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Populatıon fluctuation of olive moth, Prays *oleae* (bern.) (lepidoptera: hyponomeutıdae) in Turkish Republic of Northern Cyprus

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Abstract

The Olive moth, *Prays oleae* (Bern) is the most abundant pest of olive trees throughout the Mediterranean and the Black Sea, the Middle East and Canary Islands. Yellow sticky traps were preferred to monitor the population of Olive moth. For this purpose, to determine the population dynamics of adult Olive moth, 6 yellow sticky traps were placed haphazardly within the tree canopies (approximately 1.5 m in height) of each olive grove. Traps were hung between the months of July and December during 2015 and 2016 in Güzelyurt and Girne regions where olive growing is intensely cultivated and traps were positioned on the southern side of each tree. The traps were renewed every week on same day periodically. In Güzelyurt region, the highest population rate was found in Lefke on 2015 (135 moths/trap) and in Doğancı on 2016 (123 moths/trap). In Girne region, the highest population was found during October in Zeytinlik village on 2015 (161 moths/trap). On 2016, the highest population was observed during August (137 moths/trap) in Karakum village. Basically, the reason for the high population was the application time of chemicals in the first and second generations of Olive moth. During this study, the effective management method against the Olive moth was observed determination the correct period of insecticide application.

Key words: Prays olea, pesticide, population, trap

Introduction

Olive trees growing has been traditionally localised in the Mediterranean Basin for thousands of years, where almost 97.9% of the cultivated areas are located (Alissandrakis et al. 2018). Historically, the islands of Cyprus and Crete are known as the origins of olives. Although many old cultivars are still cultivated to some extent in Northern Cyprus, the most cultivated cultivar is the local variety for both oil and table olives, and cultivar Gemlik is also being produced (Helvacı et al., 2018). The list of potentially harmful organisms includes more than 255 species and the losses due to insect pests alone are estimated to be approximately 15% of production.

Among them, the most common species are the olive fruit fly, *Bactrocera oleae* (Rossi, 1790) (Diptera: Tephritidae), the olive moth, *Prays oleae* (Bernard, 1788) (Lepidoptera: Hyponomeutidae), and the Mediterranean black scale, *Saissetia oleae* (Olivier, 1791) (Hemiptera: Coccidae) (Alissandrakis et al. 2018). The olive moth, *Prays oleae* (Bern) is the most abundant pest of olive trees throughout the Mediterranean and the Black Sea, the Middle East and Canary Islands (Kumral et al., 2005). The damage caused by this insect can reduce the olive production by 49 to 63 % (Mansour et al., 2017). Çetin and Ağaoğlu (2005) studied to aim the determination of population of Olive moth in 9 olive orchards in Mut district of Mersin and used pheromone traps.

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Besides this, to find out the % of the damage rate, 20 cm. long shoots have been taken from the randomly selected each 10 trees which made 2 m. long shoot in total. Also, from every orchard, 100 fruit and leaf have been collected. 10 trees randomly have been selected from the early (June) and late (September-October) In early (June) and late (September-October) fruit casting, in the orchards where the casting was seen, ten trees were chosen randomly and 100 fruits were taken from each orchard, one with ten fruit from each bottom and the number of fruits with and without larvae exit holes were counted and their ratios were determined. The highest adult population of Olive moth was observed in the second generation and the lowest one in the third generation. The loss of yield rate was determined as 3.2-5.4 %. In 2004-2005 in Adana a study which was about the population development of Olive moth was carried out and pheromone traps were used. As a result of this study, dropped fruit in the whole canopies of six olive cultivars was recorded weekly from fruit setting to harvesting and then the percentage of dropped olive fruits caused by Prays oleae was 1.7-1.8 %. Besides, it was observed that the adults of Olive moth can be trapped with the traps during 8 months of the year (Kaçar and Ulusoy, 2007). In another study in Greece; from late March to late October 2010, wing traps were used and baited with synthetic sex pheromone and were placed in olive trees to monitor the flight activity of male of Olive moth. All traps were renewed on 25 March 2010. The date of trap installation corresponded to the start of the male Olive moth flight. Male catches were calculated for each olive grove, defined as the number of moths per trap on each sampling date. More specifically, the population of the Olive moth declined after the first spraying, which reached up to 66% of the original population of the first generation. Population continued to decline in the next generation in conjunction with the second spraying against the second generation (Andreadis et al., 2011).

During this research, it was aimed to determine the population density of Olive moth which causes damage in three different phenological periods of olive. For determination of population, 14 olive orchards were selected in Güzelyurt and Girne regions where olive where olive production is made intensely in TRNC.

Materıal and Method

Olive Material

This study was carried out to reveal the adult population density of Olive moth in 14 olive orchards with different olive varieties on 2015-2016 in Güzelyurt (8 orchards) and Girne (6 orchards) regions where olive cultivation was intensive in Turkish Republic of Northern Cyprus. The majority of the orchards are established with " Cyprus local " olive variety and other varieties are also available (Table 1).

Table 1. Some characteristics of the experimental orchards located in Northern Cyprus.

No	Location	Producer	Size of orchard (da.)	Amount of trees	Age of trees	Variety
1	Kalkanlı	Erten Kurnaz	2	43	100	Yerli
2	Kalkanlı	Arife Kandulu	10.7	420	15	Gemlik
3	Serhatköy	Ali Kankoru	13.4	450	16	Koroneiki
4	Zümrütköy	Ümit Zeki	2	85	21	Gemlik
5	Doğancı	Hasan Ergel	6.7	182	21	Gemlik
6	Yeşilyurt	Erkin Bilgin	2.7	90	12	Gemlik
7	Çamlıköy	Hüseyin Mahmutoğlu	8	90	250	Yerli
8	Lefke	Ziya Sezey	21.4	900	16	Pikual
9	Akdeniz	Serhat Usanmaz	33.4	2400	4	Koroneiki
10	Geçitköy	Talip Sancar	21.4	380	16	Gemlik
11	Lapta	Ufuk Hacıelmas	2	18	50	Yerli
12	Lapta	Andaç Kireçci	3.4	33	60	Yerli
13	Zeytinlik	İrfan Candemir	6.7	52	80	Yerli
14	Karakum	Tanser Nizam	2.7	20	84	Yerli

Method

Yellow sticky traps were preferred to monitor the population of Olive moth. For this purpose, to determine the population dynamics of adult Olive moth, 6 yellow sticky traps were bought from pesticide dealers and were placed haphazardly within the tree canopies (approximately 1.5 m in height) of each olive grove between the months of July and December during 2015 and 2016 in Güzelyurt and Girne regions where olive growing is intensely cultivated and traps were positioned on the southern side of each tree. The traps were renewed every week on same day periodically. Traps that remained in the orchards for a week were brought to the laboratory with appropriate transportation conditions and adult Olive moth individuals were counted.

Data collection and analysis

The effect of regions and years on Olive moth population was compared with SPSS 20.0 using ANOVA and T-test.

Results and Discussion

Yellow sticky traps were put in selected 14 olive groves in Güzelyurt and Girne regions and according to the observations, adults of Olive moth were counted population was found high in Girne region 2015 (228 moths/trap) and Güzelyurt region on 2016 (280 moths/trap) (Figure 1).

Besides, the population was found high and equal during October (60 moths/trap) and November (75 moths/trap) in Lefke village which is cultivated ‘‘Piqual’’ olive variety on 2015 and during August (123 moths/trap) on 2016 in Doğancı village (Figure 2); In Girne region, the highest population was found during October (161 moths/trap) in Zeytinlik village which is established ‘‘Cyprus local’’ variety on 2015 (Figure 3). On 2016, the highest population was observed during August (137 moths/trap) in Karakum village which is cultivated ‘‘Cyprus local’’ variety (Figure 3). The most important effect on having high population in the orchards was caused the unsufficient and inaccurate applications against Olive moth (Table 2 and Table 3). This result was due to the wrong application time of pesticide and applied once during olive production period in Karakum village and chemical was not applied during a growing season in Zeytinlik village for Girne region. In Güzelyurt region, the highest population rate was found in Lefke on 2015 and in Doğancı on 2016. The reason for these results, chemicals were not applied in Doğancı village during growing season on 2016 (Table 3).

In Lefke village, chemicals were used four times (June, July, August and September) during growing season but, chemical was not applied in the flowering period of ‘‘Pikual’’ variety which is cultivated in Lefke village (Table 2 and Table 3). According to the results, in order to have effective control and successful management of this pest, application timing of pesticides should be selected correctly. It is important to apply the pesticide should be implemented from flowering period to maturation to manage and decrease the population of Olive moth.

During this research, traps were used to determine the population of Olive moth. In Northern Greece, a research was carried out by using pheromone traps to determine the optimum time for spraying against the Olive moth (Andreadis et al., 2011). In another study, delta-type sexual traps were used and traps were hanged with a height of 1.5 m. in each orchard where the study was carried out to follow the adult flight and population density. It was observed that the adult flight started in the second week of April and continued until mid-June. It was determined that adult emergence of the third progeny began in the second week of September and continued until mid-November (Kaplan et al., 2016).

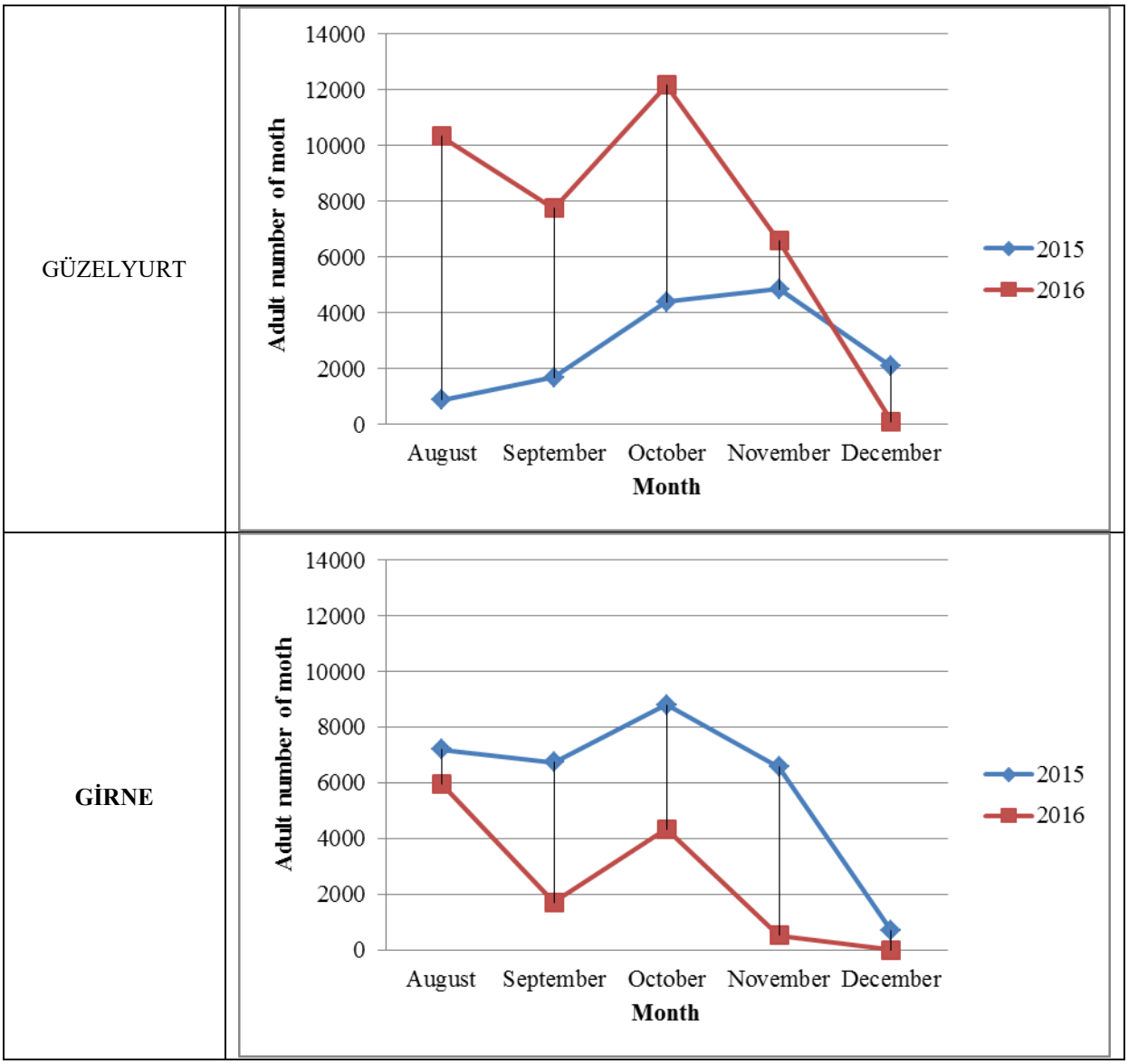

Figure 1. Population dynamics of Olive moth in Güzelyurt and Girne region on 2015 and 2016

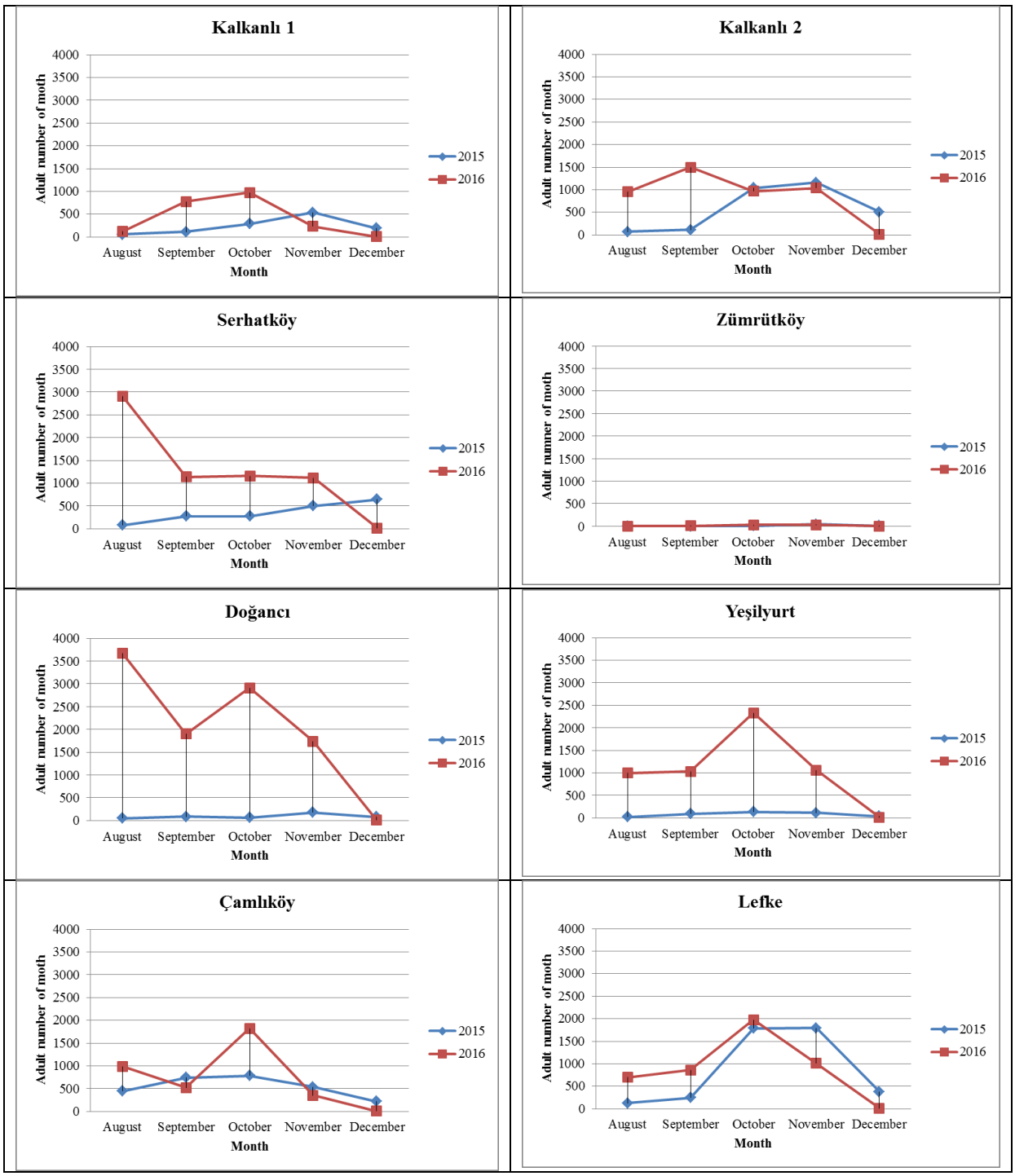

Figure 2. Population dynamics of Olive moth in the villages of Güzelyurt region on 2015 and 2016

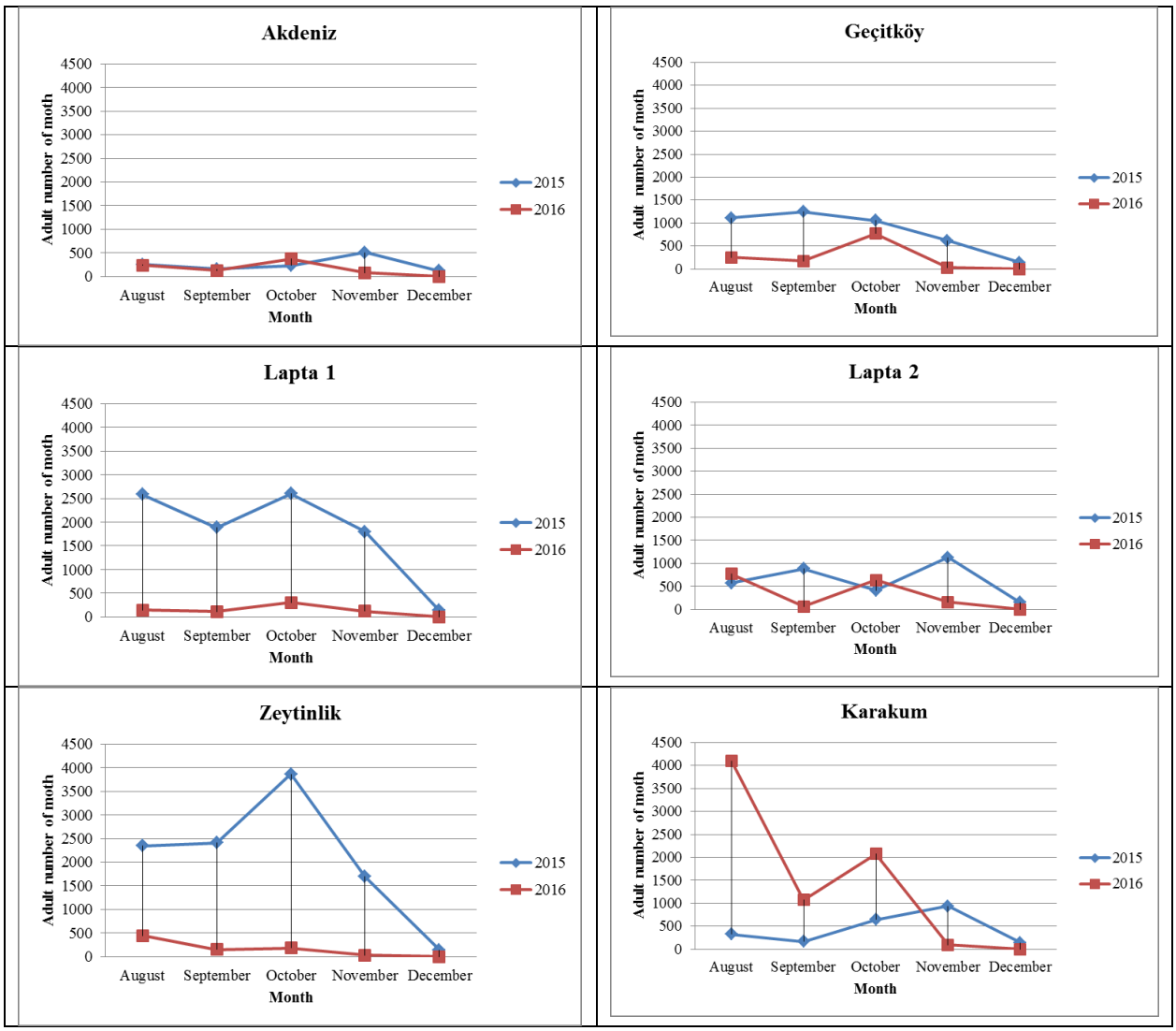

Figure 3. Population dynamics of Olive moth in the villages of Girne region on 2015 and 2016

Table 2. First year data of survey orchards, pesticides used, application date and period (2015)

1st year data	GÜZELYURT				
Producer	**Variety**	**Location**	**Active ingredient**	**Application date**	**Application period**
Erten Kurnaz	Cyprus local	Kalkanlı 1	Dimethoate	July	Fruit
Arife Kandulu	Gemlik	Kalkanlı 2	Dimethoate	July-August	Bud and Fruit
Ümit Zeki	Gemlik	Zümrütköy	Dimethoate	July-August	Bud and fruit
Ali Kankoru	Koroneiki	Serhatköy	Dimethoate ve Acetamiprid	Beginning of April and July	Flowering and fruit
Erkin Bilgin	Gemlik	Yeşilyurt	Dimethoate	August	Fruit
Hasan Ergel	Gemlik	Doğancı	Dimethoate	July-August	Bud and fruit
Hüseyin Mahmutoğlu	Cyprus local	Çamlıköy	Dimethoate	July	Fruit
Ziya Sezey	Piqual	Lefke	Dimethoate	June, July, August and September	Flowering and fruit

1st year data	GİRNE				
Producer	**Variety**	**Location**	**Active ingredient**	**Application date**	**Application period**
Serhat Usanmaz	Koroneiki	Akdeniz	Cypermethrin	Beginning of April and July	Flowering and fruit
Talip Sancar	Gemlik	Geçitköy	Dimethoate	May	Before and after of flowering
Ufuk Hacıelmas	Cyprus local	Lapta 1	Dimethoate	March	Flowering
Andaç Kireççi	Cyprus local	Lapta 2	Dimethoate	March and June	Bud and fruit
İrfan Candemir	Cyprus local	Zeytinlik	-	-	-
Tanser Nizam	Cyprus local	Karakum	Dimethoate	July	Fruit

Table 3. Second year data of survey orchards , pesticides used, application date and period (2016)

2nd year data	**GÜZELYURT**				
Producer	**Variety**	**Location**	**Active ingredient**	**Application date**	**Application period**
Erten Kurnaz	Cyprus local	Kalkanlı 1	Dimethoate	July and August	Fruit
Arife Kandulu	Gemlik	Kalkanlı 2	Dimethoate	June and July	Bud and fruit
Ümit Zeki	Gemlik	Zümrütköy	Dimethoate ve Delthamethrin	April, June, July and August	Flowering and fruit
Ali Kankoru	Koroneiki	Serhatköy	Dimethoate	May and July	Flowering and fruit
Hasan Ergel	Gemlik	Doğancı	-	-	-
Erkin Bilgin	Gemlik	Yeşilyurt	-	-	-
Hüseyin Mahmutoğlu	Cyprus local	Çamlıköy	Dimethoate	August	Fruit
Ziya Sezey	Piqual	Lefke	Dimethoate	June, July, August and September	Flowering and fruit

2nd year data	**GİRNE**				
Producer	**Variety**	**Location**	**Active ingredient**	**Application date**	**Application period**
Serhat Usanmaz	Koroneiki	Akdeniz	-	-	-
Talip Sancar	Gemlik	Geçitköy	Dimethoate	July	Fruit
Ufuk Hacıelmas	Cyprus local	Lapta	-	-	-
Andaç Kireççi	Cyprus local	Lapta	Dimethoate	May and September	Flowering and fruit
İrfan Candemir	Cyprus local	Zeytinlik	-	-	-
Tanser Nizam	Cyprus local	Karakum	Dimethoate	July	Fruit

Conclusions

The olive tree is attacked by various insect pests, which can cause considerable yield losses, and current olive cultivation involves regular use of plant protection products (Herz et al., 2005). Olive moth is one of the most important olive pests, specially it's first and second generations, which cause direct damages on flowers and fruits (Bjelis and Radunic, 2009). Current supression methods are based on chemical treatments, mostly with large spectrum of insecticides (Rojnic et al., 2018). During this study, the highest population was found in Lefke on 2015 and in Doğancı on 2016 for Güzelyurt region and for Girne region, the highest population was determined in Zeytinlik on 2015 and in Karakum on 2016, respectively.

Basically, the reason for the high population was the application time of chemicals in the first and second generations of Olive moth. During this study, the effective management method against the Olive moth was observed determination the correct period of insecticide application.

Conflict of Interest

The authors declare that there is no conflict of interest.

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