ISPEC Tarım Bilimleri Dergisi, 9(1): 268-276, 2025
ISPEC Journal of Agricultural Sciences, 9(1): 268-276, 2025
DOI: https://doi.org/10.5281/zenodo.14843299

Efficacy of Trap Types on the Attractiveness of *Kermania pistaciella* Amsel, 1964 (Lepidoptera: Tineidae)

Halil DİLMEN [1*], Cevdet KAPLAN [1]
[1] Siirt University, Faculty of Agriculture, Department of Plant Protection, Siirt
[*]Corresponding author: halildilmen@siirt.edu.tr

Abstract
Kermania pistaciella Amsel. (Lepidoptera: Tineidae) is a critical pest in pistachio cultivation, leading to significant yield loss and quality degradation. This study was conducted to evaluate the effectiveness of Delta, Funnel, and Pherecon trap types in attracting adult *K. pistaciella*. Statistical analyses were performed using ANOVA to assess the mean differences between the trap types. The results showed that the Delta trap had a significantly higher capture rate than the other two traps. The average number of adults caught by the Delta, Funnel, and Pherecon traps were 579.67, 403.67, and 380.00, respectively. The Delta trap peaked at an average of 600 adults captured at the end of April and early May, while the Funnel and Pherecon traps showed lower capture rates during this period. From May 23 to June 8, 2022, capture rates decreased across all traps. The Delta trap captured an average of 55.77 more adults than the Funnel trap and 46.92 more than the Pherecon trap, with these differences being statistically significant ($p<0.01$). However, no significant difference was observed between the Funnel and Pherecon traps ($p > 0.05$). Additionally, the interaction between trap types and time factors was also found to be significant ($p<0.05$).

Research Article

Article History
Received :03.11.2024
Accepted :20.12.2024

Keywords
Kermania pistaciella
capture rate
pest control
trap effectiveness

1. Introduction

Pistachio (*Pistacia vera* L.) is one of the most economically valuable agricultural products in Türkiye. Türkiye ranks third in the world for pistachio production, following Iran and the United States, contributing approximately 23.37% of global production (FAO, 2024). In Türkiye, pistachios are primarily cultivated in the southeastern provinces. The Siirt variety, characterized by its large size, broad cracking range, and white shell, is particularly notable and is in high demand both domestically and internationally. Pistachio orchards in Türkiye are threatened by various insect pests that cause significant yield and quality losses. Among these, *Kermania pistaciella* (Lepidoptera: Tineidae), commonly known as the pistachio twig borer, is one of the most widespread and destructive species. It is particularly prevalent in the southeastern region where pistachio cultivation is concentrated (Küçükarslan, 1966; Bolu, 2002; Kaplan et al. 2018; Kaplan and Çiftçi, 2021). Similarly, in Iran, *K. pistaciella* is the most common and significant pest in pistachio orchards (Mehrnejad, 2002). *Kermania pistaciella* completes one generation per year and overwinters as a mature larva in the fourth instar within twigs. Adult emergence begins in early April, and after mating, females lay their eggs on new shoots or the tips of fruit clusters. The larvae penetrate one- and two-year-old shoots and fruit clusters, feeding on the xylem and pith, which causes weakening, wilting, and fruit drop (Küçükarslan, 1966; Anonymous, 2011; Tezerji, 2011; Fakhhri and Abbasipour, 2019). The first study on the biology of *K. pistaciella* in Türkiye was conducted by Küçükarslan (1966) in the pistachio orchards of Gaziantep. Subsequent studies in Türkiye and Iran have focused on the population dynamics, adult flight patterns, chemical control, mass trapping, and parasitoids of *K. pistaciella* (Achterberg and Mehrnejad, 2002; Özgen et al., 2012; Yanık and Yıldırım, 2016; Beyarslan and Sahan, 2019; Fakhhri and Abbasipour, 2019).

Insecticide applications are commonly used to control *K. pistaciella* populations in both Iran and Türkiye. However, the indiscriminate and untimely use of insecticides poses a serious threat to natural enemies. Therefore, insecticide applications against *K. pistaciella* should be carefully timed to target the pest during its peak activity period while minimizing the impact on parasitoids (Mehrnejad, 2002; Özgen et al., 2012). To mitigate the negative effects of chemical insecticides, environmentally friendly approaches have been sought. For this purpose, the sex pheromone of *K. pistaciella* has been identified and is now used to monitor male activity and determine the optimal timing for insecticide applications (Gries et al., 2006).

In the southeastern region of Türkiye, the widespread distribution of *K. pistaciella* can be attributed to inadequate knowledge of its biology, insufficient cultural control measures, and improper timing of chemical treatments (Bolu, 2002). While several studies have been conducted on the biology, distribution, parasitoids, parasitism rates, chemical control, and mass trapping of *K. pistaciella* in Türkiye (Küçükarslan, 1966; Özgen et al., 2012; Yanık and Yıldırım, 2016), similar research has also been carried out in Iran, focusing on chemical control, parasitism rates, parasitoids, population dynamics, and the best pheromone trap types (Mehrnejad, 2002; Abbaszadeh et al., 2006; Zamani et al., 2012; Fakhhri and Abbasipour, 2019).

Understanding the biology, flight patterns, and population dynamics of pest species in cultivated plants is crucial for effective pest management. This knowledge is essential for determining the timing of non-chemical control methods, the release of natural enemies, the appropriate timing of chemical applications, and the deployment of pheromone traps (Bassirat, 2008). In recent years, pheromones and other attractants have been increasingly used to develop mass trapping methods for pest management, which are essential components of pest control programs worldwide (Carde, 1990; Cronin et al., 2000; Devetak et al., 2015). The population density, seasonal occurrence, and flight patterns of pest species can vary between

regions, influenced by factors such as temperature and relative humidity.

In Siirt province, recent increases in humidity and changes in temperature, partly due to the construction of dams, have led to an increase in the population density of pests in pistachio orchards. Pistachio producers in this region are making significant efforts to combat these pests. To develop the most effective control methods against *K. pistaciella*, it is necessary to investigate the seasonal population fluctuations of the pest, identify the most effective trap type for monitoring the pest, and determine the optimal duration for deploying these traps in orchards. Recent studies in Siirt (Kaplan and Ciftci, 2021) have observed that pistachio producers use different types of traps to monitor this pest. This study aims to investigate whether different trap types used in Siirt have varying effectiveness in attracting *K. pistaciella* adults and to identify the most effective trap type for use in regional mass trapping programs.

2. Materials and Methods

This study was conducted in 2022 in a pistachio orchard located in İkizbağlar village, central Siirt district (37° 58' 47.66" N, 41° 58' 41.10" E). The orchard consisted of 20-25-year-old productive pistachio trees of the Siirt variety, planted with a row spacing of 8 meters and an intra-row spacing of 4 meters. The orchard was well-maintained, with regular pruning and cultivation practices.

2.1 Field trials

A single type of sexual pheromone was used in the experiment, and three different trap types were compared. The experiment was designed based on a randomized block design, with traps randomly placed within each block. The traps were spaced at least 30 meters apart and hung on trees, positioned at a height of 1.5 to 2 meters on branches facing south. The traps were deployed in March and remained in the orchard until the end of the adult flight period. The traps were inspected 1-2 times per week, and the captured adult moths were counted, with the traps and debris cleaned during each check. The sexual pheromone used was obtained from Verim İnşaat, while the trap types included Delta, Pherecon, and Funnel traps.

2.2. Statistical analysis

The performance of the three trap type (Delta, Funnel, and Pherecon) was evaluated by comparing the capture rates of *Kermania pistaciella*. A two-way ANOVA was conducted using SPSS software to assess the effects and interactions between trap types and sampling times on capture rates.

3. Results and Discussion

The effectiveness of Delta, Funnel, and Pherecon traps in capturing *Kermania pistaciella* adults was evaluated over time. Data collection occurred between March 28, 2022, and June 6, 2022, capturing the pest's active flight period from March to early June. The results provide valuable insights into the population dynamics of the pest and the performance of different trap types across various periods. The average capture rates of *Kermania pistaciella* in the three trap types (Delta, Funnel, and Pherecon) over time are presented in Figure 1. During the initial period from March 28 to April 18, the capture rates for all three trap types were low, with almost no adults being caught in Delta and Funnel traps. Similarly, Pherecon traps also exhibited low capture rates during this period. However, between April 25 and May 2, there was a significant increase in the capture rates across all trap types. Notably, Delta traps reached their peak, capturing an average of 600 adults, followed by Funnel traps, which captured approximately 400 adults. Pherecon traps, although exhibiting lower capture rates, showed a noticeable increase with around 200 adults. In the period from May 9 to May 16, a decline in capture rates was observed. Although Delta traps still maintained the highest capture rates, the numbers had significantly decreased. Funnel and Pherecon traps followed a similar trend, with reduced capture rates. By the period between May 23 and June 6, capture rates continued to decline across all trap types, with the number of

captured adults approaching near-zero levels. Overall, Delta traps demonstrated the highest capture efficiency, peaking at the end of April and early May. Funnel traps had the second-highest capture rates, though consistently lower than Delta traps. Pherecon traps had the lowest capture rates among the three but were still effective during specific periods. These findings highlight the population dynamics of *K. pistaciella* and the varying effectiveness of different trap types over time. While Delta traps emerged as the most effective, all three traps proved useful for monitoring the pest population during different periods (Figure 1).

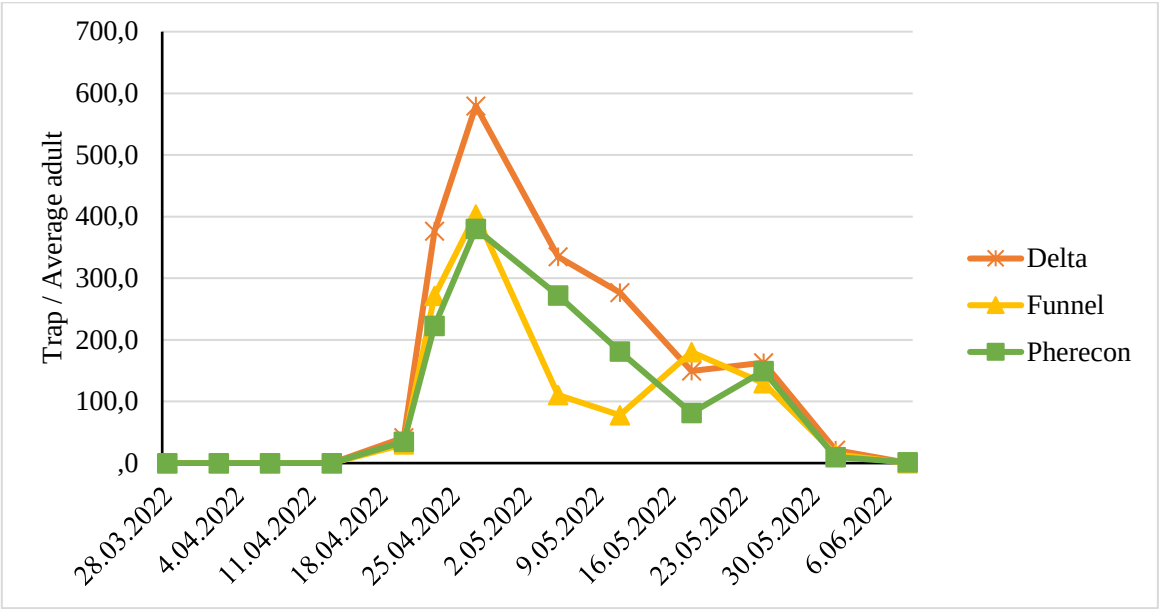

Figure 1. Average capture rates of *Kermania pistaciella* in three different trap types

In our study, the average capture rates and standard deviations of *K. pistaciella* using Delta, Funnel, and Pherecon traps on specific dates are presented in Table 1. The Delta trap showed the highest average number of adults captured, reaching 579.6 adults on April 27, 2022. In the Funnel trap, an average of 403.6 adults were captured during the same period. The Pherecon trap had the lowest capture rates compared to the other two traps, with an average of 380 adults, making it the least effective during this period. All traps exhibited high capture rates during the peak period of the pest population, with a subsequent decline in capture rates thereafter. These results allow us to compare the effectiveness of different trap types and understand the population dynamics of the pest.

Table 1. Average capture rates and standard deviations of *Kermania pistaciella* in Delta, Funnel, and Pherecon traps

Traps	Time	Mean	Std. Deviation	N
Delta	28.03.2022	.00	.00	3
	2.04.2022	.00	.00	3
	7.04.2022	.00	.00	3
	13.04.2022	.00	.00	3
	20.04.2022	41.33	10.21	3
	23.04.2022	376.33	89.12	3
	27.04.2022	579.67	36.61	3
	5.05.2022	335.00	161.98	3
	11.05.2022	276.67	143.79	3
	18.05.2022	149.67	130.99	3
	25.05.2022	163.00	101.35	3
	1.06.2022	21.00	13.45	3
	8.06.2022	.33	.57	3
	Total	149.46	195.28	39
Funnel	28.03.2022	.00	.00	3
	2.04.2022	.00	.00	3
	7.04.2022	.00	.00	3
	13.04.2022	.00	.00	3
	20.04.2022	30.33	12.58	3
	23.04.2022	271.33	79.75	3
	27.04.2022	403.67	124.23	3
	5.05.2022	110.67	19.75	3
	11.05.2022	77.667	6.80	3
	18.05.2022	180.00	196.73	3
	25.05.2022	129.67	120.03	3
	1.06.2022	14.67	18.471	3
	8.06.2022	.00	.00	3
	Total	93.6923	138.11916	39
Pherecon	28.03.2022	.00	.00	3
	2.04.2022	.00	.00	3
	7.04.2022	.00	.00	3
	13.04.2022	.00	.00	3
	20.04.2022	34.67	12.51	3
	23.04.2022	222.67	49.89	3
	27.04.2022	380.00	96.43	3
	5.05.2022	272.00	31.19	3
	11.05.2022	181.33	41.18	3
	18.05.2022	81.67	30.00	3
	25.05.2022	149.33	76.02	3
	1.06.2022	9.67	7.37	3
	8.06.2022	1.67	1.52	3
	Total	102.53	128.34	39

The statistical analysis of the mean differences in capture rates of *K. pistaciella* between Delta, Funnel, and Pherecon traps is presented in Table 2. The Delta trap captured an average of 55.77 more adults than the Funnel trap, and this difference was statistically significant ($p = 0.001$) (Table 2). Additionally, the Delta trap captured an average of 46.92 more adults than the Pherecon trap, with this difference also found to be statistically significant ($p = 0.003$) (Table 2). On the other hand, the Funnel trap captured an average of 8.85 more adults than the Pherecon trap; however, this difference was not statistically significant ($p = 0.568$) (Table 2). In conclusion, the Delta trap had significantly higher capture rates compared to both the Funnel and Pherecon traps. No

significant difference was observed between the Funnel and Pherecon traps. These results indicate that the Delta trap is more effective for monitoring and controlling *K. pistaciella*.

Table 2. Statistical analysis of the mean differences in capture rates of *Kermania pistaciella* between Delta, Funnel, and Pherecon traps

Traps		Mean Difference	Std. Error	P value
Funnel	Delta	-55.7692	15.43209	.001*
	Pherecon	-8.8462	15.43209	.568
Pherecon	Delta	-46.9231	15.43209	.003*
	Funnel	8.8462	15.43209	.568

*p-values < 0.05 indicate significant differences between comparisons.

The effects of the trap types analyzed in this study were found to be statistically significant ($p = 0.001$) (Table 3). Similarly, the effect of the time factor was also statistically significant ($p = 0.000$) (Table 3). The interaction between trap types and the time factor was found to be statistically significant ($p = 0.034$) (Table 3). These results demonstrate that both trap types and the time factor, when considered independently or together, lead to significant differences.

Table 3. Statistical analysis results of the interaction effects of trap types and the time factor

Source	Sum of Squares	df	Mean Square	F	P value
Trap	70073.077	2	35036.538	7.545	.001
Time	2242525.880	12	186877.157	40.241	.000
Trap * Time	195376.479	24	8140.687	1.753	.034
Error	362225.333	78	4643.915		
Corrected Total	2870200.769	116			

*p-values < 0.05 indicate significant differences between comparisons

The Delta trap showed the highest average catch rate. Funnel and Pherecon traps had similar average catch rates, both significantly lower than the Delta trap. Statistical analysis confirmed that the Delta trap was significantly different from and outperformed the other two trap types (Figure 2). These findings highlight that the Delta trap is the most effective for capturing the pest, while Funnel and Pherecon traps exhibited comparable performance. This suggests that the Delta trap should be preferred when developing strategies for monitoring adult populations of *K. pistaciella*.

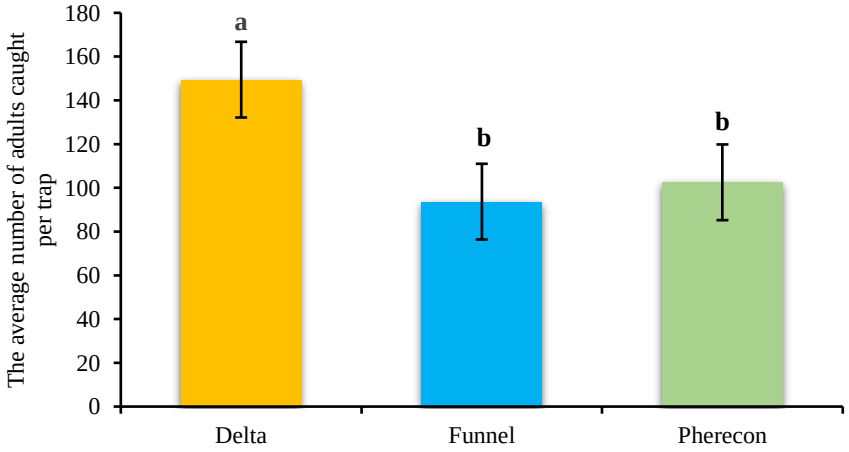

Figure 2. Average number of adult *Kermania pistaciella* caught per trap type (Delta, Funnel, and Pherecon). Different letters above the bars indicate statistically significant differences between trap types ($p < 0.05$).

Studies comprehensively examining the effects of different trap designs on pest insects worldwide are quite limited. This study found that the Delta trap exhibited a significantly

higher capture rate compared to two other trap types. The superior performance of the Delta trap suggests it can be an effective tool for controlling moth populations. Similar results were obtained in Fakhri and Abbasipour's (2019) study, which indicated that Delta traps had higher capture rates compared to other trap types for monitoring *Kermania pistaciella* populations. However, Zamani et al., (2012) reported in a study conducted in Iran that Funnel traps were more effective than Delta traps for capturing *K. pistaciella*. This discrepancy highlights that local ecosystem conditions and application methods can significantly influence trap performance. Other research on different pests has also revealed similar variations in trap effectiveness. For instance, Athanassiou et al. (2002) reported in a study conducted in Greece that Funnel traps captured approximately 4.2 and 29.9 times more *Pectinophora gossypiella* than Delta and Pherocon II traps, respectively. Athanassiou et al., (2004) found that Funnel traps were more attractive than other trap types for capturing male *Palpita unionalis* in olive groves. In Turkey, a study conducted in Ankara and Çankırı on mass trapping of the Cherry Fruit Fly (*Rhagolethis cerasi*) evaluated trap types and various attractants. The study concluded that the visual yellow sticky Rebell trap combined with ammonium capsules was the most effective combination. Four of these trap combinations per tree were deemed sufficient for effective mass trapping (Özdem and Kılınçer, 2009). Additionally, Casagrande et al., (1994) tested three trap types (vertical trap, tent trap, and 3D trap) against the Cherry Fruit Fly (*Rhagolethis cerasi L.*) in Italy during 1993-1994. The visual sticky trap (vertical trap) captured significantly more adults than the other traps. Moreover, the effect of trap type, color, and placement on capturing pest species has been addressed in various studies (Whitfield et al., 2019; Cruz-López et al., 2020; Sabbahi and Azzaoui, 2022; Hosang et al., 2022; Uluca and Ak, 2023). These findings emphasize that trap design and application conditions are crucial factors influencing pest control success and underscore the need for a comprehensive evaluation of these factors.

4. Conclusion

The data obtained from this study demonstrate that the Delta trap is the most effective trap for capturing *Kermania pistaciella* populations. The Delta trap showed the highest average moth capture rate, making it the most effective trap for combating the Pistachio Nut Borer ($p = 0.001$). Funnel and Pherecon traps, on the other hand, presented similar capture rates but exhibited lower efficacy compared to the Delta trap ($p < 0.05$). These results provide valuable information for optimizing pest management strategies. In conclusion, the Delta trap has been identified as the most effective tool for controlling moth populations and should be prioritized in pest control programs. However, considering the impact of local ecosystem conditions and other environmental factors, Funnel and Pherecon traps may also be used as supplementary control tools. Future research should focus on further improving trap designs and placement strategies to support these findings and enhance the effectiveness of integrated pest management programs.

Declaration of Author Contributions

The authors declare that they have contributed equally to the article. All authors declare that they have seen/read and approved the final version of the article ready for publication.

Declaration of Conflicts of Interest

All authors declare that there is no conflict of interest related to this article.

Funding

This research received no external funding.

References

Abbaszadeh, G., Seiedoleslami, H., Samih, M.A., Hatami, B. 2006. Bioecology of pistachio twig borer moth *Kermania pistaciella* Amsel, in Rafsanjan and Isfahan-Iran. *Communications in Agricultural and Applied Biological Sciences*, 71(2b): 563-569.

Achterberg, C., Mehrnejad, M.R., 2002. The braconid parasitoids (Hymenoptera: Braconidae) of *Kermania pistaciella* Amsel (Lepidoptera: Tineidae: Hieroxestinae) in Iran. *Zoologische Mededelingen*, 76: 27–39.

Anonymous, 2011. Technical instruction of integrated management of pistachio [Antepfıstığı Entegre Mücadele Teknik Talimatı].- T.C. Ministry of Food, Agriculture and Livestock, General Directorate of Agricultural Research and Policies, Department of Plant Health Research, Ankara, Turkey.

Athanassiou, C.G., Kavallieratos, N.G., Mazomenos, B.E., 2004. Effect of trap type, trap color, trapping location, and pheromone dispenser on captures of male *Palpita unionalis* (Lepidoptera: Pyralidae). *Journal of Economic Entomology*, 97(2): 321-329.

Athanassiou, C.G., Kavallieratos, N.G., Gravanis, F.T., Koukounitsa, N.A., Roussou, D.E., 2002. Influence of trap type, pheromone quantity and trapping location on capture of the pink bollworm, *Pectinophora gossypiella* (Saunders) (Lepidoptera:Gelechiidae). *Applied Entomology and Zoology*, 37(3): 385-391.

Bassirat, M., 2008. Estimating the heat requirements for Pistachio twig moth, *Kermania pistaciella* Amsel in field condition. *Journal of Science and Technology of Agriculture and Natural Resources*, 12(45): 339-349.

Beyarslan, A., Şahan, Y.B., 2019. A new species of Chelonini (Hymenoptera: Braconidae) from pistachio twig borer moth (*Kermania pistaciella* Amsel (Lep.: Tineidae)) in Gaziantep. *Turkish Journal of Zoology*, 43(4): 388-392.

Bolu, H., 2002. Investigations on the fauna of insects and mites in pistachio areas in South Eastern Anatolia Region of Turkey.- *Türkiye Entomoloji Dergisi*, 26(3): 197-208.

Carde, RT., 1990. Principles of mating disruption. In Ridgway, R.L., Silverstein, R.M. and Inscoe, M.N. (Eds). Behavior-modifying chemicals for insect management, applications of pheromones and other attractants. Marcel Dekker, INC, New York. pp. 47-71.

Casagrande, E., Molinari F., Cravedi, P., Bertonazzi, C., 1995. Evaluation of new attractants and traps for the monitoring of the cherry fruit flay, *Rhagoletis cerasi* L. *IOBC WPRS Bulletin*, 18(2):31-34.

Cronin, J.T., Hayes, J.L., Turchin, P., 2000. Evaluation of traps used to monitor southern pine beetle aerial populations and sex ratios. *Agricultural and Forest Entomology*, 2(1): 69-76.

Cruz-López, L., Vázquez, M.A., Castillo, A., 2020. Effectiveness of the sex pheromone for monitoring *Stenoma catenifer* (Lepidoptera: Elachistidae) in avocado orchards. *Neotropical Entomology*, 49: 332-336.

Devetak, M., Bohinc, T., Kač, M., Trdan, S., 2015. Seasonal dynamics of the cabbage armyworm (*Mamestra brassicae* L.) and the bright line brown-eyes moth (Mamestra oleraceae L.) in Slovania. *Horticultural Science*, 41: 80-88.

Fakhri, N., Abbasipour, H., 2019. Population fluctuations of the pistachio twig borer, *Kermania pistaciella* Amsel, 1964 (Lep.: Oinophylidae) using delta pheromone trap. *Acta agriculturae Slovenica*, 114(1):13.

FAO, 2024. Crops and livestock products. Food and Agriculture Organization (FAO) of the United Nations. Available at https://www.fao.org/faostat/en/#data/QCL (Accessed: 03.08.2024).

Gries, R., Khaskin, G., Daroogheh, H., Mart, C., Karadag, S., Er, M.K., Grie, G. 2006. (2 S, 12 Z)-2-Acetoxy-12-heptadecene: major sex pheromone component of pistachio twig borer, *Kermania pistaciella*. *Journal of Chemical Ecology*, 32: 2667-2677.

Hosang, M.L.A., Maskromo, I., Alouw, J.C., 2022. Comparative effectiveness of three types of pheromones against *Rhynchophorus vulneratus* (Panzer) and *Oryctes rhinoceros* (L.) in Indonesia. In: *IOP Conference Series: Earth and Environmental Science*, v: 974, p 012090. Institute of Physics Publishing.

Küçükarslan, N., 1966. ntep Fıstıklarında zarar yapan fıstık dal güvesi (*Kermanıa Pistaciella* Amsel, Lep. - Oinophilidae)'nin biyoloji ve savaşı üzerinde bazı incelemeler, Ankara: Ankara Üniversitesi Ziraat Fakültesi Bitki Koruma Kürsüsü.

Kaplan, C., Çiftçi, M.C., Çakmak, S., 2018. Insect pests in pistachio producing areas of Turkey. *Ejons 4. International Congress on Mathematic, Engineering and Natural Sciences-IV*, Congress Prooceding Books, p:10-16, Kiev, Ukraine.

Kaplan, C., Çiftçi, M.C., 2021. Population fluctuations of the Pistachio twig borer, *Kermania pistaciella* Amsel and its parasitoids. *Fresenius Environmental Bulletin*, 30(5): 5476-548.

Mehrnejad, M.R., 2002. The natural parasitism ratio of the pistachio twig borer moth, *Kermania pistaciella*, in Iran. *Acta Horticultrae*, 591: 541-544.

Özdem, A., Kılıner, N., 2009. The effectiveness of the trap types and lures used for mass trapping to control Cherry fruit fly [*Rhagoletis cerasi* (L., 1958)] (Diptera: Tephritidae). 4(2): 371-377.

Özgen, I., Bolu, H., Beyarslan, A., 2012. *Chelonus flavipalpis* Szépligeti, 1896 and *Mirax rufilabris* Haliday, 1833 (Hymenoptera: Braconidae): two new larva-pupa parasitoids of Pistachio twig borer *Kermania pistaciella* Amsel, 1964 (Lepidoptera: Oinophilidae) with the parasitization ratios from Turkey. *Munis Entomology & Zoology*, 7(1): 238-242.

Sabbahi, R., Azzaoui, K., 2022. The effectiveness of pheromone traps in controlling the tomato leafminer, *Tuta absoluta*, in the United Arab Emirates. *Journal of Plant Diseases and Protection*, 129(2): 367-374.

Tezerji, Z.S., 2011. Determination of damages of pistachio twig borer moth *Kermania pistaciella* Amsel, to fruit cluster of pistachio trees. *Acta Horticulturae*, 912: 701-707.

Uluca, M., Ak, K., 2023. Evaluation of the Effectiveness of Different Trap Types and Pheromones against *Halyomorpha halys* (Hemiptera: Pentatomidae). *Black Sea Journal of Agriculture*, 6(5): 516-523.

Whitfiel, E.C., Lobos, E., Cork, A., Hall, D.R., 2019. Comparison of different trap designs for capture of noctuid moths (Lepidoptera: Noctuidae) with pheromone and floral odor attractants. *Journal of Economic Entomology*, 112(5): 2199-2206.

Yaniki, E., Yildirim, Y., 2016. Effectiveness of mass trapping for control of the pistachio twig borer, *Kermania pistaciella*. *Bulletin of Insectology*, 69(1): 35-40.

Zamani, Z., Khajehali, J., Sabzalian, M.R., 2012. Influence of trap type, trapping location and cardinal direction on the capture of the pistachio twig borer moth, *Kermania pistaciella* Amsel (Lepidoptera: Tineidae) in Isfahan. *Plant Pest Research*, 2(2): 53-62.

To Cite Dilmen, H., Kaplan, C., 2025. Efficacy of Trap Types on the Attractiveness of *Kermania pistaciella* Amsel, 1964 (Lepidoptera: Tineidae). *ISPEC Journal of Agricultural Sciences*, 9(1): 268-276.
DOI: https://doi.org/10.5281/zenodo.14843299.