

## BIOLOGY AND BEHAVIOR OF *DROSOPHILA SUZUKII*: THE KEY TO EFFICIENT HABITAT MANAGEMENT IN AGRICULTURAL CROPS

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### Abstract

*Drosophila suzukii* has become a species of significant concern for agricultural crops worldwide. This insect is particularly worrisome for farmers due to its short life cycle, enabling rapid and prolific reproduction, resulting in substantial damage to fruit and vegetable crops.

In this context, this article focuses on examining the biology and behavior of *Drosophila suzukii*, providing an in-depth understanding of these crucial aspects for efficient habitat management in agricultural crops. Recent research has shed light on the species' life cycle, highlighting it as a short one with a high reproductive rate. This means that the species has the potential to cause significant crop damage if not properly managed.

Furthermore, the feeding preferences of *Drosophila suzukii* are a key factor in its behavior. This species tends to target ripe fruits, with a particular preference for soft-fleshed varieties, posing a major challenge in fruit cultivation. Understanding this aspect is essential for developing crop protection strategies.

The article also addresses how this knowledge of the biology and behavior of *Drosophila suzukii* can be integrated into habitat management strategies in agricultural crops. Biological control agents and environmental modification techniques are becoming increasingly important in the fight against this pest.

### INTRODUCTION

*Drosophila suzukii*, commonly known as the spotted wing drosophila, has become a significantly impactful pest species in agricultural crops worldwide (Cini et al., 2012). This insect is of great concern to agricultural producers due to its dietary preferences and rapid reproductive capacity, resulting in substantial damage to fruit and vegetable crops (Asplen et al., 2015). While various management methods have been developed for *Drosophila suzukii*, it is crucial to gain an in-depth understanding of the biology and behavior of this species to develop effective crop protection strategies.

A crucial aspect of comprehending the biology of *Drosophila suzukii* is its life cycle. This species exhibits a short life cycle, which means it can reproduce rapidly and in large numbers, causing significant crop damage (Walsh et al.,

2011). Additionally, its feeding preferences significantly influence the areas and agricultural crops it affects.



Figure 1. Adult female *Drosophila suzukii*



Figure 2. Adult male *Drosophila suzukii*

In this context, this article provides a detailed examination of the biology and behavior of *Drosophila suzukii* and discusses how this information can be

applied to protect agricultural crops. We will focus on data obtained from recent research concerning the species' life cycle, dietary preferences, and influencing factors. Moreover, we will explore how this knowledge can be integrated into habitat management strategies, including the use of biological control agents and environmental modification techniques.

## MATERIALS AND METHODS

The study of the biology and behavior of *Drosophila suzukii* took place within a berry plantation in Perișor, Dolj County, Romania.



Figure 3. Raspberry plantation

This area was chosen due to the prior reported presence of *Drosophila suzukii* and its significance in berry production.

**Specimen Collection:** The collection of *Drosophila suzukii* specimens was carried out using homemade traps. These traps were distributed across different areas of the plantation and

periodically monitored to record the presence of insects.

Specimens of *Drosophila suzukii* were collected from the berry plantation in Perișor, Dolj County, Romania. These adults were regularly observed and monitored to record their developmental stages. Developmental stages include eggs, larvae, pupal stage, and adults (Walsh et al., 2011). Data on developmental stages were recorded through direct observations and photographs. Specimens were examined to determine their developmental state at the time of collection. This allowed the assessment of the presence of various stages in the plantation and an understanding of the life cycle of *Drosophila suzukii* under the specified conditions.

The life cycle of *Drosophila suzukii* is well-known for its short yet intense phase, which is a central element in understanding the biology of this species. The life cycle of *Drosophila suzukii* can be divided into several key stages: **Eggs:** Eggs laid by the female are typically deposited in fruit while still on the host plant. They can hatch in just a few days, depending on the environmental temperature.

**Larvae:** After hatching, the larvae emerge and feed on the fruit's contents. *Drosophila suzukii* larvae are white and reach a size of about 3 mm before transitioning to the next stage of development.

**Pupa:** The larvae transform into pupae within the fruit or other suitable locations. During this stage, the pupa is enclosed in a cocoon and undergoes significant developmental changes, preparing to become a fully developed adult.

**Adults:** After the pupal period, *Drosophila suzukii* emerges as a fully developed adult. These adults are small, measuring approximately 2-3 mm in length, and are recognizable by

their characteristic wings and abdomen. Adults are ready to reproduce and continue the life cycle (Walsh et al., 2011).

Understanding this life cycle is essential to anticipate critical developmental stages and plan appropriate management measures. For instance, knowing when the eggs hatch or when larvae are most active can help identify potential timing for control treatments. Additionally, understanding dietary preferences at different developmental stages can assist in identifying key moments for damage prevention and crop protection.

**Assessing Dietary Preferences:** To evaluate the dietary preferences of *Drosophila suzukii*, various berry varieties present in the plantation were selected. Adult specimens were observed while feeding on these fruits, and data were regularly recorded.

Within our farm, where both raspberries (*Delniwa* and *Polka* varieties) and blackberries (*Asterina* and *Ouachita* varieties) are cultivated, we observed a significant preference of *Drosophila suzukii* for the *Polka* variety of raspberries. This preference can be attributed to several factors that make the *Polka* variety more attractive to this pest species. According to previous research (Atallah et al., 2014), the *Polka* raspberry variety emits a broader range of volatile compounds compared to other varieties cultivated on the farm. These volatile chemical compounds can act as attractive signals for *Drosophila suzukii*, guiding the insects towards the *Polka* variety. Additionally, the fruit structure and soft texture of *Polka* raspberries provide an ideal environment for egg-laying and larval development. These factors converge to make the *Polka* variety an ideal environment for the reproduction of *Drosophila suzukii*, rendering it more attractive than other raspberry and

blackberry varieties cultivated on the farm.

## RESULTS AND DISCUSSIONS

In our study of the biology and behavior of *Drosophila suzukii* within the berry plantation in Perișor, Dolj County, we obtained several significant results. Monitoring the presence of *Drosophila suzukii* revealed a significant presence of this species in raspberry and blackberry crops. Additionally, we observed that *Drosophila suzukii* exhibited specific dietary preferences, with a significant attraction to the *Polka* raspberry variety. This behavior was observed over multiple agricultural seasons.

Regarding the life cycle of *Drosophila suzukii*, we observed that the eggs laid in the fruits hatched rapidly, and the larvae underwent a swift developmental process within the host fruits. This short yet intense life cycle led to a significant increase in the population of *Drosophila suzukii* during the harvest season.

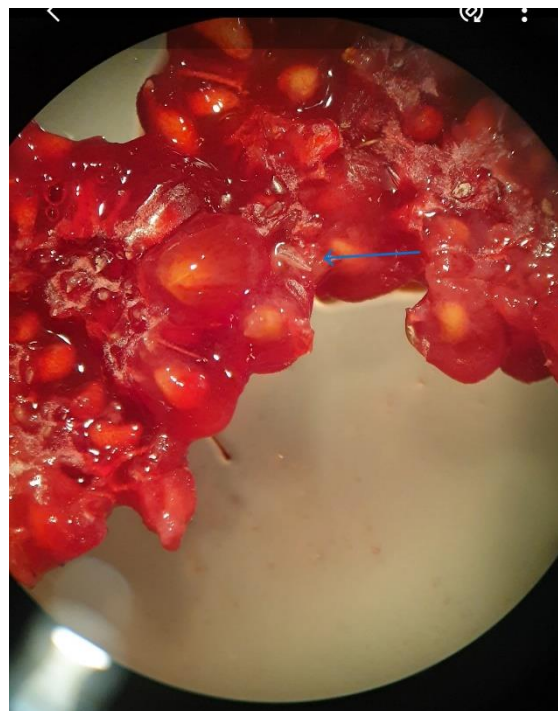


Figure 4. Larva of *Drosophila suzukii*

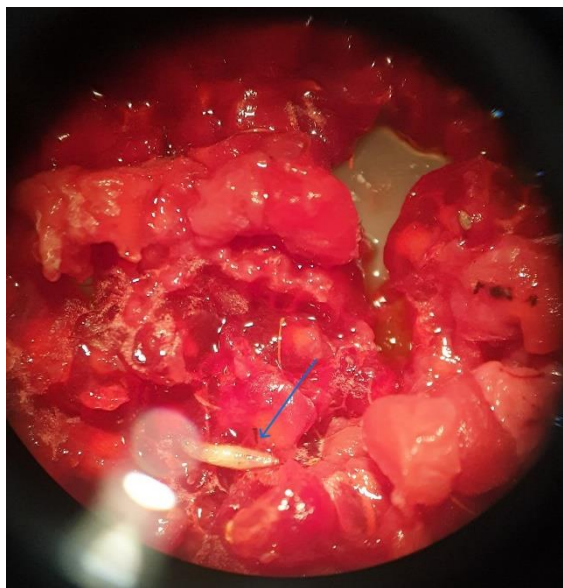


Figure 5. Larva of *Drosophila suzukii*

The results obtained in this study underscore the importance of understanding the biology and behavior of *Drosophila suzukii* for the protection of agricultural crops. The preference of this pest for the *Polka* raspberry variety highlighted the role of chemical signals emitted by fruits and their texture in attractiveness to *Drosophila suzukii* (Atallah et al., 2014). This preference had a significant impact on the damage inflicted on raspberry crops.



Figure 6 .Raspberry damaged due to the attack of *Drosophila suzukii*

Additionally, the short life cycle of *Drosophila suzukii* emphasizes the need for efficient management to control the population of this pest. Monitoring and early detection are key in identifying critical moments for applying protective treatments (Ioriatti et al., 2019). The use of biological control and crop protection technologies can help reduce infestations.

Furthermore, educating farmers and agricultural workers about the behavior of *Drosophila suzukii* and protective strategies is essential for the successful management of this pest in agricultural crops.

In conclusion, this study provides a detailed understanding of the biology and behavior of *Drosophila suzukii* in the context of raspberry and blackberry

crops in the Perișor plantation. This information can serve as a basis for developing more efficient habitat management strategies in agricultural crops and minimizing the negative impact on fruit production.

**Table 1. The number of *Drosophila suzukii* larvae or eggs on a fruit**

Item. No.	Blackberry		Raspberry	
	<i>Ouachita</i>	<i>Asterina</i>	<i>Polka</i>	<i>Delniwa</i>
1.	0	0	6	0
2.	0	1	3	0
3.	0	0	0	0
4.	0	0	2	0
5.	0	0	1	1
6.	0	0	4	0
7.	0	0	2	0
8.	1	0	5	0
9.	0	0	3	0
10.	0	0	22	0
Total	1	1	49	1

## CONCLUSIONS

The study of the biology and behavior of *Drosophila suzukii* in the berry plantation in Perișor, Dolj County, combined with research on the efficient management of this pest species in agricultural crops, highlights several essential conclusions:

**Specific Feeding Preferences:** Observations regarding the feeding preferences of *Drosophila suzukii*, particularly its strong attraction to the *Polka* raspberry variety, emphasize the importance of a detailed understanding of the factors influencing the preferences of this species. This knowledge is crucial for developing crop protection strategies that take into account the pest's feeding preferences.

**Rapid Life Cycle:** The short life cycle of *Drosophila suzukii*, characterized by rapid reproduction and larval development in fruits, poses a significant challenge for the efficient

management of this pest. This underscores the importance of constant monitoring and a swift response to its presence.

**Holistic Approach:** The key to efficient habitat management of *Drosophila suzukii* in agricultural crops lies in adopting a holistic approach. Early monitoring and detection, agroecosystem management, biological control, crop protection, and farmer education are essential components of this integrated approach.

**Ongoing Research:** The study has demonstrated that understanding the biology and behavior of *Drosophila suzukii* is an evolving process. Continuous research and the development of innovative technologies and strategies are necessary to keep up with changes in the behavior of this pest and adapt management strategies.

In conclusion, protecting agricultural crops from *Drosophila suzukii* is a challenge, but the correct and integrated approach can help minimize damage. The efficient management of the habitat of this pest species depends on collaboration between farmers, researchers, and plant protection specialists to develop innovative strategies and technologies that contribute to ensuring healthy agricultural production.

## REFERENCES

- Asplen, M. K., Anfora, G., Biondi, A., Choi, D. S., Chu, D., Daane, K. M., ... & Dalton, D. T. (2015). Invasion biology of spotted wing *Drosophila suzukii*: a global perspective and future priorities. *Journal of Pest Science*, 88(3), 469-494.
- Atallah, J., Teixeira, L., Salazar, R., Zaragoza, G., & Kopp, A. (2014). The

making of a pest: the evolution of a fruit-penetrating ovipositor in *Drosophila suzukii* and related species. Proceedings of the Royal Society B: Biological Sciences, 281(1781), 20132840.

Cini, A., Ioriatti, C., & Anfora, G. (2012). A review of the invasion of *Drosophila suzukii* in Europe and a draft research agenda for integrated pest management. Bulletin of Insectology, 65(1), 149-160.

Ioriatti, C., Walton, V., Dalton, D., & Anfora, G. (2019). Agroecology and conservation biological control: an overview. Agroecology for Pest Management: Advances in the Theory and Practice, 1-16.

Lee, J. C., Bruck, D. J., Dreves, A. J., Ioriatti, C., Vogt, H., & Baufeld, P. (2013). In focus: spotted wing *Drosophila*, *Drosophila suzukii*, across perspectives. Pest Management Science, 69(2), 139-147.

Walsh, D. B., Bolda, M. P., Goodhue, R. E., Dreves, A. J., Lee, J., Bruck, D. J., ... & Zalom, F. G. (2011). *Drosophila suzukii* (Diptera: Drosophilidae): invasive pest of ripening soft fruit expanding its geographic range and damage potential. Journal of Integrated Pest Management, 2(1), G1-G7.