



Evaluation of population density of diamondback moth (DBM), *Plutella xylostella* (L.) (Lepidoptera: Plutellidae) on different canola varieties in Hatay province

Hatay ilinde farklı kanola çeşitleri üzerinde lahanaya yaprak güvesi, *Plutella xylostella* (L.) (Lepidoptera: Plutellidae)'nin popülasyon yoğunluğunun değerlendirilmesi

Nihat DEMİREL¹

¹Hatay Mustafa Kemal University, Faculty of Agriculture, Department of Plant Protection, Antakya-Hatay, Turkey.

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✉ Corresponding author: Nihat DEMİREL

✉: ndemirel@mkcu.edu.tr

Ö Z E T / A B S T R A C T

Aims: Evaluation of population density of the diamondback moth (DBM), *Plutella xylostella* (L.) (Lepidoptera: Plutellidae), on different canola varieties in Hatay province.

Methods and Results: The study was conducted in 2007-2009 to evaluate population density of diamondback moth on different canola varieties in Hatay province. The study was carried out in six different canola 'Hydromel', 'Elvis', 'Sarı', 'Lycosmos', 'Hunter' and 'Sory' varieties. Samplings were done by using a 45-cm diameter sweep-net, taking 25 (back-forth) sweep samples per site. The DBM larvae were sorted out from plant materials, counted and recorded for each of the sampling locality and canola variety in order to evaluate population density of *P. xylostella*. After three years of the study, the population density of pest varied in each of the sampling year and variety of canola. In 2007, a total of 348 DBM larvae were caught by sweep-net on five different canola varieties and canola fields. The largest mean of DBM larvae catches by sweep-net were recorded on 15 May on variety of 'Lycosmos'. In 2008, A total of 1009 DBM larvae were caught by sweep-net on four different canola varieties and eleven canola fields. The largest mean of catches by sweep-net were recorded on 10 April on variety of 'Elvis' (Atçana III), followed by variety of 'Hunter' (Demirköprü I), 'Sarı' (Demirköprü I), 'Lycosmos' (Demirköprü II). In 2009, a total of 75 DBM larvae were caught by sweep-net on canola variety. The largest number of DBM larvae catches by sweep-net were recorded on 22 April, followed by 20 May.

Conclusions: The highest number of the DBM larvae were caught by sweep-net in May, following in April in three years. In addition, the highest number of the DBM larvae were caught by sweep-net on variety of 'Lycosmos', following by 'Elvis', and 'Sarı' cultivars.

Significance and Impact of the Study: The diamondback moth is important pest of brassica vegetable and oilseed crops in Turkey. The highest number of the DBM larvae were caught by sweep-net in May, following in April during the sampling periods. In addition, the highest number of the DBM larvae were caught by sweep-net on variety of 'Lycosmos', following by 'Elvis', and 'Sarı' cultivars.

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INTRODUCTION

Canola (oilseed rape), (*Brassica napus* L.), is an important oil crop grown for use in animal feed consumption, vegetable oil and biodiesel production worldwide (Raymer, 2002; Karaosmanoğlu, 2004). Canola is the second largest oilseed crop providing 13% of the world's supply. Seeds of these species commonly contain 40% or more oil and produce meals containing 35-40% protein (Raymer, 2002). Many insect species causing damage to canola have been reported by researchers (Lamb, 1989; Talekar and Shelton, 1993; Brown et al., 1999; Gavloski et al., 2000; Atakan et al., 2005; Gu et al., 2007; Demirel, 2009). The diamondback moth (DBM), *Plutella xylostella* (L.) (Lepidoptera: Plutellidae), is a worldwide pest of brassica vegetable and oilseed crops (Scarbrick and Daniels, 1986; Shahidi, 1990; Talekar and Shelton, 1993; Capinera, 2002; Raymer, 2002; Mosiane et al., 2003; Wilkerson et al., 2005; Furlong et al., 2008; Zalucki et al., 2012; Furlong et al., 2013; Saran and Genç, 2021). Adults are 12-13 mm long with fringed wings and brown (Talekar and Shelton, 1993; Capinera, 2002; Atay et al., 2019). The larvae feed on the leaves of canola during the vegetative crop stage on growing tips during the bolting stage and on the flower and pods during the reproductive growth stages causing poor pod filling and reduced yield (Talekar and Shelton, 1993; Mosiane et al., 2003). The larvae caused crop losses of more than 90% (Zalucki et al., 2012) and 100% crop losses on cabbages (Mkize, 2003). The DBM is difficult to control with

insecticides because it develops rapidly through an ongoing series of overlapping generations and has great ability to evolve resistance to insecticides (Talekar and Shelton, 1993). The pheromone traps, sweep net sampling and individual plant examinations can be used to monitor the DBM on the different host plants (Talekar and Shelton, 1993). Sweep net sampling can determine the presence and general abundance of the species on host plants (Talekar and Shelton, 1993). The sweep net is very widely used for collecting different insect species on different types of vegetation (Southwood, 1978). Sweep net sampling has strong advantages of ease of use, the ability to sample different vegetation and the relatively low cost and also can be particularly useful when comparing relative numbers of insects over time (Southwood, 1978). The purpose of this study was to evaluate population density of diamondback moth, *Plutella xylostella* (L.) (Lepidoptera: Plutellidae) on different canola varieties in Hatay province.

MATERIALS and METHODS

Surveys were conducted in 2007-2009 in canola fields in Hatay province of Turkey. In 2007, samples were collected from five different canola fields with 'Hydromel', 'Elvis', 'Sarı', 'Lycosmos' and 'Sory' cultivars (Table 1). In 2008, field work was carried out on eleven canola fields with 'Elvis', 'Sarı', 'Hunter' and 'Lycosmos' cultivars. In addition, in 2009, study was carried out in one canola field with 'Elvis' cultivar.

Table 1. Sampling of *P. xylostella* on different localities, canola varieties, planted area (da) and sampling year in Hatay province

Localities	Varieties	Planted area (da)	Sampling year
Atçana I	Hydromel	9	2007
Atçana II	Elvis	40	2007
Atçana III	Sarı	30	2007
Kayıboyu	Lycosmos	80	2007
Kumlu	Sory	30	2007
Atçana I	Elvis	40	2008
Atçana II	Elvis	30	2008
Atçana III	Elvis	30	2008
Demirköprü I	Sarı	9	2008
Demirköprü I	Hunter	9	2008
Demirköprü II	Sarı	15	2008
Demirköprü II	Lycosmos	16	2008
Demirköprü II	Hunter	8	2008
Demirköprü III	Sarı	45	2008
Demirköprü III	Hunter	5	2008
Demirköprü IV	Sarı	40	2008
Atçana	Elvis	50	2009

Samples were collected by sweep-net every fifteen days in 2007 and 2008 and were collected weekly in 2009. Samplings were done by using a 45-cm diameter sweep-net, taking 25 (back-forth) sweep samples per site. All samples were done by the same person, usually a straight line transect across the sample site. Samples were immediately placed into (0.5 L) plastic jars containing 96% ethyl alcohol and returned to the lab for evaluation. The diamondback moth larvae were sorted out from plant materials, counted and recorded for each of the sampling locality and canola variety. All data were

analyzed by analysis of variance (ANOVA) with using the SAS software (SAS Institute Inc., 1998).

RESULTS and DISCUSSION

Population density of *P. xylostella* varied in each of the sampling year and variety of canola. In the first year, the sweep-net sampling was conducted on five different canola varieties and a total of 348 DBM larvae were caught by sweep-net (Figure 1). The population density of this pest was varied during the sampling period.

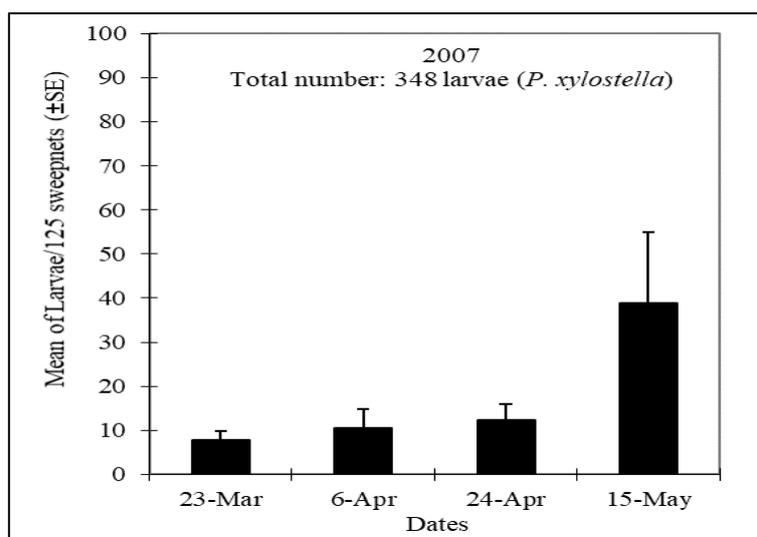


Figure 1. Mean (±SE) of DBM larvae caught by sweep-net on canola varieties in Hatay province

The largest mean of catches by sweep-net were recorded on 15 May (38.8), followed by 24 April (12.4), 6 April (10.6) and 23 March (7.8), respectively.

Population density of the DBM larvae was varied for each of the sampled canola variety (Figure 2). The

largest mean of the DBM larvae were caught by sweep-net on variety of 'Lycosmos' with 30.75, followed by variety of 'Sari' with (17.25), 'Hydromel' with (16.25), 'Elvis' with (13.50), 'Sory' with (9.25), respectively.

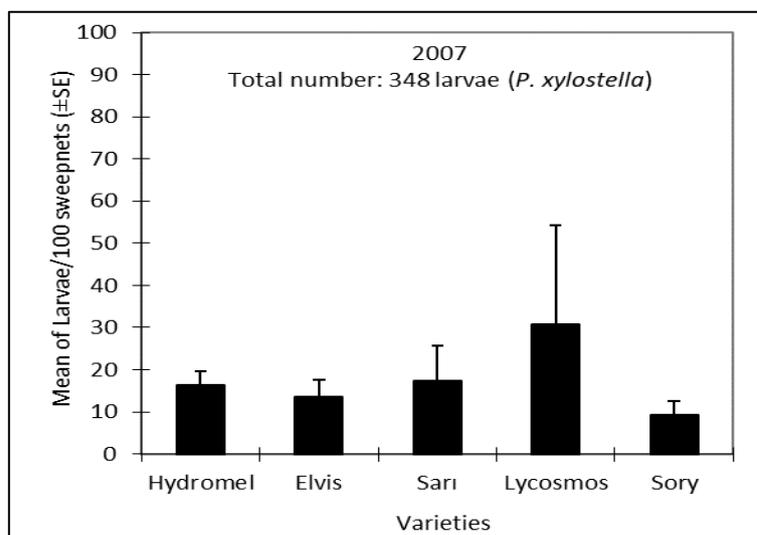


Figure 2. Mean (±SE) of DBM larvae caught by sweep-net on canola varieties in Hatay province

In the second year, the sweep-net sampling was conducted on four different canola varieties in eleven canola fields. A total of 1009 DBM larvae were caught by sweep-net (Figure 3). Population density of the pest was varied during the sampling period. The largest mean of

catches by sweep-net were recorded on 10 April (43.64), followed by 07 May (18.18), 27 March (16.09), 24 April (10.09), 14 May (2.27), 13 March (1.36) and 28 February (0.09), respectively.

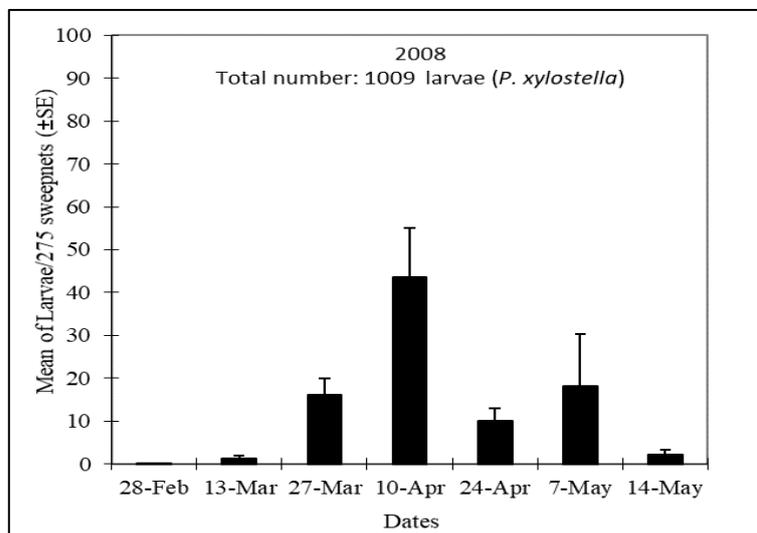


Figure 3. Mean (±SE) of DBM larvae caught by sweep-net on canola varieties in Hatay province

The population density of DBM larvae was varied for each of the sampled canola variety (Figure 4). The largest mean of DBM larvae were caught by sweep-net on variety of 'Elvis' (Atçana III) with 23.00, followed by variety of 'Hunter' (Demirköprü I) with 21.57, 'Sarı' (Demirköprü I) with 18.43, 'Lycosmos' (Demirköprü II)

with 16.86, 'Elvis' (Atçana II) with 16.43, 'Sarı' (Demirköprü II) with 13.14, 'Elvis' (Atçana I) with 12.86, 'Hunter' (Demirköprü II) with (10.86), 'Hunter' (Demirköprü III) with 5.43, 'Sarı' (Demirköprü IV) with 3.14, and 'Sarı' (Demirköprü III) with 2.43, respectively.

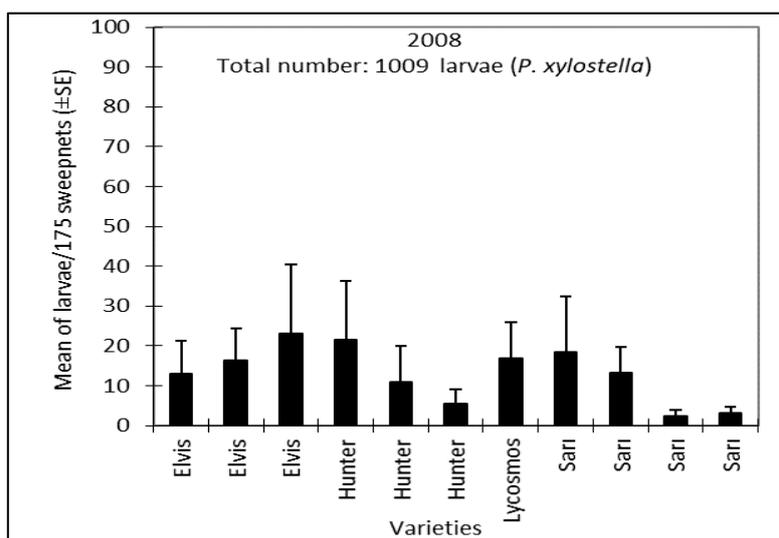


Figure 4. Mean (±SE) of DBM larvae caught by sweep-net on canola varieties in Hatay province

In the third year, the sweep-net sampling was conducted at one canola variety. A total of 75 DBM larvae were caught by sweep-net (Figure 5). The population density of this pest was varied during the sampling period. The

largest number of catches by sweep-net were recorded on 22 April (31), followed by 20 May (14), 29 April (10), 15 April (8), 1 April (6), 8 April (2) and 6 May (2), 13 May and 27 May (1), respectively.

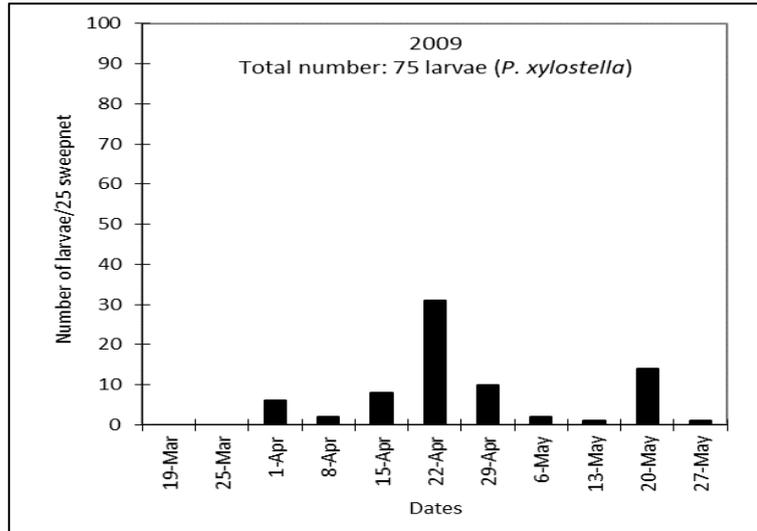


Figure 5. Mean (\pm SE) of DBM larvae caught by sweep-net on canola variety in Hatay province

The diamondback moth is a significant pest of brassica vegetables and oilseed crops (Calderson and Hare, 1986; Philip and Mengersen, 1989; Talekar and Shelton, 1993; Dossdall, 1994; Capinera, 2002; Mkize, 2003; Mosiane et al., 2003; Wilkerson et al., 2005; Furlong et al., 2008; Zalucki et al., 2012, Furlong et al., 2013). The seasonal population dynamics of *P. xylostella* on brassica vegetables was studied by Sachan and Srivastava (1972) and Jayarathnam (1977). The highest larval population density was recorded during February-March and August-September. In addition, Kuwahara et al. (1996) recorded consistently high larval populations during March-May. Moreover, Nagarkatti and Jayanth (1982) and Ahmad and Ansari (2010) reported the population density of larva was higher during July-September than other seasons.

In conclusions, the diamondback moth is an important pest of brassica vegetable and oilseed crops in Turkey. After three years of the study, the population density of the pest varied in each of the sampling year and variety of canola. In 2007, a total of 348 DBM larvae were caught by sweep-net on five different canola varieties and canola fields. The largest mean of DBM larvae catches by sweep-net were recorded on 15 May on variety of 'Lycosmos'. In 2008, A total of 1009 DBM larvae were caught by sweep-net on four different canola varieties and eleven canola fields. The largest mean of catches by sweep-net were recorded on 10 April on variety of 'Elvis' (Atçana III), followed by variety of 'Hunter' (Demirköprü I), 'Sarı' (Demirköprü I), 'Lycosmos' (Demirköprü II). In 2009, a total of 75 DBM larvae were caught by sweep-net on canola variety. The largest number of DBM larvae catches by sweep-net were recorded on 22 April, followed by 20 May. The highest number of the DBM larvae were caught by sweep-net in May, following in April in three years. In addition, the highest number of

the DBM larvae were caught by sweep-net on variety of 'Lycosmos', followed by 'Elvis', and 'Sarı' cultivars. The highest number of the DBM larvae were caught by sweep-net in May, following in April during the sampling period. In addition, the highest number of the DBM larvae were caught by sweep-net on variety of 'Lycosmos', following by 'Elvis', and 'Sarı' cultivars.

ÖZET

Amaç: Hatay ilinde farklı kanola çeşitleri üzerinde lahana yaprak güvesi, *Plutella xylostella* (L.) (Lepidoptera: Plutellidae)'nin popülasyon yoğunluğunun değerlendirilmesi

Yöntem ve Bulgular: Çalışma 2007-2009 yıllarında Hatay ilinde farklı kanola çeşitleri üzerinde lahana yaprak güvesi popülasyon yoğunluğunun değerlendirilmesi amacıyla yürütülmüştür. Çalışma altı farklı kanola 'Hydromel', 'Elvis', 'Sarı', 'Lycosmos', 'Hunter' ve 'Sory' çeşitlerinde yürütülmüştür. Örneklemeler her kanola tarlasından 45 cm çapında atrapla 25 (ileri-geri) şeklinde alınmıştır. Lahana yaprak güvesi larvalarının popülasyon yoğunluğunu değerlendirmek için örnekleme yeri ve kanola çeşidine göre bitki materyallerinden seçilmiş, sayılmış ve kaydedilmiştir. Çalışmadan üç yıl sonra, zararlının popülasyon yoğunluğu, örnekleme yılı ve kanola çeşidinin her birinde değişiklik göstermiştir. 2007 yılında beş farklı kanola çeşidi ve kanola tarlasından toplam 348 adet lahana yaprak güvesi larvası atrap ile yakalanmıştır. Atrap tarafından yakalanan lahana yaprak güvesinin larvalarının en büyük ortalaması 15 Mayıs'ta 'Lycosmos' çeşidinde kaydedildi. 2008 yılında dört farklı kanola çeşidinde ve on bir kanola tarlasında toplam 1009 adet lahana yaprak güvesi larvası atrap ile yakalanmıştır. Atrap ile en yüksek ortalama yakalama 10

Nisan'da 'Elvis' (Atçana III) çeşidinde kaydedilirken, bunu 'Hunter' (Demirköprü I), 'Sarı' (Demirköprü I), 'Lycosmos' (Demirköprü II) izlemiştir. 2009 yılında kanola çeşidinde toplam 75 adet lahana yaprak güvesi larvası atrap ile yakalanmıştır. Atrap ile en fazla sayısı lahana yaprak güvesi larvası 22 Nisan'da yakalanmış, bunu 20 Mayıs takip etmiştir.

Genel Yorum: üç yıl boyunca, atrap ile en yüksek sayıda DBM larvaları Mayıs ayında yakalanmış olup, bunu Nisan ayı takip etmiştir. Ayrıca atrap ile en fazla lahana yaprak güvesi larvası 'Lycosmos' çeşidinde yakalanmış, bunu 'Elvis' ve 'Sarı' çeşitleri izlemiştir.

Çalışmanın Önemi ve Etkisi: Lahana yaprak güvesi Türkiye'deki Brassicaceae familyasına ait sebze ve yağlı tohum bitkilerinde önemli bir zararlıdır. Örnekleme süresince atrap ile en yüksek sayıda lahana yaprak güvesi larvası Mayıs ayında yakalanmış olup bunu Nisan ayı takip etmiştir. Ayrıca atrap ile en fazla sayıda lahana yaprak güvesi larvası 'Lycosmos' çeşidinde yakalanmış, bunu 'Elvis' ve 'Sarı' çeşitleri izlemiştir.

Anahtar Kelimeler: Lahana yaprak güvesi, *Plutella xylostella*, kanola, Hatay.

CONFLICT OF INTEREST

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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