

IPN Achieves Patent for

DENGUE

RESEARCH

Researchers at the CeProBi discovered a plant with a larvicidal effect on the dengue vector, a disease that has been on the rise in Mexico and worldwide.



Enrique Soto

Scientists from the Instituto Politécnico Nacional (IPN) have obtained a patent for discovering that the *Lupinus* plant (legume), which grows in temperate regions of the country, contains natural compounds (quinolizidine alkaloids) that can control the larval development of *Aedes aegypti* mosquitoes, the vector transmitting the dengue virus. This disease affected around 280,000 people in Mexico last year.

Kalina Bermúdez Torres, the director and scientist of the Centro de Productos Bióticos (CeProBi) and leader of the research group emphasized the significance of the study due to the increase in confirmed cases both in Mexico and globally. "In our country, cases quadrupled between 2022 and 2023," she noted

CLIMATE CHANGE FACILITATES MOSQUITO DEVELOPMENT

This could be explained -he said- by changes in the distribution of the vector because the conditions for its development have been favorably modified, by the increase in temperatures and atypical rains, both phenomena related to El Niño and climate change, unplanned urbanization, the vector's capacity to develop resistance to insecticides, but also to the lack of effective strategies to guarantee the involvement of the affected population in control measures..

Dr. Bermúdez highlighted that dengue is now found in temperate areas where the vector previously did not reach. She added that the symptoms of this disease can be confused with those of COVID-19, as both can present with fever, fatigue, and headaches, as well as muscle, bone, and joint pain. However, dengue can also cause rashes, vomiting, and petechiae (red or brown spots caused by bleeding under the skin).

A Ph.D. in Science from the Friedrich Schiller University of Jena, Germany, explained that it is the female mosquito that transmits the dengue virus, as it requires a blood meal for egg development, which is laid in clean water reservoirs. Thus, the population needs to adopt mosquito control measures, such as covering water containers, especially in areas where the insect is present.

LARVICIDAL EFFECT OF WILD LUPIN PLANT

Kalina Bermúdez Torres emphasized that results obtained from projects funded by IPN and the National Council of Humanities, Science, and Technology (Conahcyt) demonstrated that quinolizidine alkaloids from a wild lupine species (*Lupinus bilineatus*) in Mexico have a larvicidal effect on the dengue vector.

"The alkaloids inhibit the molting of these insects, preventing their development and keeping them in the larval stage. This means they do not mature into adults and remain in the water, making them easier to control. We proved that quinolizidine alkaloids have a larvostatic effect, which earned us the patent," she stressed.



The quinolizidine alkaloids of *Lupinus bilineatus* species have a larvicidal effect on the dengue vector.



Kalina Bermúdez Torres, CeProBi scientist, leads the group participating in the research.





INTERESTING FACT

Dengue affected the health of around 280,000 people in Mexico last year.



The polytechnic scientist, who holds Level I in the National System of Researchers (SNI) of Conahcyt, also highlighted that quinolizidine alkaloids have a larvicidal effect by causing mortality in *Aedes aegypti* mosquitoes.

TEAM WORKING ON ANOTHER PATENT

Currently, her team is working to produce encapsulated formulations with this natural substance (quinolizidine alkaloids) to act during the insect's larval stage, increasing efficacy and enabling better control over their elimination, thus reducing environmental impact. "Encapsulation helps store the alkaloids for longer and prevents degradation. It also allows for controlled release. We are working on another patent for the development of these encapsulated formulations," she announced.

Kalina Bermúdez Torres detailed that the Lupinus plant grows in regions from 1,800 to 4,000 meters above sea level. "In the Americas, there are many species, ranging from Canada and the United States to Patagonia (Argentina and Chile). In other parts of the world, it is also found in the Mediterranean," she noted.

Six master's students have graduated from this research project (on Lupinus), and two more with the study of the *Aedes aegypti* vector (Masters of Science: Raúl Simeón Michi Flores and Wendolin Borges Coronel).

Finally, the CeProBi researcher advocated for comprehensive campaigns to combat dengue, integrating environmental education in schools along with health sector initiatives. "Everyone living in areas where dengue is present must participate in prevention measures and not wait for the problem to be solved for them," she concluded.