AN INITIAL INVESTIGATION OF PEST SPECIES ON DAI LOAN MANGO PLANTING IN CAO LANH CITY, DONG THAP PROVINCE, VIETNAM

Nguyen Thi Oanh[1*] and Ha Danh Duc[2]

[1]Center for Chemical Analysis, Dong Thap University
[2]Department of Engineering and Information Technology, Dong Thap University
[*]Corresponding author: ntoanh@dthu.edu.vn

Article history

Received: 07/02/2020; Received in revised form: 21/02/2020; Accepted: 06/03/2020

Abstract

Insect pests that damage Dai Loan mango trees were preliminarily surveyed in some regions in Cao Lanh city, Dong Thap Province, Vietnam. The results of the survey recorded twenty-nine species of insect pests belonging to sixteen families, and five orders. Bactrocera dorsalis (fruit fly), Idioscopus nitidulus (leafhopper) and Deanolis albizonalis (fruit borer) were very abundant, while Alcidodes frenatus had the lowest numbers in all surveyed sites. A number of insect pest species that were observed attacking mango in other places in Vietnam were not found in our surveys. However, fifteen species of insect pests were noted in this study, but they have not been found in other places. The results reported here highlight some insect pests attacking Dai Loan mango that have not been recorded before.

Keywords: *Dai Loan mango, insect pests, species.*

DẪN LIỆU BAN ĐẦU VỀ THÀNH PHẦN LOÀI CÔN TRÙNG GÂY HẠI TRÊN XOÀI ĐÀI LOAN TẠI THÀNH PHỐ CAO LÃNH, TỈNH ĐỒNG THÁP, VIỆT NAM

Nguyễn Thị Oanh[1*] và Hà Danh Đức[2]

[1]Trung tâm Phân tích Hóa học, Trường Đại học Đồng Tháp
[2]Khoa Kỹ thuật - Công nghệ, Trường Đại học Đồng Tháp
[*]Tác giả liên hệ: ntoanh@dthu.edu.vn

Lịch sử bài báo

Ngày nhận: 07/02/2020; Ngày nhận chỉnh sửa: 21/02/2020; Ngày duyệt đăng: 06/03/2020

Tóm tắt

Bước đầu khảo sát về côn trùng gây hại trên xoài Đài Loan đã được thực hiện tại một số xã thuộc thành phố Cao Lãnh, tỉnh Đồng Tháp, Việt Nam. Kết quả đã ghi nhận có 29 loài côn trùng thuộc 16 họ của 5 bộ. Các loài bắt gặp phổ biến gồm ruồi đục trái Bactrocera dorsalis, rầy bông xoài Idioscopus nitidulus và sâu đục trái Deanolis albizonalis, trong khi loài bọ đục cành Alcidodes frenatus có tần suất bắt gặp ít (< 25%) trong tất cả các địa điểm được khảo sát. Một số loài côn trùng gây hại xoài được ghi nhận ở những địa điểm khác ở Việt Nam đã được công bố nhưng không được tìm thấy trong nghiên cứu của chúng tôi. Tuy nhiên, có 15 loài côn trùng gây hại đã được ghi nhận trong nghiên cứu này, nhưng không gặp ở những nơi khác. Kết quả của chúng tôi đã xác định một số loài côn trùng gây hại trên xoài Đài Loan nhưng chưa được công bố trước đây.

Từ khóa: *Xoài Đài Loan, côn trùng, thành phần loài.*

1. Introduce

The mango, *Mangifera indica*, is an important subtropical fruit in many countries in Asia, Africa and America. In Vietnam, most mangoes are cultivated in the southern provinces. So far, Dong Thap has had the largest area of mango cultivation in the Mekong Delta with more than 10,000 hectares. The annual yield is over 90,000 tons with a value estimated at 1,500 billion VND (Vietnam Agriculture Newspaper, 2018). Cao Lanh city is a large mango producer in Dong Thap Province with several genera: Cat Chu, Cat Hoa Loc and Dai Loan. The genus Dai Loan has been increasingly cultivated for recent years because of its large fruits, thick flesh, thin seeds and sweet flavor. It grows and develops quickly, produces fruits throughout the year, and adapts well to many soil types, including acidic sulfate soil and mildly saline soil.

In recent years, however, mango has been devastated by insect pests that reduced the quantity and quality of the fruit, especially the Dai Loan mango. Some studies on mango pests have been carried out by Nguyen Thi Thu Cuc, Nguyen Thi To Tran, Nguyen Hong Ung and Vu Quang Giang in Viet Nam. Mango insect pests were also described by Augustyn *et al.*, Chowdhury, and Anant in other countries; however, an investigation of the insect pests of Dai Loan mango in Dong Thap Province has not been conducted so far. Current studies have mostly focused on insect pests of all mango genera, but not a specific genus.

2. Materials and methods

2.1. Chemicals, materials and instruments

Ethanol (70%), ethyl acetate (> 99%), and diethyl ether (> 99%) were purchased from Sigma-Aldrich (USA) and used to store and process insect samples. Insect net catchers (Vietnam) and Townes-style Malaise traps (Netherlands) were used to collect insects. A digital camera (Sony DSC W-800 20.1 Mp) and a stereo microscope Meiji Techno DK3000 (Japan) equipped with a Lumenera INFINITY1-3C camera (Canada) were used to take photographs to identify and classify collected insect pests.

2.2. Methods of sample collection

Insect pest samples were collected from gardens of Dai Loan mango trees in some villages in Cao Lanh city: Tan Thuan Tay, Tan Thuan Dong and Hoa An. The mango trees have been planted for almost 10 years. Each garden was more than 3,000 m^2 in area. The collection was conducted for one year, from November 2018 to November 2019, mainly by using Townes-style Malaise traps. In addition, insect samples were directly collected by hand and using hand-net-catchers at four equidistant sites near the edges and the center of each garden. At each site, insect pests were also collected on the branches of mango trees. All insect pests were either immediately stored in 70% ethanol (except butterflies and mealybugs), or treated with ethyl acetate or diethyl ether. The collection by all methods and investigation were conducted every ten-day period. Obtained samples were transported to the laboratory for analysis and classification.

The abundance (C%) of an insect pest species (A) was calculated by the following equation:

$$C(\%) = \frac{a}{b} \text{ x } 100.$$

In which, a is the number of sites where species A was found, and b is the total number of the investigated sites.

The obtained insect samples were observed using a stereo microscope (Meiji Techno DK3000, Japan) at 70X magnification. The measurement of specimens and image processing were performed using scale ruler software (Lumenera INFINITY1 - 3C, Canada). The classification of insect species was based on the morphological characteristics compared to the classification keys by Nugnes *et al.* (2018), Kapoor (2005), Han *et al*. (2017),

Srinivasa *et al*. (2017), Alam *et al.* (2018) and Pham Van Lam (2013).

3. Results and discussion

3.1. Insect species damaging Dai Loan mango

Twenty-nine species of insect pests were identified after the surveys in gardens of Dai Loan mango in three places: Tan Thuan Tay, Tan Thuan Dong and Hoa An. The insect pests belonged to sixteen families, and five orders: Coleoptera, Diptera, Homoptera, Lepidoptera and Thysanoptera. The types of insect pests varied, depending on the plant parts being attacked, e.g., stems, branches, leaves, flowers and fruits (Table 1), (Figure 1).

Table 1. Species of insect pests damaging Dai Loan mango collected from three communes in Cao Lanh city

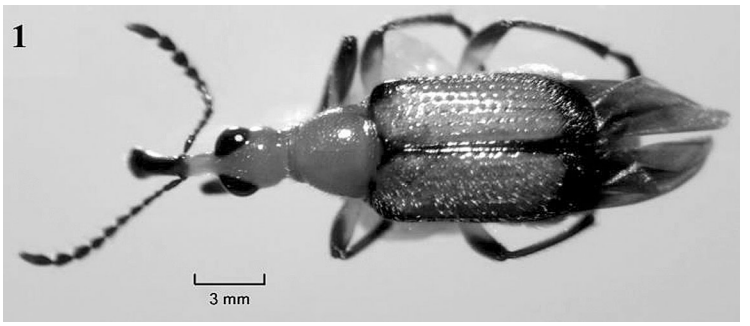
Order	Family	Species	Affected parts
Coleoptera	Attelabidae	*Deporaus marginatus* (Pascoe, 1883)	Leaves
	Cerambycidae	*Plocaederus ruficornis* (Newman)	Trunk, branches
	Curculionidae	*Alcidodes frenatus* Faust	Leaf veins, young branches
		Hypocryphalus mangiferae (Stebbing, 1914)	Tissues, bark
		Sternochetus mangiferae (Fabricius)	Seed cover, gemma
	Nitidulidae	*Carpophilus* spp.	Bark
Diptera	Tephritidae	*Bactrocera cucurbitae* Coquillett	Fruit
		Bactrocera dorsalis (Hendel)	Fruit
Homoptera	Cicadellidae	*Idioscopus nitidulus* (Walker)	Flowers, leaves
	Coccidae	*Ceroplastes ceriferus* (Fabricius)	Trunk
		Ceroplastes floridensis Comstock, 1881	Trunk, leaves
		Vinsonia stellifera (Westwood)	Leaves, fruit
	Coreidae	*Cletus trigonus* (Thunberg)	Leaves, fruit
	Diaspididae	*Aspidiotus destructor* Signoret	Leaves
		Aonidiella aurantii Maskell	Leaves
		Aulacaspis tubercularis Newstead	Leaves, fruit
		Lepidosaphes beckii (Newman)	Bark, leaves fruit
		Pseudaulacaspis cockerelli (Cooley)	Leaves
	Pseudococcidae	*Planococcus citri* (Risso)	Young leaves, fruit
Lepidoptera	Crambidae	*Deanolis albizonalis* (Hampson, 1903)	Fruit
	Erebidae	*Euproctis fraterna* Moore	Leaves, flowers
		Orgyia postica Walker	Leaves, flowers
		Orvasca subnotata Walker	Flowers
	Noctuidae	*Chlumetia transversa* Walker	Shoot, flowers
		Cryptoblabes gnidiella (Milliere, 1867)	Young leaves
	Tortricidae	*Dudua aprobola* (Meyrick)	Leaf veins, young-left stems, shoots
		Cydia sp.	Fruit
Thysanoptera	Thripidae	*Scirtothrips dorsalis* Hood, 1919	Young leaves, flowers
	Phloeothripidae	*Haplothrips leucanthemi* (Schrank)	Leaves, flowers

In a 2001 report, Nguyen Thi Thu Cuc proposed methods for preventing damage by twenty-two species of insect pests in the Mekong Delta. The prevalent species in the list included fruit flies, mealybugs, young stem borers, bugs, and thrips. Nine species that were recorded in the study conducted by Nguyen Thi Thu Cuc (2001) were also observed in our study: *Deporaus marginatus, Plocaederus ruficornis, Bactrocera cucurbitae, Bactrocera dorsalis, Idioscopus nitidulus, Deanolis albizonalis, Chlumetia transversa, Dudua aprobola and Scirtothrips dorsalis.*

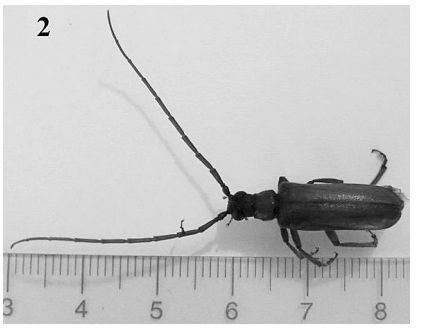
Another study carried out in Binh Dinh Province found 54 species belonging to 28 families, and 9 orders living on mango trees (Nguyen Thi To Tran, 2002). Fruit flies, *Bactrocera dorsalis,* leafhoppers, *Idioscopus clypealis,* and shoot borers, *Chulumetia transversa*, were the major pests identified in the study (Nguyen Thi To Tran, 2002). However, only four species found in Binh Dinh Province were also found in the study in Dong Thap Province, namely *Sternochetus mangiferae, Bactrocera dorsalis, Chlumetia transversa* and *Scirtothrips dorsalis*. Quach Thi Ngo *et al.* (2009) summarized the pests damaging mangoes in Viet Nam with a total of 79 species, of which seven species were identified in our survey: *Bactrocera dorsalis, Idioscopus nitidulus, Pseudaulacaspis cockerelli, Planococcus citri, Orgyia postica, Orvasca subnotata and Scirtothrips dorsalis.*

From these results, a number of insect pest species damaging mangoes recorded in other places were not found in our surveys. Fifteen species of insect pest were observed in this study, however, they have not been found in other places in the Mekong Delta. In Malaysian countries, surveys of mango pests have reported 29 species belonging to 15 families observed during the non-fruiting season, and 69 species belonging to 39 families observed during the fruiting season (Abdullah and Shamsulaman, 2008). The number of species in these surveys was higher than in our study because they were conducted in a larger area. In another report, Prakash (2012) found 22 species of insect pests on mango plantations in West Bengal, India. Sahoo and Jha (2008) (cited in Anant, 2016) observed 26 insect pests in mango gardens such as fruit borers, leafhoppers, hairy caterpillars, nest forming caterpillars, slug caterpillars, shoot borers, bagworms, painted bugs, aphids, mealy bugs, leaf-eating weevils, grey weevils, fruit flies and gall insects. These insect pests caused damage to mangoes during flowering and fruit development. The occurrence of pests during new flush, twig expansion, matured leaf and fruit maturity stages of 0 to 5 year-old, 5 to 15 year-old and over 15 year-old mango trees was determined in a field experiment conducted in Andhra Pradesh, India (Kannan and Rao, 2006).

Some species reported at other investigated sites were also found in this study. For example, *Deporaus marginatus* (leaf-cutting weevil), *Sternochetus mangiferae* (stone weevil), *Bactrocera dorsalis* (fruit fly), *Idioscopus nitidulus* (leafhopper), *Aspidiotus destructor* (mango scale), *Orgyia postica* (leaf-eating caterpillar), *Chlumetia transversa* (shoot borer), *Scirtothrips dorsalis* (thrips) were observed in India and also found in this study (Anant, 2016). Another study by Kannan and Rao (2006) documented the incidence of different pests related to different age groups of mango trees. The authors found that from 0 to 5 years old, the trees mainly encountered leaf-cutting and leaf-eating insects, and stem borers such as *Rhynchaenus mangiferae* Marshall, *Apodercus transquebaricus* Fabricius, *Deporaus marginatus* Pascoe, *Penicillaria jocostarix* Gune and *Orgyia postica* Walker. After the trees were 5 to 15 years old, the most common pests were mainly aphids such as *Toxoptera odinae* Vandergoot and flower-feeding insects like *Alassodes quadraria* Guen. Leaf spot-forming species such as *Procontarinia matteiana* Kieffer and *Amradiplosis ecinogalliperda* Mani were harmful to plants older than five years.

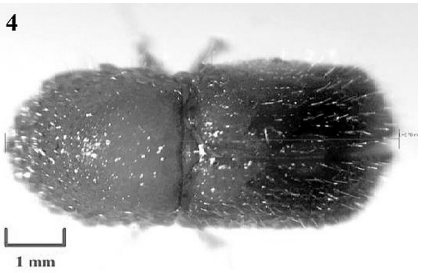


1 - Deporaus marginatus

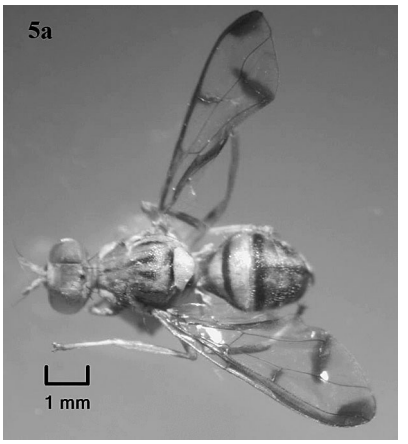


2 - Plocaederus ruficornis

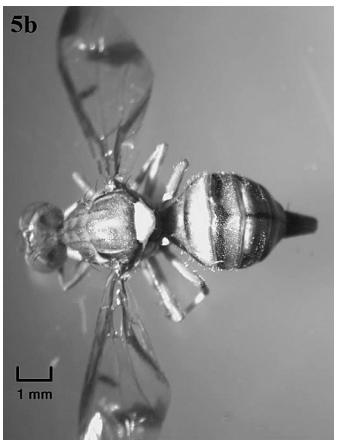
3 - Sternochetus mangiferae



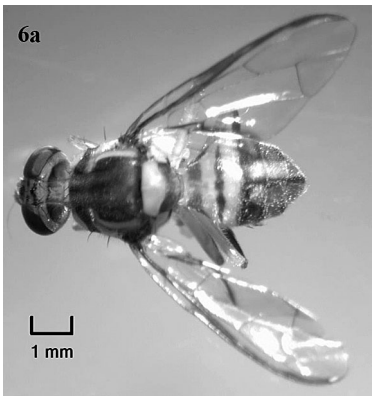
4 - Hypocryphalus mangiferae



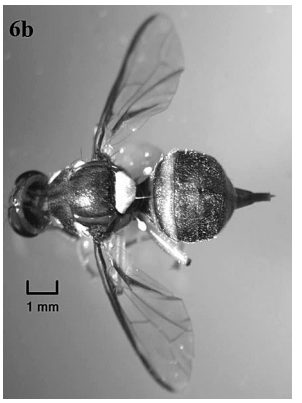
5a - Bactrocera cucurbitae (Male)



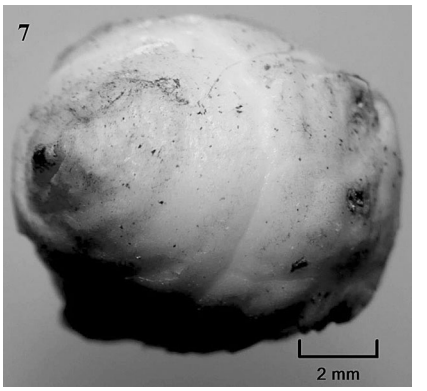
5b - Bactrocera cucurbitae (Female)



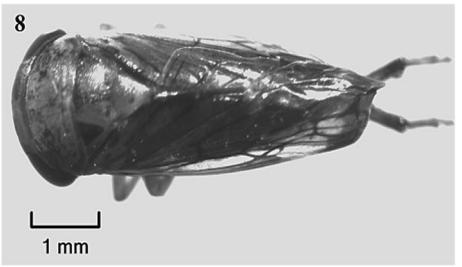
6a - Bactrocera dorsalis (Male)



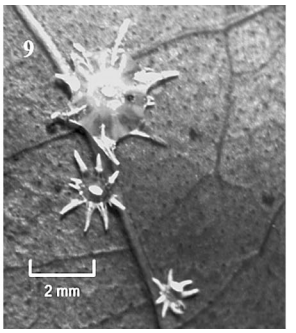
6b - Bactrocera dorsalis (Female)



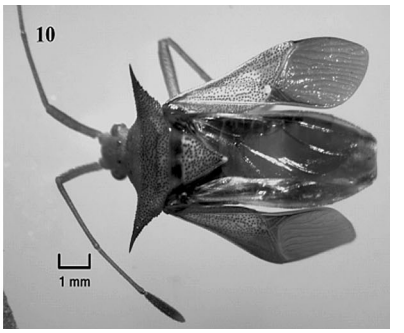
7 - Ceroplastes ceriferus



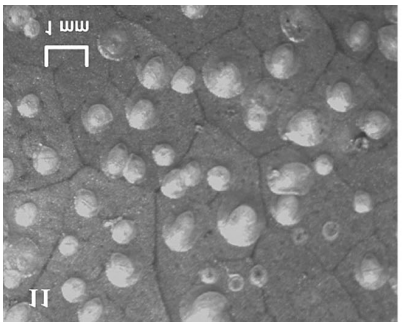
8 - Idioscopus nitidulus



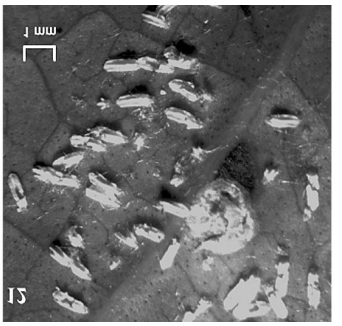
9 - Vinsonia stellifera



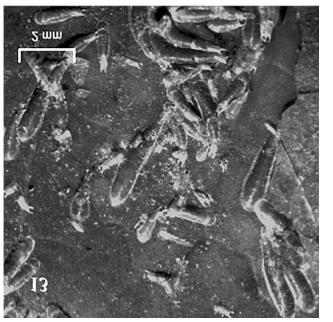
10 - Deanolis albizonalis



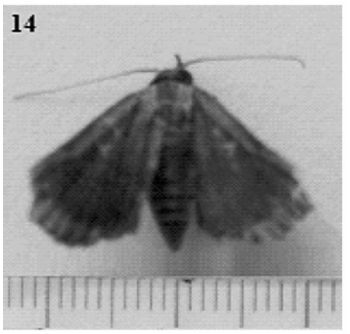
11 - Aspidiotus destructor



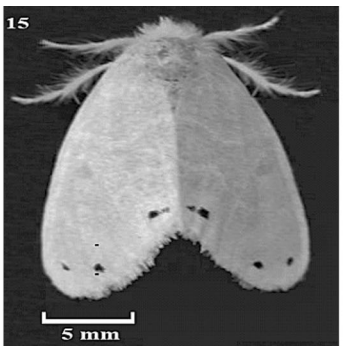
12 - Aulacaspis tubercularis



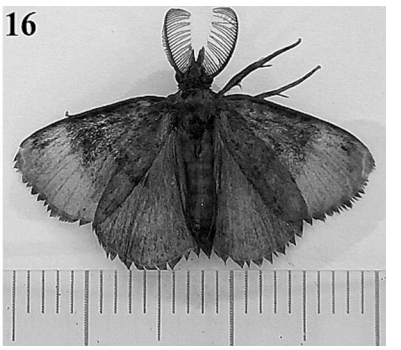
13 - Lepidosaphes beckii



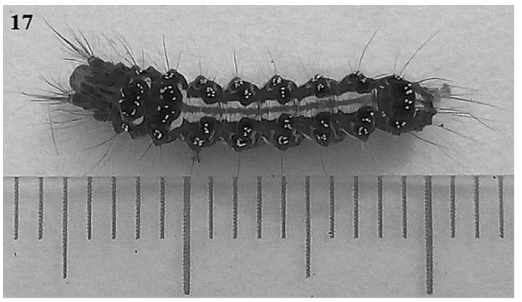
14 - Deanolis albizonalis



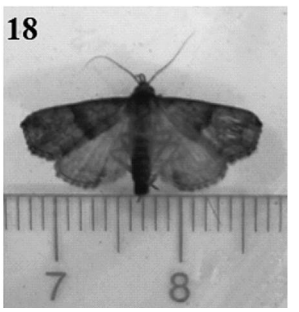
15 - Euproctis fraterna



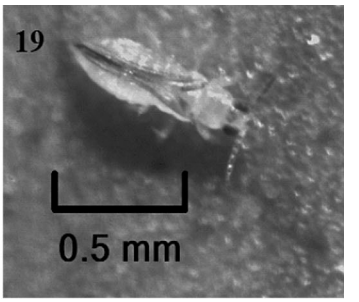
16 - Orgyia postica



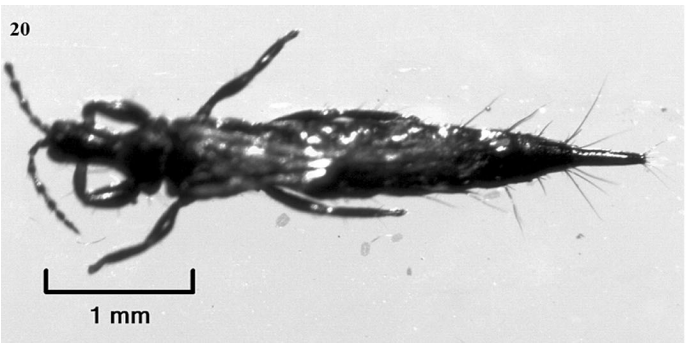
17 - Orvasca subnotata



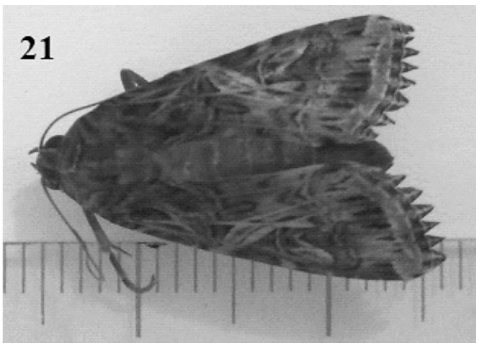
18 - Chlumetia transversa



19 - Scirtothrips dorsalis



20 - Haplothrips leucanthemi



21- Cydia sp.

Figure 1. Some insect pests harmful to the Dai Loan mango recorded during the surveying time

3.2. Abundance of insect pests on Dai Loan mango

The species numbers at each survey site were almost the same; however, the individual abundance of each species was different (Table 2). Among them, Homoptera was the most dominant order with eleven species belonging to Cicadellidae, Coccidae, Coreidae, Diaspididae and Pseudococcidae, while *Alcidodes frenatus* was only found in Tan Thuan Tay.

Table 2. Abundance of insect pest species of Dai Loan mango in some communes in Cao Lanh city

No.	Species	Abundance in surveyed sites		
		Tan Thuan Tay	Tan Thuan Dong	Hoa An
1	*Deporaus marginatus* (Pascoe, 1883)	++	+++	+++
2	*Plocaederus ruficornis* (Newman)	++	+++	+++
3	*Alcidodes frenatus* Faust	+	-	-
4	*Hypocryphalus mangiferae* (Stebbing, 1914)	++	++	++
5	*Sternochetus mangiferae* (Fabricius)	-	+	++
6	*Carpophilus* spp.	++	+	++
7	*Bactrocera cucurbitae* Coquillett	++	++	++
8	*Bactrocera dorsalis* (Hendel)	+++	+++	+++
9	*Idioscopus nitidulus* (Walker)	+++	+++	+++
10	*Ceroplastes ceriferus* (Fabricius)	+	+	++
11	*Ceroplastes floridensis* Comstock, 1881	+	-	+
12	*Vinsonia stellifera* (Westwood)	+	+	++
13	*Cletus trigonus* (Thunberg)	+	-	+
14	*Aspidiotus destructor* Signoret	+	+++	++
15	*Aonidiella aurantii* Maskell	+	+	+
16	*Aulacaspis tubercularis* Newstead	+	-	+
17	*Lepidosaphes beckii* (Newman)	++	+	++

18	*Pseudaulacaspis cockerelli* (Cooley)	+	+	+
19	*Planococcus citri* (Risso)	++	++	+++
20	*Deanolis albizonalis* (Hampson, 1903)	+++	+++	+++
21	*Euproctis fraterna* Moore	++	++	++
22	*Orgyia postica* Walker	+	++	++
23	*Orvasca subnotata* Walker	+	+	+
24	*Chlumetia transversa* Walker	+	+	+
25	*Cryptoblabes gnidiella* (Milliere, 1867)	+	++	+
26	*Dudua aprobola* (Meyrick)	+++	++	++
27	*Cydia* sp.	++	++	++
28	*Scirtothrips dorsalis* Hood, 1919	++	++	++
29	*Haplothrips leucanthemi* (Schrank)	++	++	+++

Note: (-): not found; (+): not abundant (< 25%); (++): quite abundant (25 - 50%); (+++): very abundant (>50%).

Table 2 also shows that, 28 species of insect pests were recorded in Tan Thuan Tay commune, of which four species appeared at more than 50% abundance *(Bactrocera dorsalis, Idioscopus nitidulus, Deanolis albizonalis and Dudua aprobola)*. Twenty-five insect pests were found in Tan Thuan Dong with six species being very abundant *(Deporaus marginatus, Plocaederus ruficornis, Bactrocera dorsalis, Idioscopus nitidulus, Aspidiotus destructor and Deanolis albizonalis)*. Twenty-eight species of insect pests were recorded in Hoa An commune, of which seven species appeared at more than 50% abundance *(Deporaus marginatus, Plocaederus ruficornis, Bactrocera dorsalis, Idioscopus nitidulus, Planococcus citri, Deanolis albizonalis và Haplothrips leucanthemi)*.

Some species were found in one site but did not appear in the other sites probably due to differences in farming methods. Moreover, the appearance of some insect pest species depended on the trees' developmental stage and which parts of the mango trees were affected. For example, aphids were mainly harmful at the time of flowering and on young leaves, while fruit flies did most damage at the time of fruit formation and harvest.

4. Conclusion

Twenty-nine species of insect pests were recorded in our surveys in Dai Loan mango gardens in Cao Lanh City, Dong Thap Province. The order Homoptera had the highest species number with eleven, followed by Lepidoptera of eight species, while Diptera and Thysanoptera had only two species. Our survey results recorded more than fifteen species in the Mekong Delta.

Acknowledgements: This research is supported by the project SPD2019.01.17./.

References

Abdullah F. and Shamsulaman K. (2008). Insect Pests of Mangifera indica Plantation in Chuping, Perlis, Malaysia. *Journal of Entomology, 5*(4), 239-251.

Alam M. S., Rahman M. A., Jahan S. M. H. (2018). Two new records of the Genus Idioscopus Baker (Hemiptera: Idiocerinae) from Bangladesh. *International Journal of Innovative Research*, *3*(1), 13-18.

Anant A. K. (2016). *Studies on insect-pests of mango with special reference to seasonal incidence and management of mango leaf*

hoppers. Master of Science in Entomology, 90 pages.

Augustyn W. A., du Plooy W., Botha B. M. and van Wilpe E. (2013). Infestation of *Mangifera indica* by the Mango Gall Fly, *Procontarinia matteiana*, (Kieffer & Cecconi) (Diptera: Cecidomyiidae). *African Entomology*, *21*(1), 79-88.

Báo Nông nghiệp Việt Nam. (2018). *Xoài Đồng Tháp vươn xa*, https://nongnghiep.vn/xoai-dong-thap-vuon-xa-post219139.html, accessed: 25-05-2018.

Chowdhury S. K. (2015). Diversity and nature of damage of mango insect pests at Kaliachak-II Block of Malda, West Bengal, India. *Journal of Entomology and Zoology Studies*, *3*(4), 307-311.

Han H. Y., Choi D. S., Ro K. E. (2017). Taxonomy of Korean Bactrocera (Diptera: Tephritidae: Dacinae) with review of their biology. *Journal of Asia-Pacific Entomology*, *20*(4), 1321-1332.

Kannan M. and Rao N. V. (2006). Influence of age and stage of the host plant on insect pests of mango *(Mangifera indica* L.). *International Journal of Agriculture Science, 2*(2), 351-353.

Kapoor V. C. (2005). Taxonomy and Biology of Economically Important Fruit Flies of India. *Israel Journal of Entomology, 35-36*(6), 459-475.

Nguyễn Hồng Ửng, Lâm Quốc Nam, Pham Thị Đông, Nguyễn Hồng Nương, Nguyễn Thị Hồng Thủy. (2015). Một số đặc điểm hình thái, đặc điểm sinh học cơ bản của rệp sáp *Aulacaspis tubercularis* (Diaspididae, Homoptera) trên xoài tại huyện Càng Long, tỉnh Trà Vinh. *Kỷ yếu Hội nghị Bảo vệ thực vật*, 429-435.

Nguyễn Thị Thu Cúc. (2001). *Biện pháp phòng trị côn trùng và nhện gây hại trên cấy ăn trái (xoài)*. NXB Đại học Cần Thơ.

Nguyễn Thị Tố Trân. (2002). *Điều tra nghiên cứu sâu bệnh hại xoài tại Bình Định.* Luận án tiến sĩ nông nghiệp, Viện Khoa học Kỹ thuật Việt Nam.

Nugnes F., Russo E., Viggiani G. and Bernardo U. (2018). First Record of an Invasive Fruit Fly Belonging to Bactrocera dorsalis Complex (Diptera: Tephritidae) in Europe. Insects 2018 Dec., *9*(4), 182 pages. doi:10.3390/insects9040182.

Prakash O. (2012). *National Horticulture Mission Ministry of Agriculture Department of Agriculture & Cooperation Krishi Bhawan*. New Delhi-110001, 46 pages.

Phạm Văn Lầm. (2013). *Các loài côn trùng và nhện nhỏ gây hại cây trồng phát hiện ở Việt Nam.* NXB Nông nghiệp.

Quách Thị Ngọ, Phạm Văn Lầm, Lê Thị Tuyết Nhung, Trương Thị Hương Lan, Thế Trường Thành. (2009). Kết quả điều tra thành phần côn trùng và nhện hại xoài tại Việt Nam. *Hội nghị khoa học toàn quốc về Sinh thái và Tài nguyên sinh vật lần thứ ba*. NXB Khoa học tự nhiên và Công nghệ: Hà Nội, 680-685.

Srinivasa N., Ramya N. and Meshram N. M. (2017). Taxonomic studies of leafhoppers (Hemiptera: Cicadellidae) fauna associated with mango from India. *International Journal of Current Microbiology and Applied Sciences, 6*(10), 2108-2124.

Vũ Quang Giảng. (2017). *Nghiên cứu biện pháp phòng trừ sâu đục quả xoài tỉnh Sơn La*. Đề tài Khoa học và Công nghệ tỉnh Sơn La.