



## Immunotoxin effect of Lambda Cyhalothrin (LC) insecticide on mammalian macrophages

Ceren Canatar<sup>\*1</sup>, İsmail Korkmaz<sup>2</sup>, Havva Türkben<sup>1</sup>, Derya Yetkin<sup>3</sup>, Badel Arslan<sup>4</sup>, Serdal Arslan<sup>2</sup>, Furkan Ayaz<sup>1,5</sup>

<sup>1</sup>Mersin University, Biotechnology Department, Türkiye. [cerencanatar07@gmail.com](mailto:cerencanatar07@gmail.com), [havvaturkben5153@gmail.com](mailto:havvaturkben5153@gmail.com)

<sup>2</sup>Mersin University Department of Medical Biology, Türkiye. [ismailkrkmazz@gmail.com](mailto:ismailkrkmazz@gmail.com), [arserdal@yahoo.com](mailto:arserdal@yahoo.com)

<sup>3</sup>Mersin University, Faculty of Medicine Histology Department, Türkiye. [deryayetkin84@gmail.com](mailto:deryayetkin84@gmail.com)

<sup>4</sup>Mersin University Department of Stem Cell and Regenerative Medicine, Türkiye. [badelarsln@gmail.com](mailto:badelarsln@gmail.com)

<sup>5</sup>Mersin University, Biotechnology Research and Application Center, Türkiye. [furkanayaz@mersin.edu.tr](mailto:furkanayaz@mersin.edu.tr)

Cite this study: Canatar, C., Korkmaz, İ., Türkben, H., Yetkin, D., Arslan, B., Arslan, S., & Ayaz, F. (2022). Immunotoxin effect of Lambda Cyhalothrin (LC) insecticide on mammalian macrophages. 5<sup>th</sup> Advanced Engineering Days, 123-124

### Keywords

Insecticide  
Plants  
Pesticide  
Agriculture  
Lambda-cyhalothrin

### Abstract

Plants are affected by some different factors such as harmful weeds and insects, and depending on this situation, inefficiency and loss occur both in agricultural areas and production rates. In this context, although pesticides are frequently used in the fight against pests, they also have some positive and negative effects. Pesticides, which are used to reduce the existing effects of harmful factors, have toxic effects on both human health and the environment. Insecticides, on the other hand, are frequently used against insects, which are among the harmful factors, and are included in the pesticide groups. Pyrethroids are synthetically produced insecticides and contain more than 40 active ingredients, and lambda-cyhalothrin is one of these active ingredients. In this proceeding study we will review the toxic effect of lambda-cyhalothrin by specifically focusing on the immune system.

### Introduction

Plants are eukaryotic species that play a key role in the regulation of many ecological processes, especially the photosynthesis reaction in the ecosystem. Plants that undertake such important tasks are exposed to many factors that are considered harmful, like other organisms in nature. Among these factors; insects, weeds, worms, mites and rodents. These living organisms, which have harmful effects on plants, damage plants in various ways. Living organisms with harmful effects exploit the energy that plants will use to maintain their own metabolic activities. Apart from this, there are other vectors that feed on the nutrients of the plants and lead to the malnutrition and poor growth in the plants [1-4].

Insects and weeds constitute a large part of the decrease in productivity in agricultural areas and crops created in agricultural areas. Firstly, chemical control methods are used within the scope of combating these pests. Pesticides are at the forefront of the chemically preferred methods in agricultural areas. Pesticides can be chemical substances as well as living organisms. These living organisms include bacteria or viruses [1-4].

Pesticides have different names according to their target organism. For example; pesticides targeting insects are called insecticides, pesticides targeting weeds are called herbicides, pesticides targeting nematodes are called nematicides, pesticides targeting fungi are called fungicides, and pesticides targeting rodents are called rodenticides [1-4].

The main purpose of this chemical control is to eliminate the factors that are considered as harmful, to reduce the effects of these factors or to control them. One of the most negative effects of pesticides used in agricultural areas; they cause death of non-target organisms because they do not directly affect the targeted organism. Pesticides have genotoxic and cytotoxic effects on the environment and human health. Among the known negative

effects on the environment are; pollution of ground/surface waters and soil which eventually cause a decrease in the number of beneficial microorganisms in the soil, air pollution and pollution of the flora [1-6].

## Results

Insecticides, which are frequently used among chemical pesticide groups, prevent the infertility of plants in the agricultural fields by targeting insects. Insecticides, according to their origin, are divided into two as synthetic insecticides and natural insecticides (bioinsecticides) created by extraction from plant sources. Synthetically produced insecticides have many advantages over other insecticide types [2,5].

The group that has the largest usage area in insecticides in the world is called pyrethroids. Pyrethroids constitute approximately 1 out of 4 insecticides in the world market [1].

Pyrethroids, which are synthetically produced insecticides, continue to be widely used in agricultural areas due to their photostability, low toxicity to mammals, short duration of action, strong lethal effect against insects, and many other superior features. Pyrethroids contain more than 40 active ingredients, and lambda-cyhalothrin is one of these active ingredients [1].

## Discussion

There are not enough studies in the literature on the immunotoxic, genotoxic and cytotoxic effects of lambda cyhalothrin, which belongs to the insecticide group of pesticides used against insects, on mammalian macrophage cells. Therefore, it is anticipated that this issue will be addressed in the future [7,8].

## Conclusion

Insecticides have been widely used in the field to increase the crop yield but their toxic effects should be studied in more details. There are studies showing toxic effect of these chemicals on different organisms and cells but to our knowledge there is no study focusing on their possible effects on the immune system. Future studies will shed light on their effect on the immune system cells and will inform the field about their toxic activities to either generate novel formulations and active ingredients or to feel safe to use them more frequently if they lack toxicity

## Acknowledgements

We would like to thank Mersin University BAP Department for their valuable contributions since we partially utilized from the infrastructure created by BAP Project with ID number of 2022-2-AP5-4761.

## References

1. Güntay, O., Hürsel, Ç. A. Y., Durusel, B., & Terzi, Y. (2021). Sentetik Piretroidlere Genel Bakış. *Atatürk Üniversitesi Ziraat Fakültesi Dergisi*, 52(2), 201-223.
2. Şahin, S. S., & Keçeci, M. (2021). İnektisitlerin Böcekler Üzerindeki Subletal Etkileri. *Türkiye Tarımsal Araştırmalar Dergisi*, 8(1), 116-124.
3. Karakaş, M. (2018). Bitkisel İnektisitler . *Türk Bilimsel Derlemeler Dergisi*, 11 (2), 32-37.
4. Güncan, A., & Durmuşoğlu, E. (2004). An evaluation of plant-based natural insecticides. *Hasad Dergisi*, 233, 26-32.
5. Xu, C., Wang, J., Liu, W., Sheng, G. D., Tu, Y., & Ma, Y. (2008). Separation and aquatic toxicity of enantiomers of the pyrethroid insecticide lambda-cyhalothrin. *Environmental Toxicology and Chemistry: An International Journal*, 27(1), 174-181.
6. Al-Saleh, I. A. (1994). Pesticides: a review article. *Journal of environmental pathology, toxicology and oncology: official organ of the International Society for Environmental Toxicology and Cancer*, 13(3), 151-161.
7. Zhang, Q., Wang, C., Sun, L., Li, L., & Zhao, M. (2010). Cytotoxicity of lambda-cyhalothrin on the macrophage cell line RAW 264.7. *Journal of Environmental Sciences*, 22(3), 428-432.
8. Ibrahim, H. M. (2016). Evaluation of the immunotoxic effects of sub-chronic doses of lambda-cyhalothrin in murine model. *MOJ. Immunol*, 3(6), 00108.