of these species is being carried out.

For what concerns vegetable enemies, 7 fungus species were isolated from *C. ciliata* overwintering adults which were found under the planes' bark in various Piedmontese sides; they are the

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Research carried out with a grant of the Italian National Researches Council.

Tab. I. Predator insects of *Corythucha ciliata* (Say) in Piedmont (Italy).

Species	ontogenetic stages	
	predator	*C. ciliata*
MANTOIDEA		
Mantidae		
Mantis religiosa L.	youngs	youngs
ORTHOPTERA		
Gryllidae		
Oecanthus pellucens (Scop.)	youngs and adults	youngs and adults
RHYNCHOTA		
Miridae		
Deraeocoris flavilinea (Costa)	youngs and adults	youngs
" *lutescens* (Schill.)	youngs and adults	youngs and adults
Anthocoridae		
Orius majusculus (Reut.)	youngs and adults	eggs and youngs
" *horvathi* (Reut.)	youngs and adults	eggs and youngs
Anthocoris nemoralis (F.)	youngs	youngs
Nabidae		
Nabis pseudoferus (Remane)	youngs and adults	youngs
NEUROPTERA		
Chrysopidae		
Chrysoperla carnea (Steph.)	youngs	eggs, youngs and adults

DEUTEROMYCETES *Beauveria bassiana* (Bals.) Vuill., *Penicillium citrinum* Thom , *Alternaria alternata* (Fr.) Keissler, *Verticillium lecanii* (Zimm.) Viégas, *Fusarium oxysporum* Schlecht, *Paecilomyces farinosus* (Helm. ex S.F.Gray) Brown & Smith, and the zygomycete *Mucor hiemalis* Wehmer (Ozino Marletto and Menardo, 1984).

The deuteromycetes *B. bassiana*, *V. lecanii*, *P. farinosus* have been tested under laboratory conditions through infection experiments on youngs and adults of the Tingid at the temperatures of 23°C, 26°C, 30°C and relative humidity around 90%. *B. bassiana* appeared to be the most virulent species, followed in order by *V. lecanii* and *P. farinosus* (Arzone and Ozino Marletto, 1984).

Until now, the anthocorid insect *Orius laticollis* Reut., the phytoseid mite *Blattisocius* sp. (Bin, 1968-69) and the deuteromycete fungus *B. bassiana* (Girolami and De Battisti, 1979) had been reported in Italy.

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BEKAMPFUNGSMASSNAHMEN GEGEN DIE PLATANENNETZWANZE IN BASEL

Christoph Wicki
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Die Stadtgärtnerei hat verschiedene Versuche unternommen, die Platanennetzwanze unter Kontrolle zu bekommen:

1. Versuch mit Stamm-Bandagen aus Sacktuch

Im Herbst 1983 hat man auf dem Parkplatz erste Versuche gemacht mit Jute-Bandagen um den Stamm der Platanen herum. Das Ziel war, Schlupfwinkel für die überwinternden Imigines zu schaffen und diese dann zu verbrennen. An einzelnen Stellen hat man grosse Mengen von Platannetzwanzen anlocken können. Dies hätte aber bedingt, dass man allen befallenen Bäumen solche Bandagen angebracht hätte.

2. Versuch mit Leimringen

Um die im Winter von der Baumkrone herabwandernden Platanennetzwanzen zu fangen, hat man in der oberen Stammpartie Leimringe (mit Tangle trap, einer neuen Direktanstrich-Paste aus den USA) angebracht. Der Erfolg war bis jetzt sehr gering, da offenbar keine grosse Wanderung nach unten stattgefunden hat.

3. Versuch mit Acecap/Trichoderma

Am 4. Juni 1984 hat man auf dem Parkplatz St. Jakob 3 Platanen mit Acecap 97-Kapseln versehen. Auf diesen Bäumen wurden einige Wochen später keine Plat.n.w.mehr gefunden. 3 weitere Platanen wurden gleichzeitig mit Trichoderma + Acecap 97 behandelt. Ein grosses Problem sind aber die Wunderschlüsse, da der Saftdruck sehr gross ist.

4. Versuch mit Sandomil und Anthio

An 3 Bäumen auf dem Parkplatz St.Jakob wurden Injektionen mit Sandomil + Anthio 1 % gemacht. Es konnten keine Verminderungen in der Anzahl der Platanennetzwanzen festgestellt werden. Es könnte daran liegen, dass die Konzentration zu schwach war.

Allgemein ist festzustellen, dass die Population Ende Sommer 1984 wieder recht gross geworden ist, nachdem ausgangs Winter 1983/84 infolge kalter Witterung und Nässe nur noch wenige Netzwanzen anzutreffen waren. Zahlreiche Individuen haben damals in der Borke von benachbarten Rosskastanien überwintert.

Neben diesen erwähnten Versuchen (1-4) hat sich Herr Thierry Latscha vom Zoologischen Institut der Universität Basel den natürlichen Feinden der Platanennetzwanze gewidmet. Es liegen aber noch keine Aussagen über seine Versuche vor.

REPORT OF THE FIRST MEETING OF THE WORKING GROUP IOBC/WPRS "INTEGRATED CONTROL OF CORYTHUCA CILIATA" ZAGREB, 9-11 Oct. 1984

M. Maceljski

Faculty of Agricultural Sciences, Zagreb,
Yugoslavia

Participants:

Prof.Dr. M.Maceljski (convenor) Faculty of Agr. Sci.,Zagreb,Yugoslavia

Prof.Dr. A.Arzone, Istituto di Ent.Agr. e Apicolt.Universita,Torino, Italy

Prof.Dr. S. Zangheri, Istituto di Ent.Agr., Università, Padova

Prof.Dr. V. Girolami, Istituto di Ent. Agr., Università, Padova

Prof.Dr. A. Kovacs, Centro Esper. e Ricerche, SIAPA, S.Vincenzo di Galliera, Italy

Rubin, Istituto di Ent. Agr., Università, Padova

Prof.dr I.Balarin, Faculty of Agr.Sci, Zagreb, Yugoslavia

Dr. Lj. Vasiljević, Plant Prot. Institute, Beograd, Yugoslavia

Dr. Ć Sidor, Institut Pasteur, Novi Sad, Yugoslavia

Ing. S. Keglević, Rep.com. of Agricult., Zagreb, Yugoslavia

Mr. J. Igrc, Faculty of Agr. Sci, Zagreb, Yugoslavia

(written communications from dr. R.De Battisti, Padova, Italy and Ing. C.Wicki, Basel, Switzerland)

From J. Ma Vives and de Quadras, Generalitat de Catalunya, Barcelona, Spain, a written information expressing also a maximal interest for a future cooperation in the group, came after the meeting.

Submitted, communications:

M.Maceljski: The appearance of *Corythuca ciliata* in Europe and the activities in order to coordinate the research work done on this insect in Europe.

A.Arzone: Spreading and importance of Corythuca ciliata (Say) in Italy twenty years later

I.Balarin, M.Maceljski: The results of investigations done on Corythuca ciliata in Yugoslavia from 1970 on.

S.Zangheri: Sinthèses des observations sur la biologie de la Corythuca ciliata Say dans la Venetie

A. Kovacs: Results of big scale experiments with trunk injections against Corythuca ciliata

A.Arzone: Preliminary report on natural enemies of Corythuca ciliata (Say) in Italy

V.Girolami: Biological control factors of Corythuca ciliata Say in north America

Ć.Sidor: First data on microorganisms found in Corythuca ciliata

R. De Battisti (presented by Girolami): Chemical Control of Corythuca ciliata in the Venetian region

C.Wicki (presented by Maceljski): Trials against Corythuca ciliata in Basel

After each communication a discussion was opened, so as a general discussion after the last presentation.

The participants were received on the 10th Oct. at the Town Hall from the vicepresident of the City of Zagreb, and on the 11th Oct. they took part at an excursion to the National Park Plitvička jezera.

Conclusions and Recommendations for Research Work in the future

Corythuca ciliata is causing big damages. The infested plane trees are hindered in development especially the younger trees. Moreover C.ciliata is promoting the spread and the possibility of some fungi to attack the plane trees, and is an important cause of dying of plane trees. Thus an extensive and alarming process of dying of plane trees has started in Italy in the last 5-10 years in areas where C.ciliata is abundant.

The leaves of plane trees are lo sing the green colour so that the esthetical, physiological and oxygen liberating functions of the plane trees in urbanised areas are not performed. Moreover C.ciliata has become an important molestant to human beings making to unagreeble stay in parks, molesting tourists and guests of restaurants and inhabitants of houses in the vicinity of the plane tree.

From the first registration in Padova, Italy in 1964 to now, Corythuca ciliata is found in the following countries: Italy, Yugoslavia, France, Hungary, Spain, Switzerland and Austria, but is also probably spread in the Federal Rep. of Germany (in Basel found in 1983), Roumania (in 1980 found 20 km from the border) and Bulgaria (found near the border). Endangered are in the first line Czechoslovakia and Greece but also Portugal and the USSR.

Some countries underestimate the danger of this insect and in some, after discovering the appearance, research is started mostly ignoring the research done before in other countries.

Thus the creating of the Working group of the IOBC/WPRS "Integrated control of Corythuca ciliata" was justified and necessary. But to fullfil completely its aim it is necessary that specialists from all infested and endagered countries, including the ones from th IOBC/EPRS, join this group.

The importance of an joint action against C.ciliata, which presumes a preliminary joint research work, is showed by the fact that in spite of C.ciliata being present more then 20 years in Italy or more than 15 years in Yugoslavia no signs of diminuishing of the intensity of appearance were registered. On the contrary there are signs of an increase of the degree of infestation and the consequences of the attack of this insect alone or together with fungi are more and more showing up by an alarming rate of dying of plane trees.

It is necessary to prevent a dissipation of research capacities and of time and to organise further research putting the stress on the problems which are most important but not at all or not sufficiently studied, and of which the knowledge could enable to lessen the problem of C.ciliata.

Such problems are especially:

1. In the research of biology and ecology of C. ciliata the stress should be put on

- the investigations of factors limiting the spread and influencing the biotic potential of the bug such as temperature, humidity and photoperiodism;
- the research of the influence of the species and hybrids of the plane trees, and the environmental factors which can affect the bug through the host plant, on the biotic potential of C. ciliata

2. In the research of the nuisibility of C. ciliata it is very important to continue the research of interactions between the bug and the fungi Ceratocystis fimbriata and Gnomonia veneta. in order to establish the priority of measures against the dying or declining of plane trees.

3. In the research of the role of natural enemies and the possibilities of biological control the stress ought to be put on:

- further research on insects enemies present in each European country including not only predacious insects but also parasites which were not found untill now;

- to continue the research on spiders as enemies of C. ciliata, and improve the knowledge of their role, biology and ecology in order to find possibilities to improve conditions for their development as this group of animals is considered to have a big influence on the density of population of the lace bug.

- further research of pathogens infesting C. ciliata, including not only Beauveria bassiana but also other fungi ., viruses, mycoplasmas, protozoa, and others; in which tasks prof. Arzone (Torino) for fungi and dr Sidor (Novi Sad) for viruses and protozoa are accepting the identifications. Epizootic, not registered untill now in the nature, ought to be tried to be provoked artificially :

- the research of environmental factors which influence the importance of the mentioned natural enemies, in order to find possibilities to improve those which will act positively on these enemies;

- the continuation of research done from Yugoslav and Italian specialists untill now in the U.S. to establish natural enemies in Northern America and the collection of data established by North Amerrican speialists on these enemies. It is agreed that all research work hitherto done in Europe and the U.S. shows that it is strongly needed to consider the opportunity of an introduction of enemies of C.ciliata from North America to Europe. We recommend to consider the possibility to send some specialists from an infested European country to the U.S. to carry on trials which are basic for such an introduction. Sufficient research data or data of trials conducted in North America should make possible a decision about an introduction of some enemies in Europe.

4. It is generally agreed that treatments of foliages with insecticides, in spite of their efficiency, are only justified outside of closely inhabited areas or in cases when a dying of trees ought to be prevented. Thus, the need of research of ecologically safe methods of chemical control as provisory aid and as parts of an integrated control programm is strongly emphasised. Especially the continuation of research of the possibilities of trunk injections of insecticides which started successfully in 1983 and 1984 in Italy is needed to clarify the therapeutical index of some insecticides, the optimal dosage per tree, the number and size of holes in the trunk, the healing of wounds, the resistance of trees to a treatment made every year etc.

It is agreed that this report together with a bibliography of publications on C. ciliata published in Europe ought to be send to interested specialists in every european country infested or endangered by this bug. This report in a shortened form ought to be published in PROFILE.

It is agreed to propose to the Secretary General of the IOBC/WPRS to publish communications presented on this meeting in a special number of the Bulletin IOBC/WPRS.

It was proposed that the next meeting of the working group takes place in September 1985 in Italy, presumably Padova, to discuss new results of research work, to consider the introduction of enemies from the U.S., to consider the possibility of giving a recommendation for a chemical control by trunk injections, and to assemble more specialists from infested and endagered European countries.

Convenor

Prof. Dr. Milan Maceljski

NEW DEVELOPMENTS IN THE STATUS OF CORYTHUCA CILIATA IN EUROPE WITH A REPORT OF ACTIVITIES BETWEEN BOTH MEETINGS

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Faculty of Agricultural Sciences, Zagreb

After our first meeting last year Corythuca ciliata was registered in Austria near to the Tschecoslowakian border (verbal information dr. Hobaus) so that we can presume its presence also in Tschecoslowakia.

All together we could summarise that the sycamore lace bug is at the moment present in Italy, Yugoslavia, France, Spain, Switzerland, Federal Republic Germany, Austria, Hungary, Romania, and Tchecoslowakia, probably Bulgaria and eridangering Portugal, Greece and the URSS. So they are infested ten or eleven countries.

As you know the first meeting of our group was hold in Zagreb, Octob. 1984. Only specialists from Italy and Yugoslavia took part, but written contributions were given from Switzerland and Spain too. Altogether 10 communications were made and very engaged discussions were hold. A report with a joint programm of further work was made and send to all interested parts. A brief summary was published in "Profile".

After this meeting the following activities were fullfilled.

- during a meeting of the phytopatological society of Italy prof. Zangheri, prof. Arzone, prof. Martelli and myself met at Torino and discussed some questions about the organisation of this meeting in Padova. We agreed to propose that papers from both meetings should be published together in one Bulletin.
- a new bibliography of publications on Corythuca ciliata in Europe was send to all interested.
- as convenor of this group I wrote some letters asking a better cooperation with members of the EPRS to both Secretery general of WPRS and EPRS.

- I was asked from the Acting Director General of the EPPO dr Smith to prepare a paper on Corythuca ciliata for the Conference on Phytosanitary Problems in Forestry hold at Nancy, June 4-6th 1985, and especially to discuss the oportunity for listing this insect on the A2 quarantine list of the EPPO. As I was prevented to participate to this meeting I prepared a paper which was read by one of my collegues from Yugoslavia and will be published in the Proceedings of this meeting. In this paper I have expressed my doubts about the usufullness of listing C. ciliata as a quarantine pest, but promised to discuss further this question on our meeting here and state the position of our group. So we will include our conclusion about this particular question in the report of this meeting.

I have prepared a summary of the report of the work and problems of our group for the General Assembly which will be hold in Stuttgart in Octobre 1985. This summary I had to send before this meeting, but the real report will take account of all important problems considered at this meeting, so as of the conclusions from this meeting.


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SOME NEW RESULTS OF INVESTIGATIONS ON THE BIOLOGY AND ECOLOGY OF *Corythuca ciliata**

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Continuing our investigations presented in 1984 (Balarin, Maceljski, 1984) in our more recent investigations we have tried to establish the fertility of females of the sycamore lace bug.

We isolated females under wire cages mounted on plane tree leaves after establishing the presence of eggs in ovariums. The number of eggs laid by every female was counted untill they died. We established that females of the overwintering generation has oviposited from 13 do 77, in average 43 do 48 eggs. The females of the first generation oviposited less - only from 7 do 54, or in average 22-30 eggs. The maximal number of eggs laid by overwintering females was found May 27th, the first between the 20-27th May and the last one was laid June 28th. The maximal number of eggs laid by the first generation was found August 9th, the first 28th July and the last one on Sept. 6th. One female deposited in one day maximal seven eggs. The period of oviposition of the females of overwintering generation lasted 40 days, and of the first generation 45 days.

We have compared the number of eggs laid by females with the number of eggs developed in ovariums. For this purpose a dissection of some hundreds of females was made during the ovipositing period of both generations.

The highest number of eggs was found in ovariums of the overwintering females between May 28th and June 5th, with a

* This research was partly supported by the U.S.-Yugoslav Joint Board on Scientific and Technological Cooperation and the RSIZ of Croatia

maximum on May 31th. The average number of eggs found in ovariums was 77, that is much higher than the number of laid eggs.

In females of the first generation the highest number of eggs was registered between August the 2nd and August the 17th, with a maximum on August the 9th. The average number of eggs found in ovariums of this generation was 43.

In spite of the very strong winter 84/85 when temperature achieved - 30 degree of Celsius, the mortality during winter was not to high to prevent a very strong attack in summer. At the end of August 1985 billions of adults were moving over the trunks of trees and on the soil under the trees searching for overwintering shelters. In the same time many larvae were still on leaves. As the oviposition of the first generation lasted untill the begin of september, we were not able to prove an apparition of a third generation in this year. Moreover we suspect that some females of the first generation which have appeared late in sommer and has deposited only a few eggs, can overwinter, so that a part of the bugs had only one generation yearly.

During the winter 1984/85 we have found the following insects together with the overwintering lace bugs.

Insects found in Yugoslavia during the winter 1984/85 under bark

(+ indicated that this species was not found in 81/82 and 83/84)*

	84/85
HETEROPTERA, Miridae	
Lygus (Orthops) kalmi (L.)	+
Lygus spp.	+
Anthocoridae	
Orius minutus minutus (L.)	+
Anthocoris nemorum (L.)	+
Anthocoris nemoralis (F.)	+

* Deraescoris lutescens, Scolopostethus pictus, Ch.bipustulatus, A. bipunctata, C.quadripunctata, Dermestidae and Staphylinidae (larvae) and Dromius quadrinotatus found in previous winters were found also.

	84/85
HETEROPTERA, Lygaeidae	
Arocatus roeseli (Schl.)	+
Platiplax salviae (Schl.)	+
Rhyparochromus albomaculatus (Goeze)	+
Piesmidae	
Piesma maculata (Lp.)	+
Pentatomidae	
Dolycoris baccarum L.	+
Arma custos (F.)	+
COLEOPTERA, Coccinellidae	
Platynaspis luteorubra Goeze	+
Pullus ferrugatus Moll.	+
Ptinidae	
Ptinus fur Lin.	+
Elateridae	
Elater elongatulus (Fbr.)	+
Cerambycidae	
Pyrrhidium sanguineum L.	+
Chrysomelidae	
Lema melanopa L.	+
Psylliodes hyoscyami L.	+
Phyllotreta atra F.	+
Phyllotreta nemorum L.	+
Phyllotreta undulata Kutsch	+
Curculionidae	
Gymnetron labile Hbst.	+

From all insects found under bark we suppose that the predacious bugs Anthocoris nemorum, A. nemoralis, Orius minutus, Deraeocoris lutescens and Arma custos, so as some predacious Coleoptera, could have some importance in reducing the number of the lace bug during winter. Some phytophagous insects found under bark can not be conected with the bug.

Only the last year our surveys of insects on infested leaves gave some results, which fact is showing a slow adaptation of some enemies to the bug. We found a significant number of predacious bugs of the species Orius minutus minutus (L.) and Kleidocerys resedae (Pz.), some Coleoptera such as Mathinus glabellus Kiesw. (Cantharidae) and Clytra laeviscula Ratz (Chrysomelidae) and some yet unidentified parasitie wasps.

Our in 1984 referred work on spiders was supplemented by Kolar (1985) in the year 1984 and 1985, who found also some other species of spiders. These species are:

Species of spiders found additionaly by Kolar in Yugoslavia

Segestria senoculata (L.) - fam. Segestridae
Pityohyphantes phrygianus - fam. Linipidae
Philodromus aurealis (Clerck) - fam. Thomisidae
Ph. colinus (C.L. Cock) - fam. Thomisidae
Dyctina viridissima syn. walckneria - fam. Dyctinidae
Araneus cucurbitinus - fam. Araneidae

Under bark of the plane trees this author has found during winter mostly species of spiders belonging to the families of Clubionidae, Salticidae, Thomisidae and Aranaeidae, and on leaves species of the families Araneidae, Dyctinidae and Clubionidae.

Kolar has made some laboratory trials, too. Segestria senoculata was daily devouring 0,7, Clubiona terrestris 0,6-2,2 and Pityophanthes phrygianus 1,5 bugs.

It is interesting that Chiracanthium mildei was in Yugoslavia registered only in Dalmatia, but we have nov found this species in Zagreb, and Kolar in Slovenia. In those regions the presence of the spider could perhaps be conected with the apparition of Corythuca ciliata.

As spiders are the most abundant group of enemies of the sycamore lace bug, not only under bark but also on the leaves, it is our opinion that they are very important natural enemies of this insect.

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Kolar, B. (1985): Pajki-predatorji prezimovajoče platanine čipkarke. Dyl. naloga, Ljubljana

REMARKS ON THE BEHAVIOUR OF CORYTHUCA CILIATA (SAY) IN SICILY

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1) Introduction

Corythucha ciliata (Say) was found out in Sicily in 1981 on sycamores of various urban tree-lines in Catania and Messina (Longo, 1981).

Its introduction into the island, carried out by the lorries that daily cross the straits of Messina, goes back probably to the end of the seventies, period in which the Tingid was already present in the nearby Calabria (Monaco, 1973). In Sicilian territory C. ciliata is presently spread in the most northern areas(Fig. 1).

From Messina, where remarkable infestations have been found in almost all the sycamores of the tree-lines close to the port area since 1981, C. ciliata has spread southward, to the centres of the Ionic coast, and westward, as far as Patti (Messina), travelling through the island motorway network.

In the towns of Caltanisetta and Palermo, where the insect has been discovered only a short time ago with an irregular presence, the diffusion has probably taken place through the Catania-Palermo motorway.

The investigations carried out on the presence of C. ciliata in several centres of the southern and western provinces of the island have given negative results. There Platanus hybrida Brot. is scarcely present in the town tree-lines.

On Platanus orientalis L., that is spontaneous in Sicily along several water courses and often present together with the previous species in some urban tree-lines, no Tingid bug infestations have been found out.

2) Materials and methods

Biological observations on C. ciliata have been carried out now and then, since

1981 in the various centres where the sycamore lace bug has been found.

The biological behaviour of the species was studied in the two years' period 1983-84 on about 500 sycamores present in the historical town-centre of Catania. From the inspection of the leaves and the flower-heads of such trees (Pignatti, 1982) it emerged that about the 70% is to ascribe to P. hybrida while the remaining 30%, mainly formed by plants older than 60, has characteristics quite similar to P.orientalis.

2.1. Spreading of the species

The control of the spreading of the species has been carried out with periodical inspections, both in winter and in summer, in almost all the sycamores of the town tree-lines. In winter, parts of bark of about 30 cm^2 were out on from each inspected tree at different heights from the ground and all the wintering adults were taken out and divided into dead and alive. Summer inspections consisted in the visual check of the presence of C. ciliata on the leaves and their damage degree.

2.2. Distribution of the wintering adults in the trunk

On 15 sycamores, selected among those that in the previous summer period had shown a larger infestation in the leaves, the distribution of the wintering adults of C. ciliata has been investigated in winter minths of 1983-84, considering the height from the ground and the exposure in the trunk. In each age six samplings have been effected during which all the bark of rhytidome have been taken away from every tree up to m 2,5 from the ground; the specimens present in each of the five examined classes (0-50, 51-100, 101-150, 151-200, 201-250 cm) have been counted separately and divided into alive and dead. The relative percentages of presence, turned to the angular values, have been submitted to the variance analysis and compared by the Duncan test.

The distribution of the wintering adults according to their exposure has been reckoned effecting two samplings in each of the two years considered. The specimens present in the different exposures of the trunk have been counted and parted into alive and dead.

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2.3. Composition and population density on the leaves

It has been reckoned counting only the post-embrional stages present in 30 leaves taken out randomly from as many trees placed in different town areas approximately every two days.

The leaves, suitably kept in pastic bags, were examined in laboratory, where the specimens of C.ciliata were counted by means of a stereomicroscope and divided into the various preimaginal stages (1st, 2nd, 3rd, 4th, 5th age) and adults. Laboratory observations have been carried out in 1984 starting from the wintering adults collected in field and placed on suitable isolated plants.

3. Results and discussion

3.1. Spreading of the species

In Fig. 2 are shown the percentage of the sycamores of the historic centre of Catania in which wintering adults of the lacebug are present under the bark, found out in different years. The progressive spreading of C. ciliata can be noted; in fact, while in the winter periods of 1981-82, it was present only in 11,22% of the sycamores inspected, in the last sampling carried out in 1984-85 said percentage has reached the 45,98%.

The infestation percentages noticed through the visual test of the leaves (Fig.2b) confirm the substantial progressive spreading of the Tingid bug in the town tree-lines. In a parallel way the infestation degree has become more remarkable; in fact the average quantity of the nymphal stages per leave has increased from 6,71 in 1983 to 23,21 in 1984.

It is to be said that in the five years' observation C. ciliata has never been found on the sycamore leaves with features similar to P. orientalis; the latter usually show a persisting-narrow brim bark under which the Tingid adults find scarce shelter opportunities in wintertime.

3.2. Distribution of the wintering adults according to the height from ground and the trunk exposure

In order to get elements useful to a possible winter control of the species the

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distribution of the wintering adults in the trunk has been studied.

In Fig. 4a are shown the percentage of adults present in the five height classes and the results of the variance analysis. In both years the percentage of presence between 151 and 200 cm has been larger than the one of the other height bands. In 1983, however, it was found similar to the one collected between 0 and 50 cm from the ground. In the highest band (201–250 cm) has been found the smallest presence of wintering adults.

In Fig. 4b the distribution and the average mortality rate are shown, according to the height from the ground, learned in the two years' observation. It is clear to see how almost the 50% of the wintering adults are located at a height included between 151 and 200 cm from the ground. The average mortality rate resulted to be of 14,90% and does not show any appreciable differences at various height.

As to the exposures, in Fig. 5 it can be seen that the percentage of specimens facing the North (80,69%) is quite larger than other exposures; to South has been reckoned only the 2,72% of the total population, while the insect is equally present in East (8,42%) and West (8,17%) exposures.

The course of wintering adults' mortality has resulted inversely proportional to the population density; in fact in the least haunted exposure (South) the mortality average (40%) has been higher than the one of other exposures.

3.3. Percentage, composition and population density on the leaves

In Fig. 6 the percentage population composition of C. ciliata on the leaves is shown; in both years we can note the presence for each of the stages considered, of 4 density peaks, that point out the four yearly generations performed by the insect in the environmental conditions happened in Catania in the observated period. The earliest nymphs of the year appear by the end of April, the second generation ones between the end of June and July, the third generation ones in August–September and finally the 4th generation ones in October; the latter are present on the leaves until the natural leaf falls and the consequent dormancy of the sycamore occurs.

The average quantity of specimens per leaf reaches its peak in summer (July–September); soon after a lot of adults of the 3rd generation move towards the bark; con–

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sequently the number of the active specimens of the leaves decreases progressively.

3.4. Biological behaviour

In Fig. 7 is outlined the biology of C. ciliata examined in 1983 and in 1984 in the historic centre of Catania, where the photoperiod and the lowest and highest temperatures have been got.

The wintering adults of the Tingid bug move to the new vegetation since the first decade of April, period in which the photoperiod is of about 12,5 hours and the lowest and highest temperatures fluctuate between 10° and 20°C. The return under the bark begins in the first decade of September, when the photoperiod is again of 12,5 hours and ends in the third decade of December, when the sycamores enter their dormancy. The latter migration is carried out by the most adults of the third generation and all the ones of the 4th. Said behaviour has been substantially equal in the two years' observation.

The adults of the first generation appear between the end of May and the first decade of June, the ones of the second in the second decade of July, most of the adults of the third generation, that usually appear about half of August, migrate, as mentioned, towards the trunk, starting from the first decade of September. Specimens remained on the foliage move to the new leaves of autumnal vegetation, which interest about the 40% of the sycamores, giving rise to a 4th generation that is completed by a modest percentage of specimens; the adults coming from the above generation move under the bark within December.

Such biological behaviour, different from the one got in Piemonte (Arzone, 1975) and in Avellino (Tremblay et alii, 1979) where the species performs from two to three generations yearly, has been confirmed by laboratory observations carried out in 1984, the results of which are shown in Fig. 8.

The eggs laid on April 15 by the wintering adults hatched on May 8 and the first generation lasted 37 days, the 2nd and 3rd generations lasted 28 days, while the 4th generation was of 32 days.

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4) Natural control

The natural enemies play a secondary role in the control of the sycamore lacebug. In the course of the investigations the most frequent predator was found to be an Orius sp. (Antòchoridae) that attacks above all the young nymphs. In the autumn of 1984 the casual predation by a Phytoseiidae mite (Amblyseius sp.) was observed.

From the several eggs of C. ciliata suitably isolated in different periods of the five years' observation, no oophagous parasitoids have never been obtained.

The wintering adults under the bark, are subjected to high rates of mortality both because of the predacious action of various spiders (Arameids) and for the entomoparasitic activity of fungi (i.e. Beauveria bassiana Vuill.), to which about the 70% of the mortality noticed in winter, in the various years is ascribed.

So the specimens that succeed in overcoming the cold season are very few; infact in the plants from which the bark has been taken away up to 250 cm from the ground, up to 270 alive specimens per tree have been found.

5) Conclusions

C. ciliata, that is thought to have reached Sicily more than five years ago, is now present under the infesting form in the north-eastern area of the island and is progressively moving westwards. In the most southern areas of Catania, the insect does not seem to have found ecological conditions favourable to its development both for the high average temperatures and for the predominating presence of the P.orientalis.

In the historic centre of Catania it has progressively set in the sycamores of almost all the town tree-lines, in particular on the trees bearing the hybrid Platanus characteristics.

Presently about the 50% of the sycamores are infested by the insect; but, even in the most infected trees, the attacks are not so serious to induce to a chemical control of the species.

The biological behaviour of the lacebug, got in two years' observations, shows remarkable differences in comparison with what has been said for other European areas, where C. ciliata should perform from two to three yearly generations.

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In Sicily the insect succeeds in performing four generations, the last of which on the sycamores' leaves that develop at the end of summer; other factors that let the fulfilment of the said generation are to be ascribed to the high average temperatures that last as long as the end of December and to the photoperiod, the lenght of which is quite similar to the one of spring time.

Summary

The distribution of C. ciliata on sycamore (Platanus hybrida) throughout Sicily is reported (Fig. 1), together with the evolution of its infestation in Catania alleys (which include over 500 plane-trees) during 1981–1985 (Fig. 2). Platanus orientalis, which is indigenous in Sicily, did not show to be infested by the sycamore lacebug.
The distribution on the trunk and mortality of wintering adults at different height of sampling has been investigated during 1983 and 1984, together with the distribution under sycamore barks and mortality of wintering adults at different exposures (Fig. 4 and 5).

Field and laboratory studies on population dynamic of C. ciliata (Fig. 6) and density of immature stages and adults/leaf during 1983 and 1984 are reported.

In Catania C. ciliata has four generations per year: the 1st generation adults are present from the end of May to mid June, the 2nd generation ones from July. The 3rd generation ones, are available on the leaves or under the rhytidome scales from mid August until mid May of the fallowing year. C. ciliata shows a fourth generation on the western sycamore, which has a flushing period in late summer–autumn (Fig. 7). This generation has been evidenced under laboratory conditions (Fig. 8).

The migration of adults from the leaves to the winter shelters begins during the second decade of September and goes on till December. Both the autumnal migration to the trunk (in September) and the spring one to the leaves (in March–April), take place with about 12,5 light hours/day.

Immature stages of C. ciliata are preyed by an Antochoridae of the genus Orius. No oophagous parasitoids have been observed, the eggs are occasionally preyed by a Phytoseid mite of the genus Amblyseius. The overwintering adults under the rhytidome scales undergo to high mortalities both for the predacious action of several Araneid and for some pathogens (Beauveria bassiana).

The number of adults whichovercomethe winter is very low, since at the end of this season a maximum number of 270 specimen per plant has been observed.

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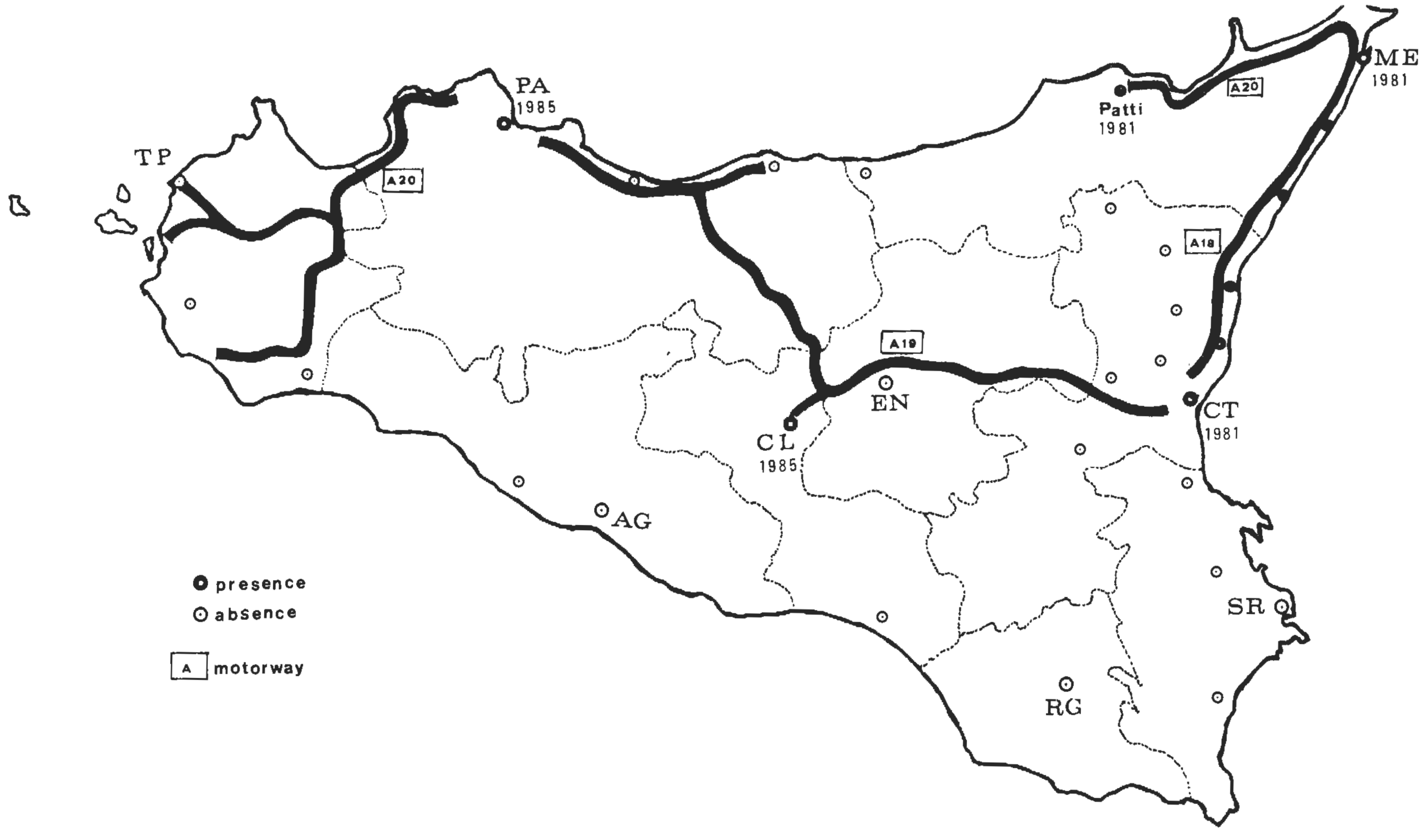


Fig. 1 - Diffusion of Corythucha ciliata (Say) in Sicily at 1985.

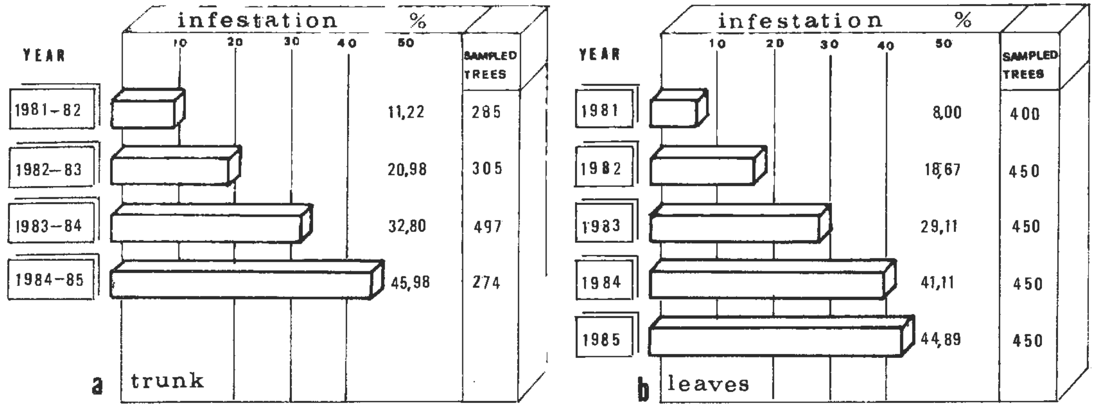


Fig. 2 – Evolution of infestation by Corythucha ciliata (Say) on Platanus in Catania.

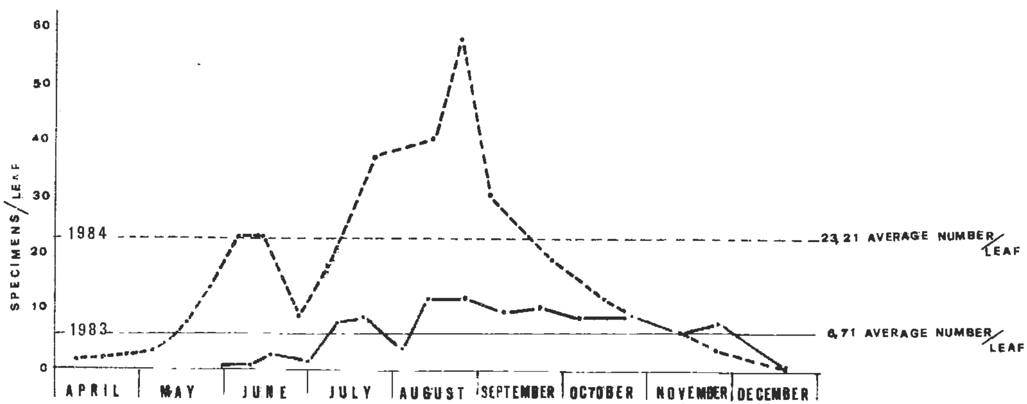


Fig. 3 – Immature stages and adults of C. ciliata/leaf during 1983 and 1984.

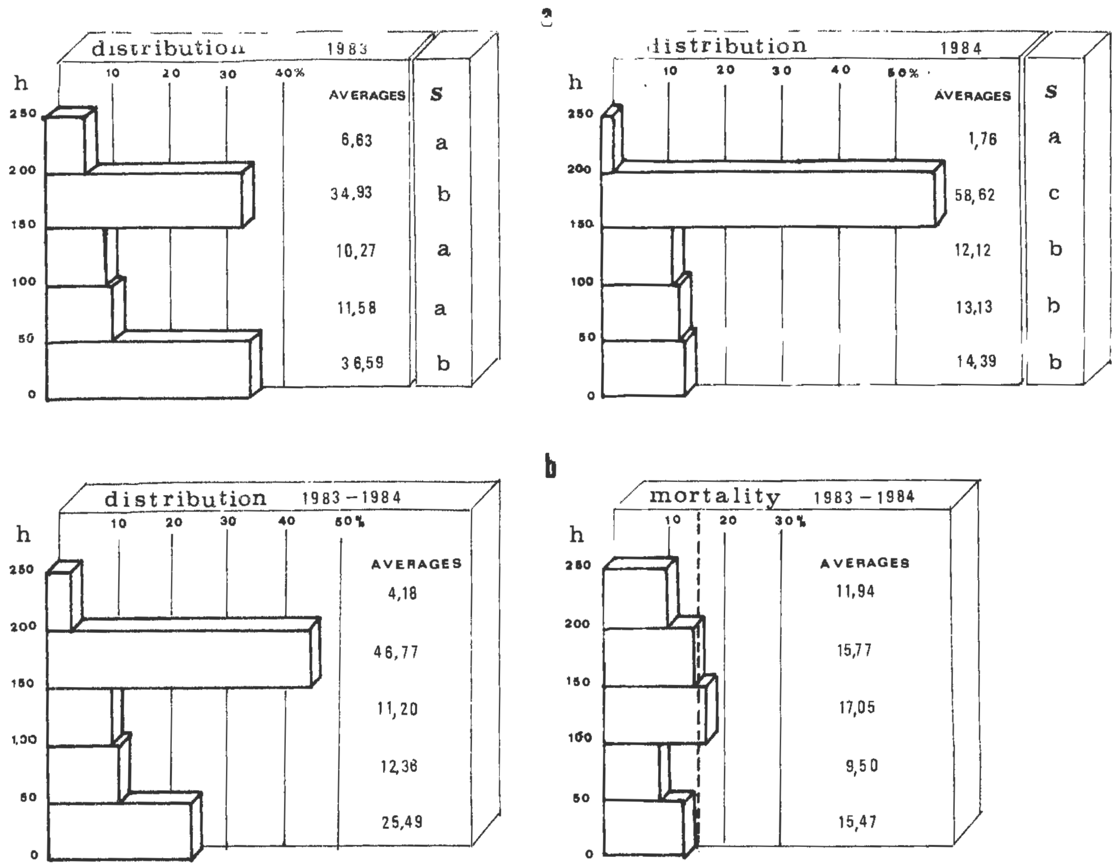


Fig. 4 – Distribution on the trunk and mortality of wintering adults at different height of sampling.

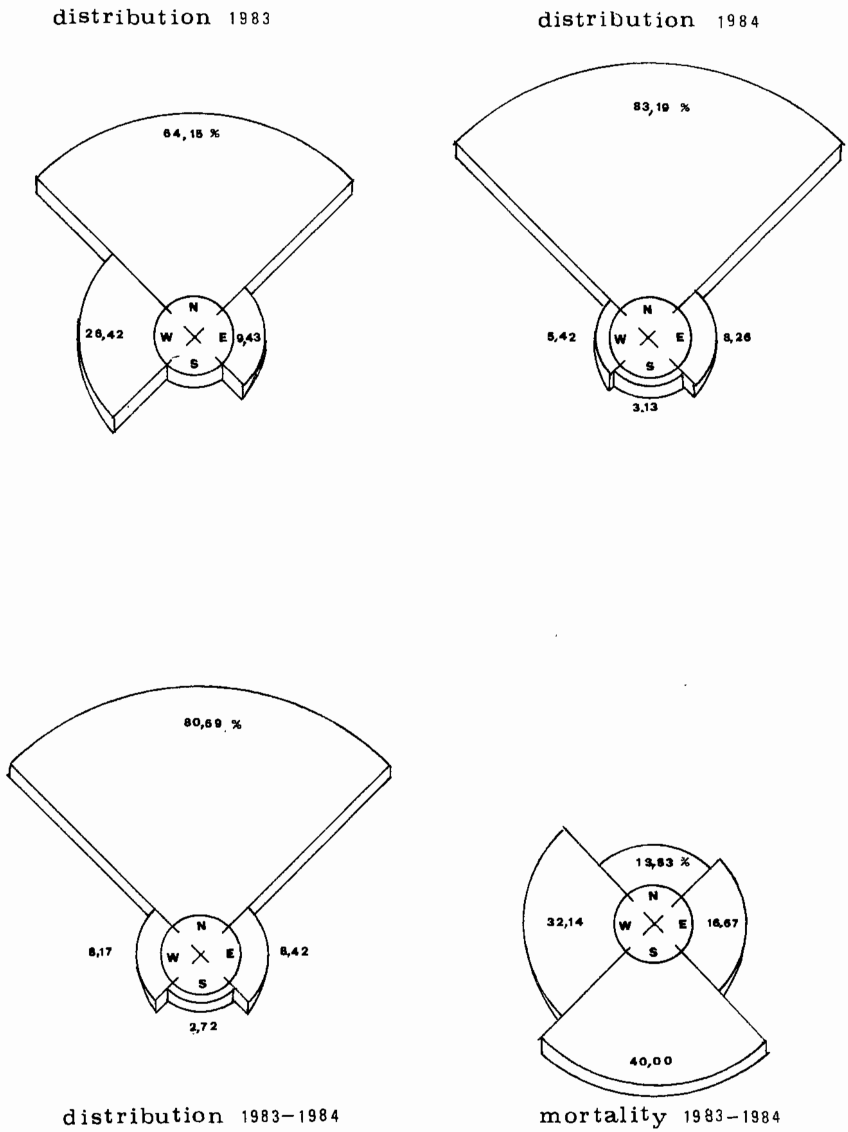


Fig. 5 – Distribution on the trunk and mortality of wintering adults at different exposures.

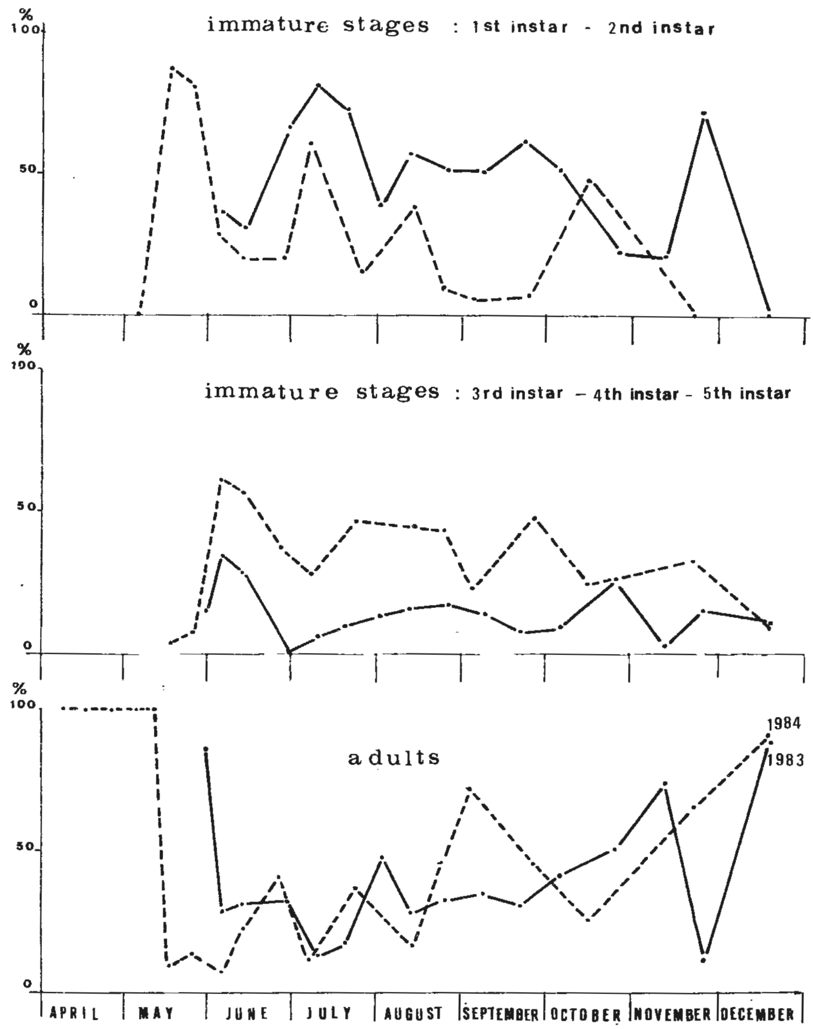


Fig. 6 – Dynamic of population of C. ciliata, during 1983 and 1984: percentage of immature stages and adults on leaves.

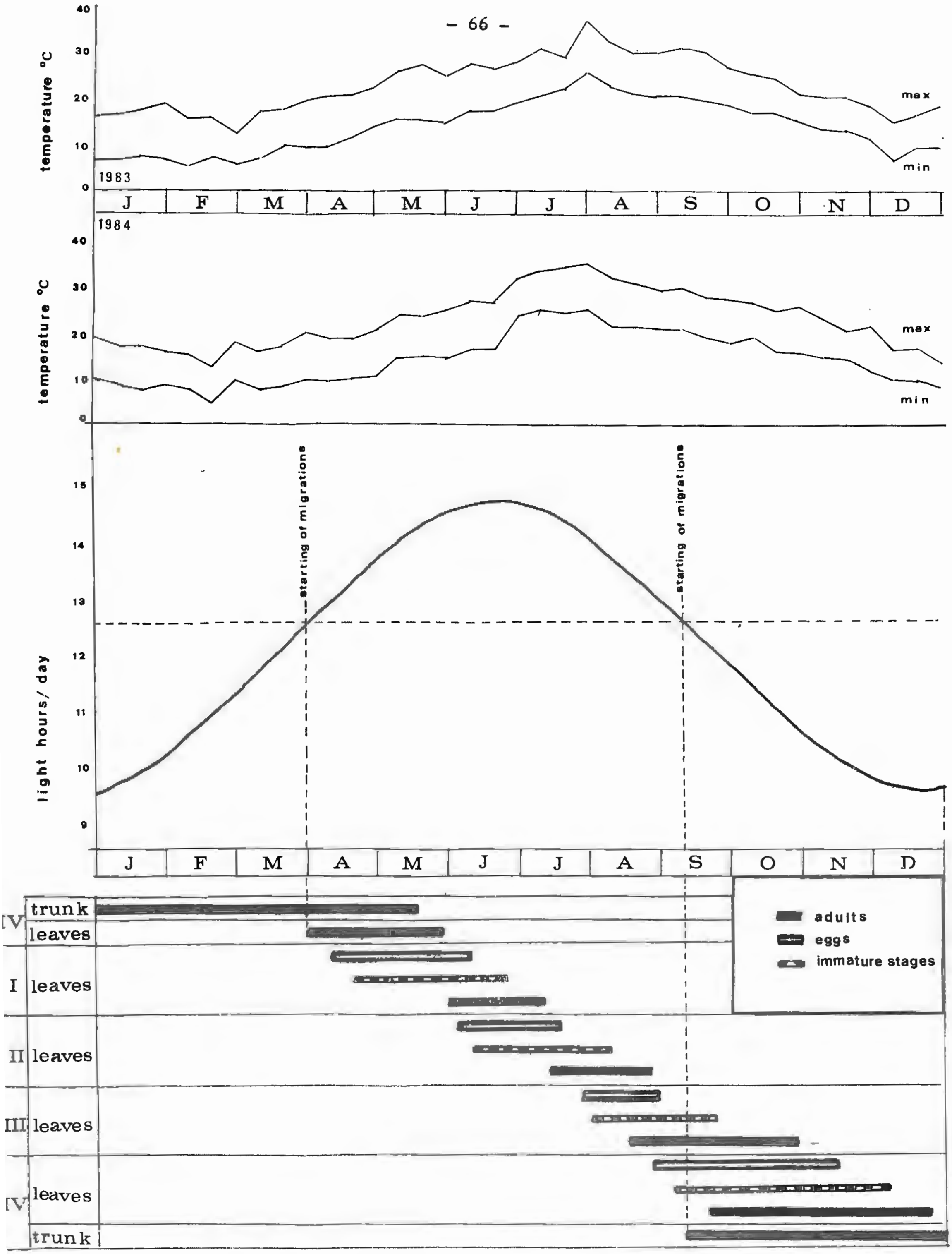
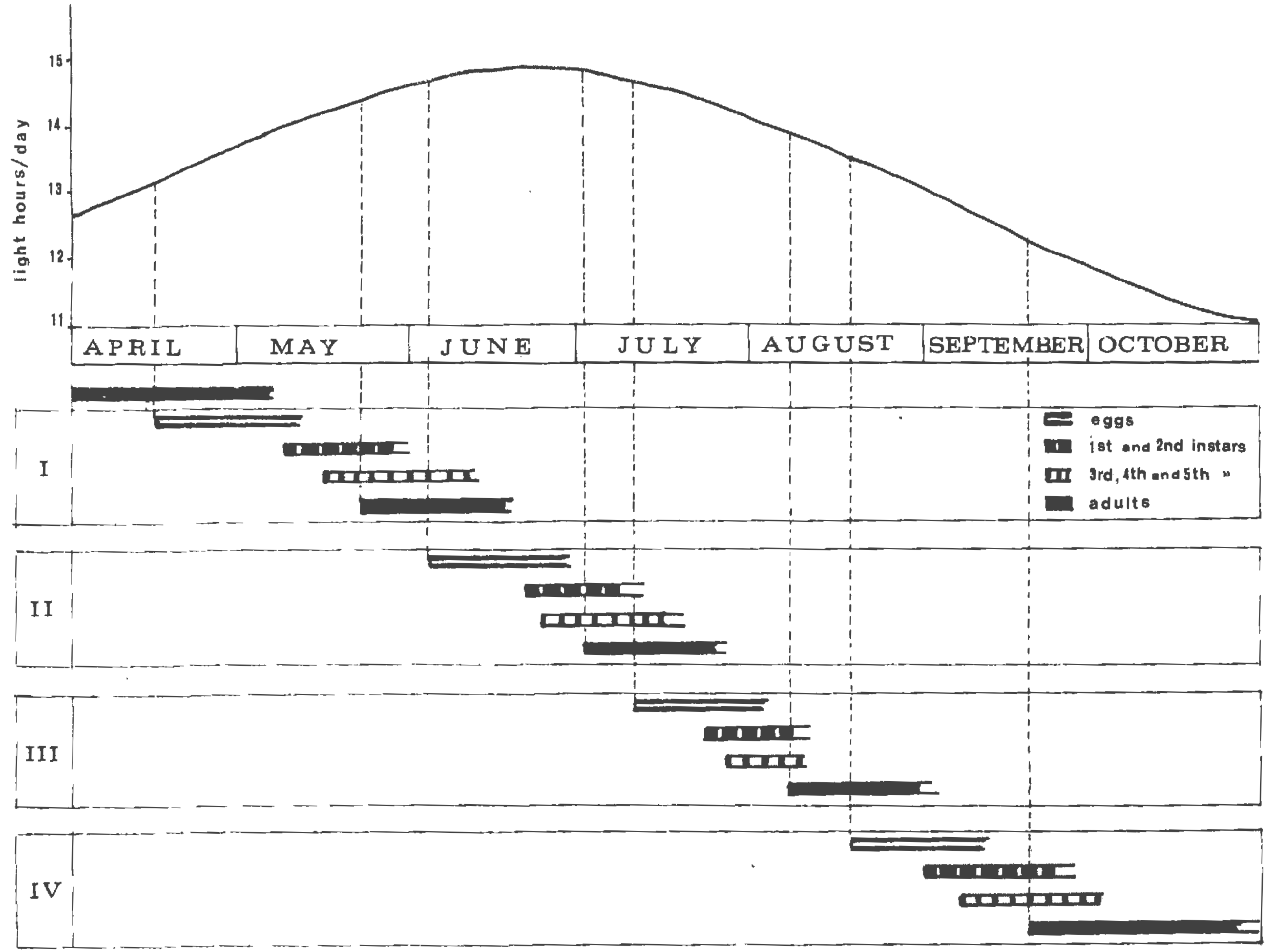


Fig. 7 - Life-cycle of C. ciliata in Sicily during 1983 and 1984.



... under laboratory conditions during 1984.

EVALUATION OF THE DIFFERENT POSSIBILITIES OF CHEMICAL CONTROL OF THE SYCAMORE LACEBUG (CORYTHUCA CILIATA SAY)

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The sycamore lacebug (SLB) started to become a pest in the large area around Naples (Campania Region) in the mid-seventies. At that time, the most spectacular site of infestation were the avenues of the city of Avellino, a chief town ca 50 km east of Naples, where hundreds of huge plane trees averaging 10-15 m in height had been totally infested by the insect and even passers-by were disturbed. Our observations and trials started in 1975 and concern these large street plants located in that urban area (Tremblay et al., 1979; Tremblay & Petriello, 1984).

Phenology of the pest

The spring migration of overwintered adults from the trunk bark to the canopy was observed to start between the end of April and the end of May. Oviposition by these adults reaches its maximum within 2-3 weeks from the start of migration and lasts until the end of June. Young stages of the first generation of the year are usually abundant between the first week of June and the first week of July and give rise to a peak of first generation adults around mid July. These adults live until mid September but do not migrate toward the trunk for hibernation. From the second week of July to whole August the plants are mostly infested by all stages of the second generation whose adults become dominant in September. Their migration under the bark usually lasts two months (from the end of August to the end of October). Occasional third generation adults may appear in October and quickly reach the hibernation sites.

Chemical control

The chemical control of SLB on young plants which can be easily sprayed is not a problem. On the contrary, spray treatments of high trees with large canopies located in urban areas very close to buildings have to face technical difficulties which may reduce the effectiveness of the insecticides used. Just in our case, the large size of plane trees suggested to test, in addition to foliar sprays, two kinds of localized treatments to the trunk, i.e. (1) surface treatments of the bark in the periods of adult migrations, and (2) bole injections with systemic insecticides.

Foliar sprays

The technical problems connected to spraying the whole canopy of large trees suggest that only one application be conducted in a key-period. The effectiveness of this key-treatment was found to be related to the lowest presence of eggs produced by overwintered adults and to the peak of first generation motile stages (young stages and pre-reproductive adults) all of which are more exposed to contact insecticides. In our area, the bionomics of the pest suggested that this single treatment be carried out between the end of June and the end of July.

Surface treatments of trunk

Persistent contact insecticides were sprayed on the trunk and large branches during several years and in different periods of the year. It was concluded that satisfying results can be obtained by using persistent insecticides of low mammalian toxicity such as Abathion (0.1% AI), Menazon (0.06% AI) etc., during the adult movements on the trunk. The insecticide mixture was heavily sprayed on trunk and main branches after having added a wetting agent in high dosage (0.2% at least). The effectiveness of these localized treatments depends on their timely execution. To this purpose, spring or autumn sampling is necessary to follow adult movements towards or from the canopy. Since each migration period may last almost two months, more than one treatment was found to be necessary. Winter survival of adults also affects the number and results of spring treatments. Full winter treatments y elded satisfying results only when 5% yellow oils (light mineral oils plus DNOC) were used.

Bole injections with systemic insecticides

Monocrotophos (in 1982) and Metasystox-R (in 1984) were introduced into the xylem by means of the Mauget Inject-A-Cide technique. Mauget cartridges containing 2.83 g (50% AI) of the one or of the other insecticide were used at the average spacing of 32 cm (0.05 g of AI per cm of circumference). To insert each cartridge a hole had to be bored into the trunk just beneath the cambium layer for introduction of the aluminium feeder. The latter had to be introduced into the pressurized capsule. In 1984 Metasystox-R gave satisfying results with one application carried out in the key-period suggested for foliar sprays (first weeks of July in both years). In 1982 some local problems obscured the effect of Monocrotophos. As a matter of fact (1) the cartridges had to be inserted much higher on the trunk (between 3 and 5 m) than suggested by registration (at breast height) to avoid interference by disturbing people or danger to children, (2) the large diameter of trees and the limited number of cartridges available for the test forced us to adopt a large spacing (ca. 32 cm instead of 20-25 cm as suggested by the producer), (3) lack of rains and difficulty of irrigating such large trees on partly paved sidewalks reduced the translocation of the insecticide in the plants, (4) in several cases a leakage of the product from the insertion holes was observed. In 1985 injections of Metasystox-R have been carried out in the first week of June but a second application was necessary around mid-July.

Comments

Laboratory trials with contact insecticides have been conducted on the lacebug population used in our tests. The insects were contact-killed by parathion and deltamethrin at dosages much higher than those normally used for the control of other Rhynchota. Further investigations are necessary to discriminate between acquisition of resistance or simple contact tolerance by the species or some populations. Possible contact tolerance is another complication of foliar sprays in addition to insensitivity of eggs and to problems related to difficult coverage of large canopies. It is also another complication of surface treatments of the bark, in addition to the problems caused by the long migration period of the adults. Bole injection, in spite of the shortcomings listed above seems to be more advisable in our case. As a matter of fact thousands of trees are being treated in Italy by this method by private companies both against insects and fungi (Kovacs et al., 1984; Sisto, 1985). In our opinion, injection by means of cartridges shows the important advantage of more sensitivity in reaching the fresh xylem (alburnum or sapwood) in respect to the perforation with an electric dril followed by pressurized injection.

SUMMARY

Chemical control of the Sycamore Lacebug, Corythucha ciliata Say (Heteroptera Tingidae) has been attempted on large plane trees in an urban area in the region around Naples (Campania). Foliar sprays, surface treatments of the trunk in spring and fall against migrating adults, and bole injection with systemic insecticides have been tested in the same locality in different years. In spite of some shortcomings, injection of systemic insecticides into the trunk seems to be more suitable to obtain control of the pest on large plane trees located in urban areas. Injection by cartridges shows more sensitivity in reaching sapwood than perforation with electrical drils followed by pressurized injection.

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MICROORGANISMS PATHOGENIC FOR INSECTS FOUND IN THE SYCAMORE LACE BUG (Corythuca ciliata)

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Microorganisms are very often causing agents of insect diseases, that may be very severe and spread over numerous insects, especially in overcrowded populations. Therefore pathogen microorganisms had been of interest for a long time, with possibilities of using them in biological control of insect pests. Nowadays this is of special importance in many contries.

In our earlier communication (Sidor, 1983) the necessity of biological control of C.ciliata was underlined. In this paper are given some data concerning microorganisms found by microscope examination of C.ciliata collected in various regions and of different population density level.

It is known that, as the rule, in abundant insect populations in one region, during one or several years, it comes to changes resulting in health conditions and the appearence of diseases in a minor or greater extent. Among these insect diseases there are very often those caused by pathogem microorganisms.

The collections of the data on C.ciliata health condition were undertaken with supposition that this insect species does not represent an exception and that in high density population some insects might be found affected or dead with diseases provoked by specific pathogen microorganisms. These investigations were most often performed by microscopic examination. If we start with our examination at the begining of spring, we can find dead or diseased insects in their overwintering places, affected most by fungus(Beauveria and other species).Still the percentage rate of the diseased insects in Croatia and Vojvodina was only 11-13%.On the teritory of Novi Sad during 1984-85 only 11,94% of C.ciliata imagos died with mycoses.According to data from Instituto Entomologico Agr.,Padova,1984,Italy the mortality rate in Winter was 39,3 to 67%.

In previous years during vegetation period numerous plane trees leaves were contaminated with C.ciliata.Attention was paid only to diseased and dead larvae,but they were found only sporadically.The diseased larvae can be distinguished from healthy ones by slower movements and somewhat lighter skin colour.These were used for making histological preparations or smears and were examined under the light microscope.The most significant pathological changes were observed in the fat body in which the inclusions of the polyhedral or round shape were found.These inclusions stain only marginally with Giemsa's stain.At the begining of the disease,when larvae are still moving,these inclusions are not numerous,but in preparations made from dead C.ciliata big changes were to be seen in completely destroyed tissues with numerous polyhedral inclusions.According to these data the viral nature of this disease can be supposed,but it needs further investigations.C.ciliata with described changes were not numerous,there were only 8-12% of affected insects.According to obtainable data Iridescens viruses have been found in four families in Hemiptera order,but there are no data about viruses in Tingidae(Martignoni,Iwai,1975).

In some localities in Vojvodina in examined imagos microsporidia were found,which,according to the development cycles and shape of spore,belong to Nosema sp.(Protozoa,Sporozoa). Among apparently healthy imagos and larvae of C.ciliata in Vojvodina there were found Nematoda species not examined in detail,but because they were found in diseased and dead insects,it is considered that they are parasites of C.ciliata. Trypanosoma sp.Protozoa,Flagelata were also found in C.ciliata.Although the number of diseased and dead C.ciliata larvae was not high,the greatest number was found at the end of vegetation period and the end of Autumn.

In conclusion we can say that diseases of *C.ciliata* in examined regions were not epizootic,but there are some samples found diseased and dead with microorganisms.The disease which is considered to be of virus origin causes the most apparent pathological changes in the internal organes of affected specimens,being changed to a liquefied mass filled with numerous polyhedral inclusions.*Protozoa* otherwise present in various insect species were found in *C.ciliata*,too.Microsporidia(*Nosema* sp.) were most often found in larvae and adult insects when compared to other microorganisms.Spores of *Nosema* were found in diseased and dead, but also in apparently healthy specimen.The highest number of diseased larvae(about 6o%) with *Nosematosis* was found in *C.ciliata* from Italy(Bari,1982).Diseased and dead insects with mentioned symptoms were found mostly in October and November.

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ACTION OF PATHOGENIC DEUTEROMYCETES AGAINST OVERWINTERING ADULTS OF CORYTHUCA CILIATA (SAY)(RHYNCHOTA TINGIDAE)***

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The problem of defending plane-trees from Corythucha ciliata (Say) continues to worry researchers and responsibles of the public green. Chemical control by contact insecticides, which is already aleatory because of the graduality ness of births and the mobility of adults, or by cytotropic and systemic ones (Binaghi, 1970; Damiano, 1974; Monaco, 1975; Tremblay & Petrillo, 1984) seems incongruous from the economical and sanitary points of view taking into consideration the number, size and site of the plants to be treated.

Means of biological and integrated controls are mainly welcome. In the light of these considerations, investigations were begun in order to ascertain what indigenous limiters showed to adapt to the tingid of nearctic origin and the main biotic causes of the drastic decrease of the phytomyzous population during winter.

This paper gives the results of the observations on the mortality of overwintering adults and of the tests carried out in climatized chambers at low temperatures with deuteromycetes isolated from adults which were found dead under the bark.

Materials and Methods

The investigations were carried out in March and April

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1985 by means of field surveys and laboratory analyses.

The surveys were effected in 3 areas which were chosen according to the age and site of the plane-trees and to the gravity of the infestation, i.e. in two turinese parks, Ruffini and Valentino, and in an avenue of Bosco Marengo in the province of Alessandria. For what concerns the turinese trees, the ones of the Ruffini park were about 30 years old and had a mean diameter of 37 cm; the ones of the Valentino park were older (about 80-90 years old), of larger sizes (diameter between 80-150 cm) and situated near the river Po, this means in a relatively damper environment. The planes in Bosco Marengo (diameter between 55 and 105 cm) were taken into consideration because during the 2 years 1983/84 they were characterized by massive summer-autumnal populations opposed to weak and late spring infestations.

In each area, 5 plane-trees were individuated for better representing the bark variability which was considered important in the tingid's overwintering (Girolami & De Battisti, 1979), i.e. having smooth and thin or rough and thick bark. On each of the 15 selected trees, 2 samplings were made, one on the northward side and one on the southward one, at a height between 1 and 1.5 m. Each sampling was made on a surface of 400 cm^2. From this surface, all the easily detachable scales were manually taken off, the C. ciliata adults and other arthropods, which remained on the trunk, were collected by means of a brush. The material was immediately closed in plastic bags and forwarded to further studies.

In laboratory, with the use of a stereoscopic microscope, the living C. ciliata adults, the ones killed by fungal attack, and the dead ones not showing mycelium were separated. After separation and counting, the adults of the phytomyzous pest showing hyphae were laid at 2 mm one from the other on moistened filter paper disks on the bottom of

Petri dishes. The results were subdued to independent series variance analysis, after transforming the percentages into angular values.

For each area, about 50 specimens were isolated among the adults killed by the fungus and were submitted to microbiological analysis. Within each sample, the choice of these specimens was differently made, according to the sample's numerical consistence : all the specimens of the Ruffini park (47), 1 out of 25 (until reaching 50 specimens) from the samples taken at Valentino park (1258) and at Bosco Marengo (1264).

The 147 specimens were submitted to stereomicroscopic observation for a quick individuation of the kind of mycelium, colour and form cf fructifications. The methodologies, that were followed for microbic isolation and taxonomic determination of the fungi, were described in previous works (Ozino Marletto, 1982; Ozino Marletto & Menardo, 1984).

For the tests in controlled conditions, the deuteromycetes Beauveria bassiana (Bals.) Vuill., Verticillium lecanii (Zimm.) Viégas, Paecilomyces farinosus (Helm ex S.F. Gray) Brown & Smith were inoculated on healthy C. ciliata adults, which were collected under the plane-trees bark during overwintering. Glass crystallizers of 25 cm diameter and 15 cm height were used; on the bottom a sheet of sterile filter paper, sprayed with 7 ml of a homogeneous conidial suspension, was laid. Then 15 healthy adults were introduced and the crystallizers were properly closed. There were 2 repetitions for each fungus with relative control that was treated with 7 ml sterile water. The inoculum dose of the 3 fungi was kept at 10^7/ml of the suspension. The crystallizers were incubated in climatized chamber at a temperature of 5 (±0.5)°C and relative humidity of 95 (± 5)%. Surveys were weekly effected until the death of the inoculated specimens.

All dead insects were accurately checked at the stereoscopic microscope in order to evidentiate the presence of mycelium on the body before reisolating the inoculated fungus.

Results

The total number of C. ciliata adults, which were found under the bark of the 3 groups of 5 plane-trees, is given in table 1, in which one can see that the percentages of survival and of mortality due to the fungus vary remarkably in the 3 areas.

The analytical data, concerning the 30 samples taken from the 15 checked plane-trees, are reported in table 2, from which it appears that the number of adults killed by the fungal infection is considerably higher under rough and thick bark on the northward side.

The results of the variance analysis on living adults and on the ones killed by fungal infection in 24 samples (2 trees with smooth and thin bark, 2 trees with rough and thick bark for each area) are given in table 3. They show that the kind of bark is significant and the site is highly significant for survival, whereas the exposure is significant and the kind of bark and the site are highly significant for the mortality due to fungal infection.

The diffusion of B. bassiana, V. lecanii, P. farinosus and of saprophytes on overwintering C. ciliata adults, which were found dead under the bark of plane-trees in the 3 piedmontese areas, is showed in table 4, in which the percentage of fungal isolations from the insects of each area is reported. B. bassiana was the mostly represented species, i.e. 53% of isolations. V. lecanii and P. farinosus were isolated less frequently and only from one area. Other fungi were isolated with a frequence fluctuating between 38 and

45% : Mucor hiemalis Wehmer, Alternaria alternata (Fr.) Keissler, Penicillium spp., Fusarium spp.

The progression of the infection test carried out with B. bassiana, V. lecanii and P. farinosus on overwintering C. ciliata adults in controlled conditions is given in fig. 1. Among the 3 entomopathogenic deuteromycetes, P. farinosus appeared to be the most virulent one, followed by V. lecanii that, in the same lapse of time, showed a more reduced activity. The 2 species caused total mortality 56 days after the infection. B. bassiana acted slowlier : it showed the first effect with a delay of 2 weeks and caused 100% mortality 63 days after the infection. The controls were all alive until the 49th day. Mortality was 3.3% at the end of the test.

Conclusions

The investigations brought into relief that the total mortality of the overwintering C. ciliata population is around 51%, of which 27% is attributable to various causes and 24% to fungi. Keeping in mind that the data concerning mortality by fungi is approximated, since only the insects clearly showing mycelium on their body (and not the ones that might have it inside) were included in the count, 24% seems very remarkable. Also the presence of deuteromycetes in all the 3 considered areas and the probable synergism with saprophytes, that were found in the same areas, are of considerable interest.

The kind of bark and the site appeared to be the most influential parameter on mortality, which was higher under the rough and thick bark of older trees. Since the mortality is strongly increased by the presence of entomopathogenic fungi, which develop much more under rough and thick bark, plane clons characterized by this kind of bark seem more convenient in order to refrain the tingid's population.

For what concerns isolations, the diffusion of micromycetes confirms previous investigations (Ozino Marletto & Menardo, 1984). To this purpose, it is useful to remember that the saprophytes *M. hiemalis*, *A. alternata*, *Penicillium*, and *Fusarium* are considered potential entomoparasites (Madelin, 1966, 1968) or entomopathogens (Roberts, 1981), especially when the insect is in a state of weakness.

With regard to infection tests, the 3 deuteromycetes already revealed to be highly virulent on *C. ciliata* youngs and adults in trophic activity. In optimal cultural conditions, *B. bassiana* was more pathogenic than the other 2 species (Arzone & Ozino Marletto, 1984). On the contrary, in the present test, at low temperatures and using overwintering adults, *P. farinosus* and *V. lecanii* acted quicklier than *B. bassiana*.

Bearing in mind that the above deuteromycetes have the chance to act at various temperatures and relative humidities (Ozino Marletto & Arzone, 1985), they seem to deserve careful attention in view of a biological control of overwintering adults.

Table 1 - Adults of <u>Corythucha ciliata</u> (Say) found during March and April 1985 under the bark in 3 Piedmontese localities. For every plane-tree cm^2 400 on the northern side and cm^2 400 on the southern side were examined.

locality	adults	alive		dead			
				showing hyphae		not showing hyphae	
		No.	%	No.	%	No.	%
Valentino Park	3232	1298	40.16	1258	38.92	676	20.92
Ruffini Park	2674	1898	70.98	47	1.76	729	27.26
Bosco Marengo	4793	2030	42.35	1264	26.37	1499	31.28
total	10699	5226	48.85	2569	24.01	2904	27.14

Table 2 - Number of adults of Corythucha ciliata (Say) found in 30 samplings carried out during March and April 1985 in the northern and southern parts of 15 plane-trees, showing smooth and rough bark, from 3 Piedmontese localities.

Exposure		North			South		
			dead			dead	
C. ciliata adults		alive	showing hyphae	not showing hyphae	alive	showing hyphae	not showing hyphae
Valentino Park	smooth	57	31	82	76	4	71
		271	29	75	107	42	85
	rough	199	214	55	106	33	36
		225	225	88	207	143	92
		28	432	59	22	105	33
Ruffini Park	smooth	188	2	49	226	5	69
		288	1	88	122	-	52
		262	2	117	200	3	84
	rough	160	13	52	62	-	21
		294	21	123	96	-	74
Bosco Marengo	smooth	212	164	358	424	20	151
		289	116	228	222	11	120
		287	71	92	198	18	49
	rough	171	218	64	112	150	136
		-	419	174	115	77	127

Table 3 - Analysis of exposure, bark and locality effects on the survival and the mortality caused by fungi of <u>Corythucha ciliata</u> (Say) overwintering adults.

<u>C. ciliata</u> adults		alive		dead showing hyphae	
source of variation	N	variance	F test	variance	F test
error	12	143.20		67.56	
exposure	1	177.00	1.24	527.55	7.81 *
bark	1	996.41	6.96 *	1984.06	29.37 **
locality	2	1069.68	7.47 **	1798.71	26.62 **

* p = 0.05; ** p = 0.01.

Table 4 - Micromycetes isolated from *Corythucha ciliata* (Say) adults found in 3 different Piedmontese localities.

species	isolations %			
	Valentino Park	Ruffini Park	Bosco Marengo	total
Beauveria bassiana	51	53	55	53
Verticillium lecanii	9	-	-	3
Paecilomyces farinosus	-	9	-	3
other fungi	40	38	45	41

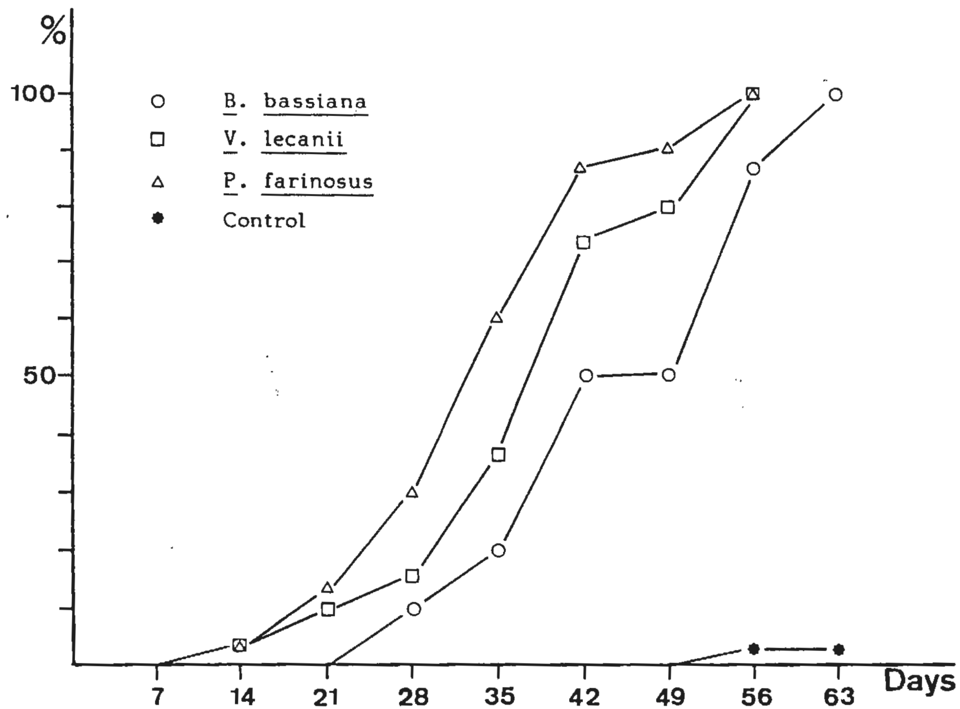

Fig. 1 - Mortality of overwintering adults of *Corythucha ciliata* (Say) in infection experiments with *Beauveria bassiana*, *Verticillium lecanii*, and *Paecilomyces farinosus*.

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Biological Control of *Corythuca ciliata*, the Sycamore lace bug, in Europe through importation of natural enemies from America: a proposed project

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The sycamore lacebug is currently a pest of hybrid plane trees in southern Europe from Yugoslavia to France and is spreading. It is an American insect recently introduced to Europe, and lace bug densities in Italy, the country believed to be the original point of introduction, far exceed those seen in the home range of the insect in the northeastern United States. The implication of this difference in lace bug density is that useful natural enemies may exist in the United States that help suppress their numbers. Preliminary studies conducted at the University of Massachusetts in 1985 showed that caging groups of lace bugs with sleeves of fine material placed over infested branches greatly improved survival of lace bugs. While only preliminary, the results of this caging study support the idea that important predators of lace bugs do exist in Massachusetts. Although actual cage exclusion tests have not yet been done in Italy, other sample data from field lace bug population studies indicate high levels of survival, comparable only to that seen inside cages in Massachusetts.

Based on these facts and assumptions a classical biological control program of importation to Europe of species of natural enemies from America, the home range of the insect, seems to be the logical way to address this problem. Such a project is currently being organized and would involve entomologists from 3 countries (U.S., Italy, Yugoslavia). It will consist of an applied portion in which surveys and collections will be made in the eastern U.S. and Canada to locate useful species of natural enemies which will then be colonized in the laboratory and shipped to Europe for release. It will also involve careful studies of stage specific survival rates for caged and uncaged groups of lace bugs in all 3 countries, both before and after release and establishment of natural enemies. The project is expected to run 5 years. Colonies of the best species will be maintained in laboratory culture in Europe and will be available for further redistribution to other interested countries.

Based on this work, it is hoped that substantial progress will soon be made to reduce sycamore lace bug densities in Europe and halt the rise in mortality of European plane trees. Work is expected to begin in the U.S. in 1986 through the Department of Entomology, at the University of Massachusetts at Amherst, MA.

SHORT INFORMATION ON CORYTHUCA CILIATA IN HUNGARY

Pal Benedek

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Corythuca ciliata was first discovered in Hungary at early spring in 1976 near Yugoslavian border (village Zakany, district Somogy). During the next few years it established itself over another southern district in Transdanubia (Baranya, Zala) and later on over southern Great Plain (districts Bacs, Csongrad, Bekes). Southern Hungary was invaded as a whole till 1979. Untill than this bug gradually was spread towards Central Hungary. Recently it can be found everywhere except cool hilly regions, but it is most common at the South and less frequent towards North and West. At Southern regions serious damages appears on Platanus trees untill mid summer. Leaves ot trees grow brown and dry and finally earls leaf-fall takes place generally in August. Damage is less serious Northwards (e.g. in Balaton areas or Budapest). There are two generations per year. Its life history seems to be the same like in Zagreb area.

Due to serious damages, control measures are necessary at Southern regions. Formerly Rovlinka and Elocron were tested (a.i. dioxacarb) with moderate and Sevin (carbaryl) and Actellic (pirimiphosmethyl) with rather low efficacy. Later on synthetic pyrethroids were tested. Both Decis (deltamethrin) and Sumicidin (fenvalerate) give very good results both on adults and larvae. These products can carefully be used at inhabited areas due to their low toxicity tu human beings.

LE COMPORTEMENT D'HIVER DE CORYTHUCA CILIATA EN TOSCANE (NOTE PRELIMINAIRE)

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INTRODUCTION

Les observations que nous avons faites regardent en particulier la façon avec laquelle la Corythuca ciliata passe la phase critique d'hiver en Toscane séptentrionale , près de la côte tyrrhénienne.

En effet il n'apparait pas dans la bibliographie que cet aspect particulier ait été consideré en détail par les auteurs qui, à des époques et dans des régions différentes de notre pays, se sont interessés à la biologie de cette espèce.

Toutefois une connaissance plus approfondie de cette phase est supposée être intéressante, surtout pour les informations éventuellement utiles, à propos de recommandations de mesures de lutte préventive plus rationelle.

En 1974, dans une brêve note, VENTURI soutenait que le répos d'hiver de ce tingide ne pouvait pas, à son avis, être défini comme une "diapause", mais plutôt comme une "hibernation". Il avait vu, en effet, que les adultes, pendant n'importe quelle phase de leur longue période d'hivernage sous l'écorce des platanes, lorsque ils étaient transportés en plein air et à une température à peine tiède, commençaient rapidement à s'agiter. Il admettait donc la possibilité que l'insecte, pendant les journées les plus douces de l'hiver, accomplissait spontanément des sorties de ses abris habituels.

Par la suite ARZONE (1973) et TREMBLAY et al. (1979) attiraient l'attention sur l'opportunité d'accomplir des études plus détaillées sur les mouvements d'hiver de cet insect, comme base pour l'application la plus efficace des traitements chimiques préventifs en correspondance de ses quartiers d'hiver.

RESULTATS DE SIX ANS D'OBSERVATIONS

A partir de 1979, jusqu'à 1985, nous avons donc accompli des observations précises sur les adultes hivernants sur le tronc des platanes qui ornent les murs de la ville de Lucca et caractérisés par un ritidome à plaques larges et subtiles. Des rélèvements moins réguliers ont été accomplis aussi dans d'autres localités de la même province, y compris le centre côtier de Lido di Camaiore. Ce qu'on a pu vérifier jusqu'aujourd'hui est résumé ci-dessous.

Migrations du feuillage aux quartiers d'hiver

Dans la zone susdite il semble que se sont les adultes de la deuxième génération (auxquels, seulement pendant certaines années, peuvent s'ajouter ceux d'une troisième) qui affrontent l'hivernation (1). Cette phase, comprise entre le moment où (à la fin de l'été) les adultes commencent à quitter les feuilles de l'hôte et celui auquel ils y retournent pendant le printemps suivant, est en moyenne dc 245 jours (cfr. tab . 1).

A ce propos je pense qu'il soit intéressant de rapporter que, pendant le mois d'août 1979 et celui de 1985, nous avons vu aussi quelques nymphes du dernier stade participer à la première phase de ces mouvements vers le tronc et se cacher sous le ritidome. Ces individus, toutefois, sont devenus des adultes seulement trois-quatre jours après.

Pendant toutes les année d'observations la migration qui a lieu à la fin de l'été, du feuillage vers le tronc, commence

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(1) Il y a désaccord parmi les auteurs à propos du nombre de générations annuelles de C. ciliata dans nos climats: deux selon ARZONE (1975) et TREMBLAY et PETRIELLO (1984), trois selon BIN (1969) et TIBERI (1975). Ce que nous avons observé en Toscane, pendant les six dernières années s'accorde avec les données de TREMBLAY et PETRIELLO (1984) pour la ville d'Avellino (dans le Sud d'Italie): le tingide présente deux générations complètes auxquelles, seulement pendant quelques années favorables, peut s'ajouter le début d'une troisième (entre septembre et octobre).

pendant la période comprise entre la dernière décade d'août et les cinq premiers jours de septembre. En suite le même mouvement atteint son maximum entre la moitié de septembre et les premiers jours d'octobre pour s'arrêter entre la fin d'octobre et les premiers jours de novembre.

Le mouvement inverse vers le feuillage, chaque année commence à partir de la deuxième moitié d'avril pour se terminer vers la fin de mai - premiers jours de juin (cfr. tab. 1).

Tab. 1. Corythuca ciliata Say. Données relatives aux mouvements entre le feuillage et le tronc accomplis par le tingide sur des platanes de la ville de Lucca

Année	Début migration tronc-feuillage	Début migration feuillage-tronc	Durée de la période (gg)
1978	---	29 août	239
1979	15 avril	5 septembre	---
1982	---	30 août	240
1983	17 avril	1 septembre	250
1984	28 avril	24 août	253
1985	24 avril	25 août	

Position et orientation des quartiers d'hiver

Pour connaître quel était le secteur du tronc sur lequel pendant l'hiver se rassemble la plupart des individus et l'éventuelle orientation préférentielle de leurs abris, on a périodiquement effectué des contrôles sur le tronc de six arbres (diamètre moyen de deux mètres cinquante) en examinant ce qui était recueilli sous 250 cm^2 de ritidome, aux quatre orientations et à trois niveaux différents.

On a ainsi observé que la plupart des individus occupait une zone comprise entre un et trois mètres au dessus du sol et que au dessus de cette zone les présences se réduisaient progressivement, en accord avec ce qu'a observé DE BATTISTI (1984) près de la Ville de Padova, dans le Nord-Est de l'Italie.

En ce qui concerne l'orientation, on a pu observer que, pendant septembre et octobre on a une distribution à peu près uniforme sur toute la surface; uniformité qui successivement, pendant l'hiver, on ne rélèvera plus. En effet, pendant cette période, un nombre supérieur d'individus est présent au dessous des abris placés sur les côtés nord et ouest du tronc, comme a également observé DE BATTISTI (1984) près de Padova. Ce qui laisse supposer qu'après une première disposition a peu près casuelle, une partie des individus, avec la progression de la mauvaise saison, effectue des déplacements graduels vers les abris situés au Nord et à Ouest, où évidemment les conditions sont plus favorables à leurs "desiderata" écologiques. Du tronc, en effet, elle est la zone plus humide et moins exposée au soleil pendant le jour et celle où les variations de température et d'humidité sont les moins grandes.

Mortalité

Par des échantillonnages effectués sous un total de mille centimètres carrés de ritidome de huit platanes différents on a observé que la mortalité due aux facteurs biotiques et abiotiques naturels était du 4% à la fin d'octobre et à la fin de novembre 1983. En suite, à la moitié de mars de l'année suivante , elle a monté en moyenne à 20%, avec un maximum de 37%.

A la même date les femelles représentaient en moyenne 70% de tous les individus survivants avec des extrêmes compris entre le 65 et le 84%.

Parmi les morts, les mâles étaient les plus nombreux, avec des pourcentages souvent doubles par rapport à celles des femelles. La cause principale des decês était vraisemblablement le Deuteromycete Beauveria bassiana, par lequel tous les morts étaient attaqués.

Activité autour des quartiers d'hiver

Sur huit plantes-échantillonset pendant deux hivers successifs (1983-84, 1984-85), tous les trois jours, entre 12.30 h et 13.30 h, on a effectué des observations sur le comportement général des adultes présents sur une surface totale de tronc de 12 m^2.

Pendant chacune des deux années les observations on été limités à la période novembre-mars, c'est-à-dire celle comprise entre deux moments opposées des migrations entre le feuillage etles abris du tronc.

Dans presque toutes les occasions, même en quantité variable, dépendant des conditions climatiques du moment, on a pû observer des individus qui circulaient au dehors des abris habituels. Seulement en trois occasions, où les conditions climatiques étaient particulièrement sévères (pluie forte au moment même du contrôle ou température exceptionellement basse qui durait depuis plusieurs jours avec des minimum de - 12°C et valeurs inférieures à 0°C au moment de l'observation) on n' a relevé aucun (cfr. fig. 1) mouvement.

En ce qui concerne l'amplitude des excursions au dehors des abris, elle n'était pas considérable: les insectes circulaient autour de l'abri habituel mais s'en éloignaient au maximum de dix centimètres. La durée moyenne de ces mouvements au dehors des abris n'a pû être mesurée à cause de difficultés que nous avons eu dans le marquage des individus. Elle semble être, cependant, toujours supérieure à une heure. De plus, cette difficulté de marquage n'a pas permis d'établir si ces mouvements regardent tous ou seulement une partie importante des adultes qui passent l'hiver dans les abris.

Les mouvements hors des abris étaient toujours relativement lents, souvent interrompus par un balancement caractéristique que l'insecte présente aussi pendant la bonne saison, lorsqu'il est actif sur les feuilles. De plus, pendant les mouvements hors de l'abri, on n'a jamais observé des insectes qui s'envolaient même lorsqu'ils étaient stimulés pour cela.

En ce qui concerne le nombre total des individus observés en activité en même temps sur les 12 m^2 du tronc, il a varié d'un maximum de mille et plus au mois de février et de mars, avec une moyenne de 210 individus.

Cette activité d'hiver nous a semblé influencée par des facteurs abiotiques différents dont, entre les plus importants dans le sens positif, a été l'humidité relative, même dans les limites imposéespar la température. On a vu, en particulier, que la plupart des individus sortaient des abris à l'occasion des jours immédiatement après ceux caractérisés par des pluies et qu'ils fréquentaient de préference les surfaces les plus humides du tronc.

Un rôle limitant l'activité de l'insecte a été naturellement celui joué par les minimum termiques. On a en effet relevé un déroulement à peu près semblable, quelque fois parfaitement superposable, dans le diagramme des températures minimes et dans celui relatif au nombre des insectes observés en même temps au dehors des abris, pendant la phase d'hiver entière (cfr. fig. 1).

Ayant examiné l'effet des températures instantanées sur les insectes au moment des observations, on a vu que celles à peine supérieures à zéro ne représentent pas - entre certaines limites - un obstacle pour leur mobilité. Au dessous de six dégrés , toutefois, les mouvements des animaux qui se trouvaient au dehors des abris devenaient progressivement plus engourdis, jusqu'à l'immobilité totale autour de 0°C.

En plus l'analyse des graphiques relatifs au nombre des insectes actifs pendant les deux hivers successifs permet de relever une périodicité plutôt régulière des maximum enrégistrés. Il est arrivé que, presque mensuellement et souvent après une brève période de pluies, on a enregistré le plus grand nombre d'individus présents en même temps au dehors des abris (cfr. fig. 1).

Cette constatation laisse entendre que, au dela des "stimuli" de certains facteurs extérieurs, il peut exister des différents mecanismes qui poussent périodiquement l'insecte à sortir de son réfuge.

Activité pendant les 24 heures

Pendant deux moments distincts des deux hivers successifs (22-23 mars 1984 et 23-24 février 1985) le comportement des adultes a été analysé pendant 24 heures, toutes les deux heures. On a ainsi enrégistré le nombre et les mouvements des insectes hors des abris sur une surface totale de tronc de 12 m^2 et les données relatives microclimatiques (cfr. fig. 2).

Le maximum de présence a été relevé pendant les premières heures du matin (entre huit et dix heures), sauf que sur les côtés exposés à l'Est, sur lesquels la même chose s'est vérifiée entre quinze et dix-sept heures, toujours coïncidant avec l'augmentation de l'humidité relative. Ceci peut s'expliquer avec l'exigence des tingides de sortir des abris avant le coucher du soleil, mais à la condition qu'ils ne soient pas dérangés directement par les rayons du soleil. Ce dernier facteur paraît, en effet, limiter les sorties des tingides de leurs abris, que le ciel nuageux et la lumière diffuse semblent favoriser.

Pendant la période comprise entre le coucher du soleil et l'aube, même si l'humidité relative attegnait des maximum, les présences des insects hors des abris étaient en tous cas assez réduites à cause de l'effect limitant des basses températures.

CONCLUSIONS

Pour finir nous voudrons rappeler que nos observations ont surtout mis en évidence que Corythuca ciliata ne passe pas l'hiver dans une condition de rétraite, mais seulement d'activité ralentie qui prévoit - au moins pour une percentage élevé d'individus -, presque chaque jour, pendant toute la période critique, des sorties de l'abri habituel et des déplacements tout autour de celui-ci.

Ces sorties peuvent s'effectuer pendant 24 heures, y compris la nuit, même si la plupart sort pendant la matinée.

En plus cette activité présente des maximum périodiques qui se suivent presque régulièrement à trente jours d'intervalle; elle parait, ensuite, positivement influencée par le taux élevé d'humidité relative et limitée par les températures inférieures au 0°C.

En définitive, il apparait évident que, pendant la période critique d'hiver, l'insecte est certainement plus actif que ce qu'on pourrait supposer. Ceci invite à ne pas délaisser la possibilité d'effectuer, pendant l'hiver, des traitements spécifiques et circonscripts, dans le temps et dans l'espace, qui seraient moins polluants et plus économiques.

En plus il faut considérer que pendant l'hiver déjà les facteurs biotiques et abiotiques naturels influencent négativement les populations, avec des pourcentages de survivance qui, à la fin de la saison, dans certains cas peuvent descendre jusqu'au 12 ou 7% (TREMBLAY et al., 1979).

Des interventions de lutte sur les formes mobiles d'hiver pourraient, en effet, réduire ultérieurement leur survivance et au moins retarder le développement des générations du printemps et de l'été.

SUMMARY

The authors report about the results of six years observations carried out in Tuscany (Central Italy) on winter behaviour of Sycamore lacebug Corythuca ciliata Say.

They have noticed that the wintering stage takes on average 245 days, since the last ten days of August till the second half of April. In this period the insects mainly gather on a trunk band from one to three meters inclusive from the ground, preferably with North-West exposure. However, they do not stay completely inactive, but they frequently get out of their shelters, even being the temperature a bit above 0°C. On such occasions their movements are slow, their trips short and no flights are noticed.

Such an activity, while noticeable during the whole 24 hours, night included, shows its peak period around 10.00 a.m. and it seems positively affected by elevated values of the relative humidity.

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Fig. 1 A

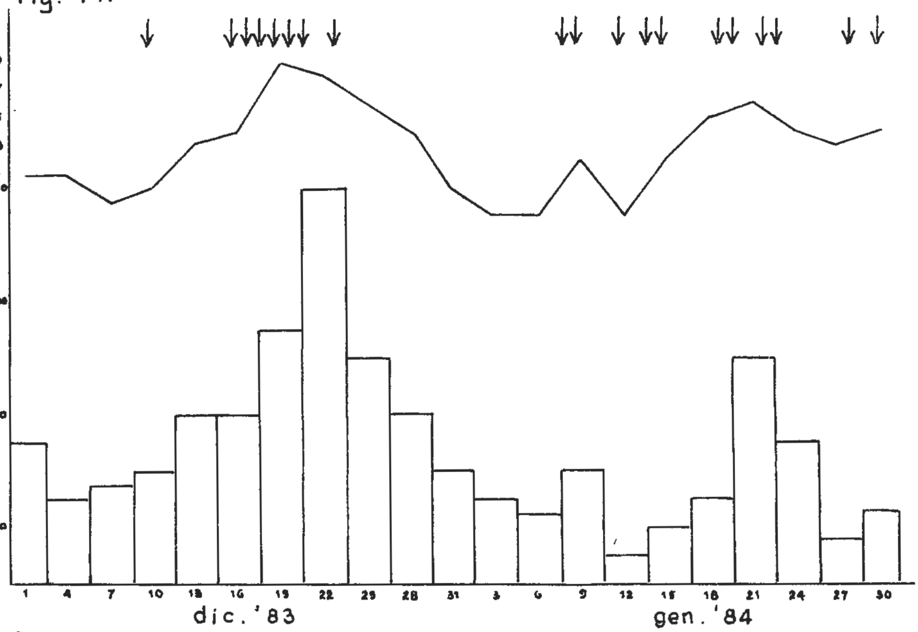

Fig. 1 B

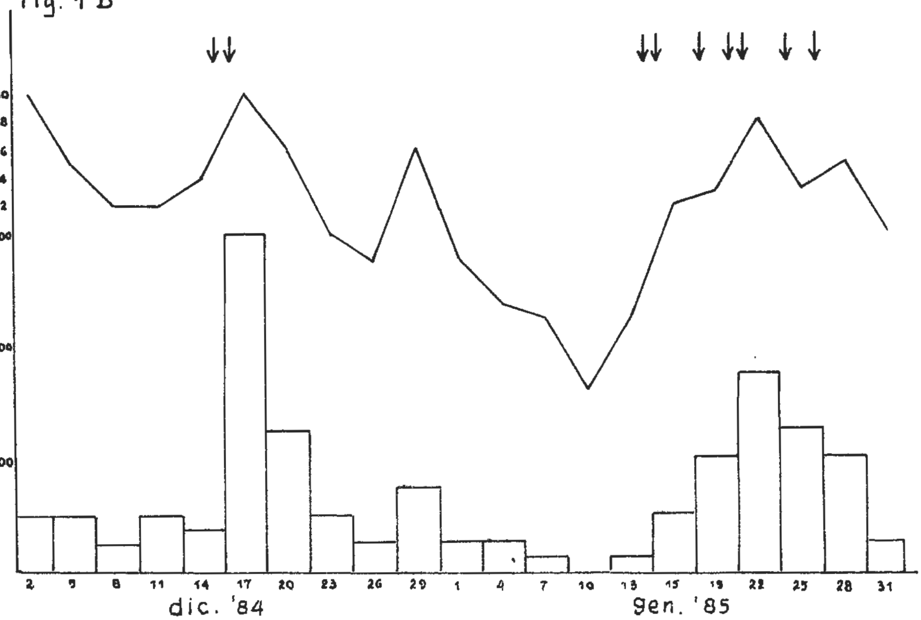

Fig. 1. <u>Corythucha ciliata</u> Say - Activité hors des abris pendant la même période de deux hivers successifs, rélevé avec des observations effectuées tous les trois jours, entre 12.30 h et 13.30 h. Sur les ordinées, en bas, le nombre total d individus observés actifs à chaque occasion sur une surface totale de tronc de 12 m^2; en haut la température minimale (Tm). Les flèches verticales indiquent les jours de pluie.

Fig. 2

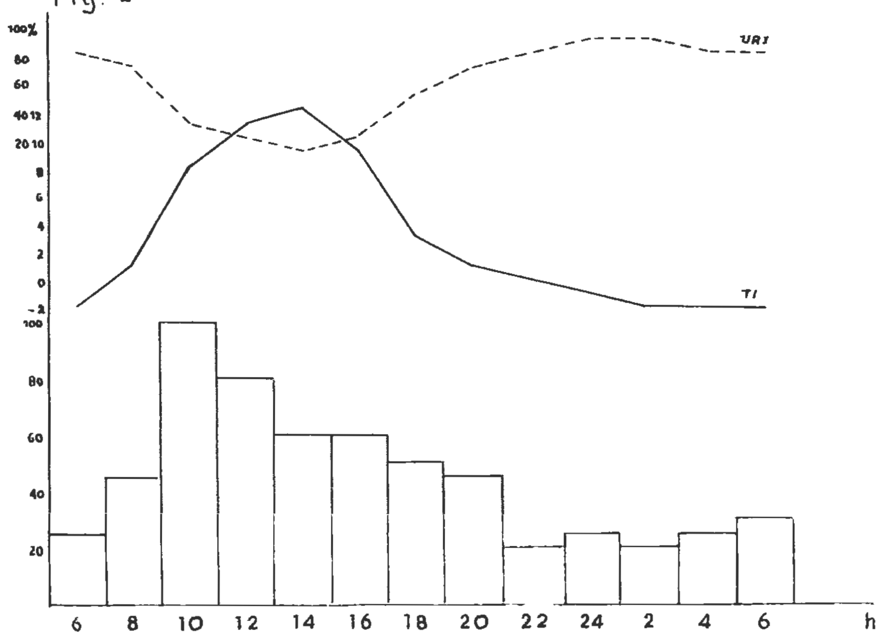

Fig. 2. Corythucha ciliata Say - Activité hors des abris d'hiver pendant les 24 heures (23-24 février 1985), relevée avec des observations effectuées toutes les deux heures. Sur les ordinées, le nombre total d'individus actifs chaque fois observés sur une surface totale de tronc de 12 m^2; en haut la température (TI) et l'humidité relative (URI) instantanées.

Report of the second meeting of the working group I.O.B.C./W.P.R.S."Integrated control of Corythuca ciliata"Padova, 17-19.Sept.1985.

Participants:

Arzone Prof.A.-Ist. di Entomologia agr.e Apicoltura -Torino
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Barbariol Dr.G. - Assessorato Verde Pubblico Comune di Padova
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Dalla Monta Prof. L. - Ist. Entomologia agr. - Padova
De Battisti Dr. R. - Ispettorato Forestale - Padova
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Massi Dr. G. - Centro Esperienza e Ricerca - SIAPA - Roma
Masutti Prof. L. - Ist. Ent. agr. - Padova
Mutto Accordi Prof. S. - Ist. Patologia Veg. - Padova
Pellizzari Prof. G. - Ist. di Entomologia agr. - Padova
Santini Prof. L. - Ist. Ent. agr. - Pisa
Sidor Dr. Ć. - Institut Pasteur - Novi Sad (YU)
Strapazzon Dr. A. - Istituto di Entomologia agr. - Padova
Tavella Dr. L. - Ist. di Entomologia agr. e Apicoltura - Torino
Tremblay Prof.E.- Ist. Ent. agr. - Portici (NA)
Van Driesche Dr. R. - Department of Entomology-Amherst Massachusetts
Zangheri Prof. S. - Ist. Ent. agr. - Padova

Submitted communications:

M.Maceljski: New developments in the status of Corythuca ciliata in Europe with a report of activities between both meetings.

I.Balarin,M.Maceljski: Some new results of investigations on the biology and ecology of Corythucha ciliata.

V.Girolami: The life cycle of Corythucha ciliata.

L. Santini, M.Bassani: Winter behaviour of Corythucha ciliata in Tuscany.

S.Longo: Remarks on the behaviour of Corythucha ciliata in Sicily.

E. Tremblay: Evaluation of the different possibilities of chemical control of the sycamore lacebug.

C. Sidor: Microrganisms pathogenic for Insects till now found in Corythucha ciliata.

A.Arzone, O.I.Ozino Marletto,L.Tavella: Action of pathogenic Deuteromycetes against overwintering adults of Corythucha ciliata.

V.Girolami: Natural enemies of Corythucha ciliata in North America.

R.Van Driesche: Possibility of biological control of Corythucha ciliata in Italy.

A short information on Corythuca ciliata in Hungary, stating a total infestation of this country and serious damages, was received by Dr. Pal Benedek, Plant. Prot. Agrochem Center Min. Agr. Food, Budapest.

After each group of two communications discussions were hold.

The participants took part in a whole day excursion to the Brenta canal, Vicenza and its surroundings, during which the numerous plane trees heavily infested with the lace bug and Ceratocystis, as well as the control measures made by trunk injections, were seen.

Conclusions

Corythuca ciliata is spread in Italy, Yugoslavia, France, Hungary, Spain, Switzerland, Austria, F.R.Germany,Roumania and Czechoslovakia, and probably in Bulgaria. In imminent danger are Greece, Portugal and the USSR. It seems that this insect is very adaptable to different climatic conditions: in Padova and Zagreb it has mostly 2 and in Sicily it has 4 generations. The spread throughout all southern countries is expected but, also, a spread to most northern european countries is considered possible. Apart from such spreading possibility, the danger of this insect is emphasized also by the fact that no diminution of the intensity of attack was recorded neither in Italy nor in Yugoslavia in spite of its presence during 21 resp. 15 years.

C. ciliata is not only directly damaging plants and contributing to its massive death, but also lessens the beneficial functions of plane trees for human beings and directly molests human beings.

It must be criticized that some infested countries belonging to the W.P.R.S. and E.P.R.S. are not taking part im the efforts of this group.

The benefit to include C. ciliata in the A2 quarantine list was discussed to answer a question asked by the EPPO. It was concluded that such listing will be useful, especially concerning the prevention of spreading the lace bug by young plants from nurseries. However, as the lace bug is overwintering also under bark of some other tree species,a possibility of spreading this insect by sending other plants from infested nurseries is present too. Because of a very high ability of the lace bug to be spread by wind, but mainly by vehicules und human beings, all quarantine measure will be of limited value and could slow down the spread to England and some north european countries.

The proposal (Van Driesche, Girolami, Macljski) of a joint research project organised in cooperation between the U.S., Italy and Yugoslavia was positively reviewed as a valuable result of the cooperation in this working group. The aim of this project is to compare the present influence of predators and parasites in North America and in Europe, to make in the U.S. all trials needed to select the most suitable natural enemy (Leptothrips mali, Chrysopa sp., Deraeocoris sp. and Orius sp. are the first candidate), to rear a satisfactory number of it, to ship them to Italy (Padova) and Yugoslavia (Zagreb) where they vill be multiplicated and released in the nature and their activity established by same methods. Both european countries should make the reared predator (s), or parasite (s) available to other countries.

Recommendation for future work

The research in the future should be focused on the following items:

The influence of factors limiting the biotic potential and the geographic distribution of the lace bug.

The influence of the genetic properties of the host plants as of the environmental factors which affect the bug through the plant. A cooperation with specialists which are selecting plane trees is recommended.

The interactions between C. ciliata, Ceratocystis fimbriata and Gnomonia veneta, so as between the measures conducted against them, ought to be established. The priority of measures against the dying of plane trees and the prevention of spreading this diseases by measures conducted against C. ciliata ought imminetly be established.

Surveys of natural enemies of the bug present in Europe should be continued and possibilities to improve its activities investigated. Besides insects (predators and parasites), spiders are considered to be very important. Prof. Balarin (Zagreb) will accept the identification of spiders if needed. The surveys of pathogens should be made especially where high population density occurred, and its role in diminuishing such density established. The possibilities of artificial infections should be tried. Prof. Arzone (Torino) for fungi and dr Sidor (Novi Sad) for viruses and microsporidia are accepting identifications if needed.

The joint research project between the U.S.,Italy and Yugoslavia, with the outermost aim to introduce the most suitable enemy (or enemies) from the U.S. to Europe ought to be started as soon as possible.

The capability of the lace bug to damage human beings by stinging and (or) transmitting diseases should be investigated thoroughly.

Untill new possibilities of control will be acceptable the chemical control of C.ciliata should be carried out according to the following principles:

1 Foliar sprays ought to be limitet to nurseries and young plants;

2 Foliar sprays should be conducted in a single key-period to be found by sampling leaves starting from the end of spring migration from the trunk;

3 Contact insect-icides of low mammalian toxicity and good persistence should be used;

4 Large plants in urban areas should be protected by trunk treatments only, i.e. by spraying trunk and main branches during the spring and autumn migrations, or by injecting systemic insecticides. The techique of injections should be improved to obtain a better translocation of the insecticides and to reduce plant damages.

As general recommendations the publishing of all papers presented in Zagreb and Padova together in one Bulletin of the IOBC/WPRS and the organisation of the next meeting in the year 1987 are given.

Convenor

Prof.dr Milan Maceljski

Working group IOBC/WPRS "Integrated control of Corythuca ciliata"

Convenor: Prof. Dr. Milan Maceljski, Plant Protection Institute, Faculty of Agr. Sciences, 41000 Zagreb, Šimunska 25 Yugoslavia

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