

Varroa dynamic sensitivity to amitraz acaricide

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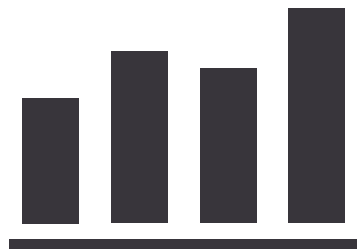
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INTRODUCTION



The extended use of acaricides in beehives for the control of varroa induces resistance of the latter to the active substances. In conventional beekeeping, two active substances are used to control mites in France : tau-fluvalinate and amitraz. After ten years of use, in 1995, the first tau-fluvalinate resistance appeared with a decrease of efficacy. Recently, an amitraz resistance also appeared in some countries (Pires et al, 2005; Maggi et al, 2008; Kamler et al, 2016). The resistance mechanism is well-known for tau-fluvalinate but not for amitraz. In France, the efficacy with amitraz treatment has been decreasing for 2 years (FNOSAD, LSA, n°291, 5-6/2019).

RESULTS



In the laboratory



During the summer of 2018, fifteen varroa populations were tested in France (figure 1). Four varroa sensitive populations were found in France with the collaboration of organic beekeepers. The lethal concentration for 90% of mites in a sensitive population (LC90) is 0,4µg/mL. Most of the varroa populations tested were intermediate populations (not sensitive and not resistant). One population could be considered as a resistant population compared to the sensitive population (figure 2). This population was collected from an apiary with low treatment efficacy (35%) in 2017 (FNOSAD, LSA, n°285,5-6/2018). Generally, the French varroa population seem to be losing its sensitivity to amitraz (increase of the LC50) (figure3).

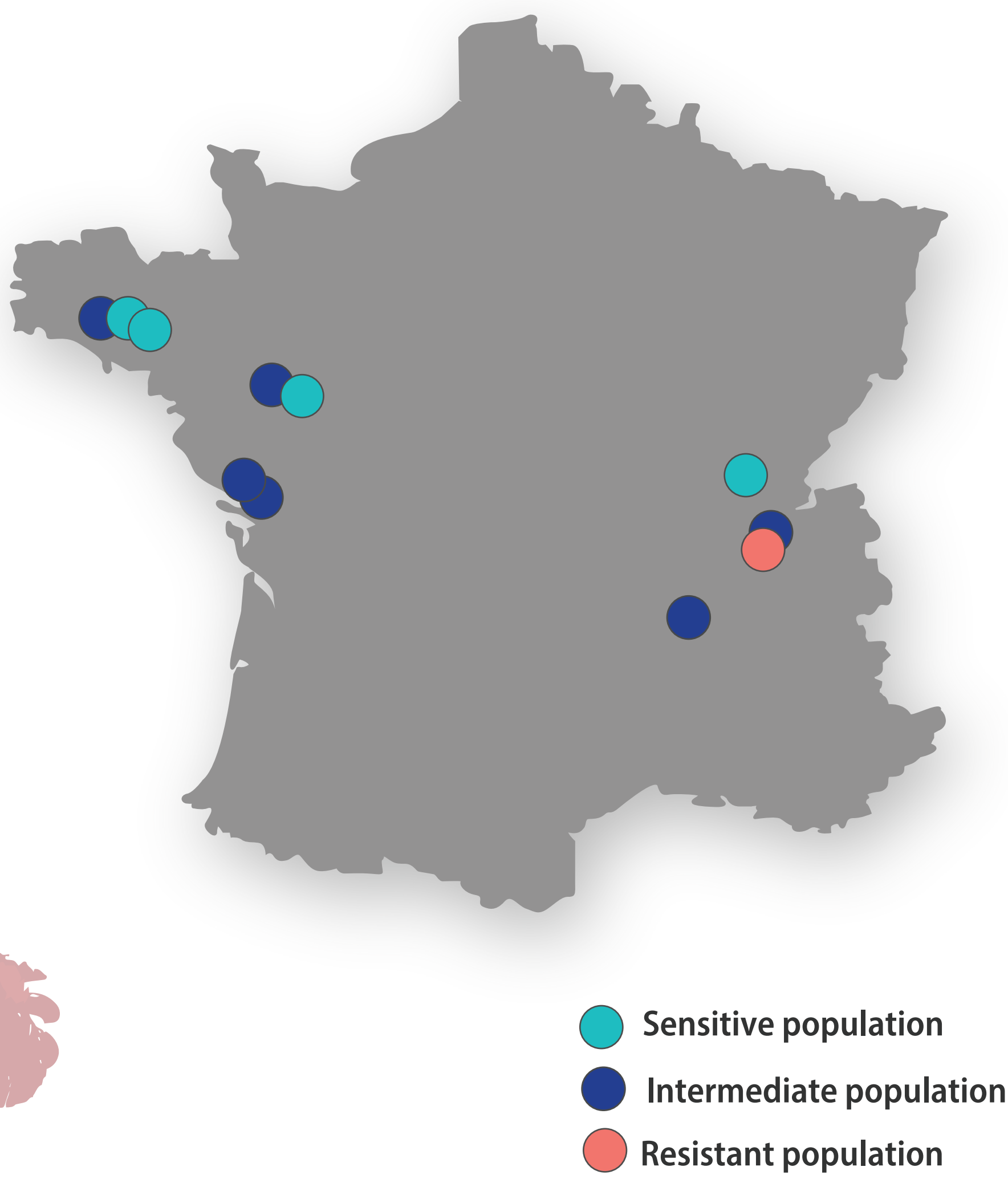


Figure 1 : Cartography of the collected mites

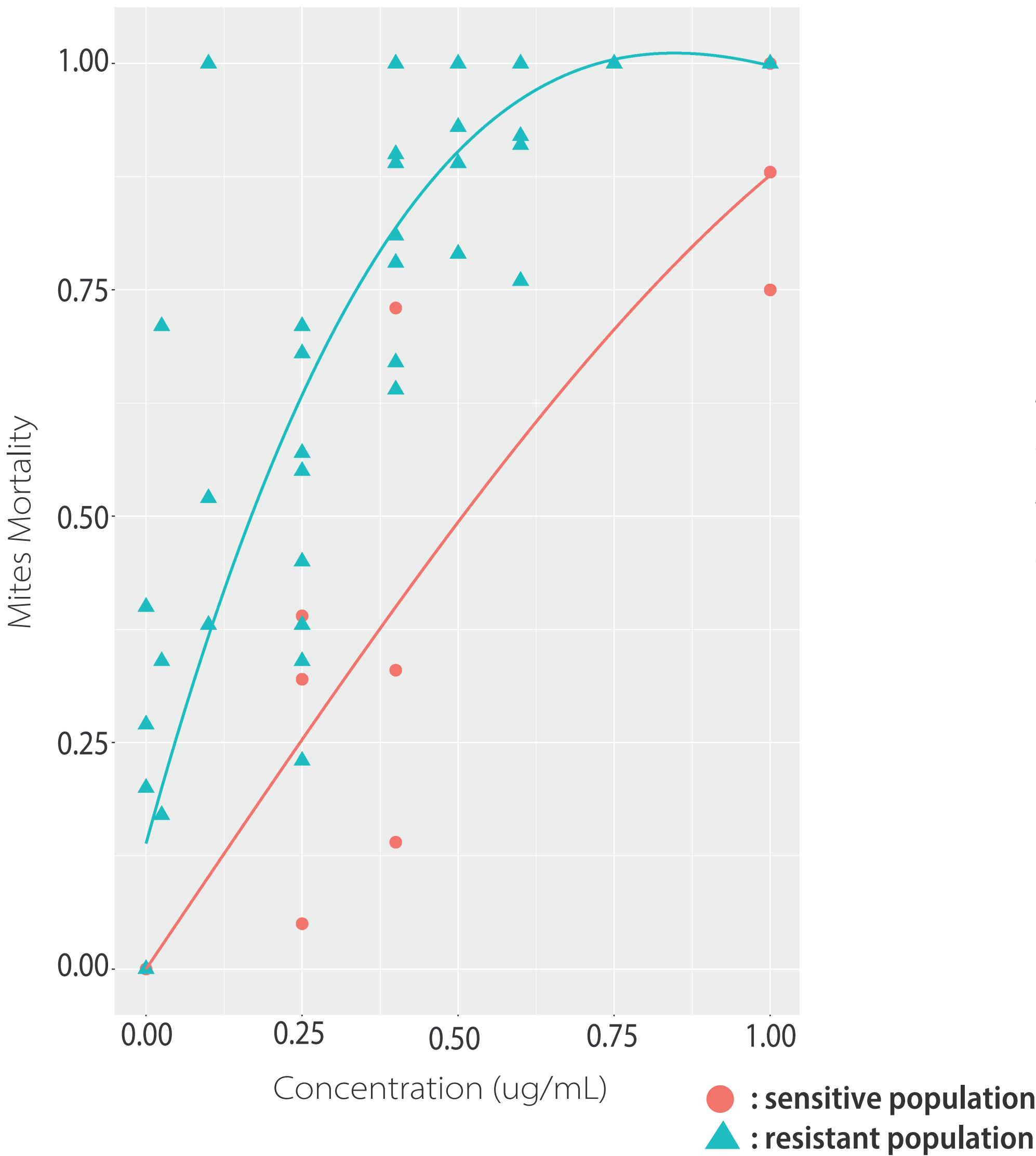


Figure 2 : Evolution of the mites mortality according to the acaricide concentration.

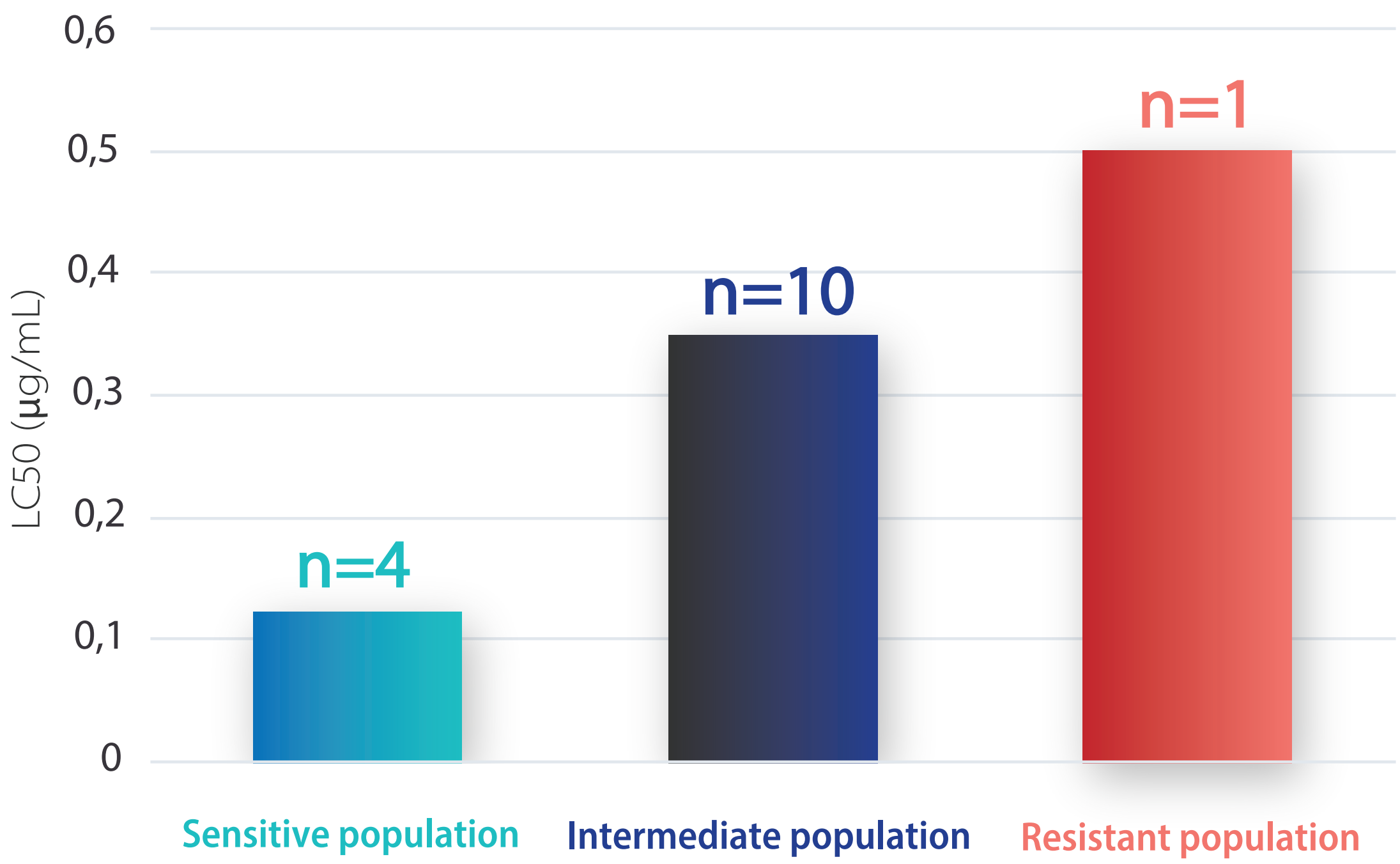


Figure 3 : Evolution of the LC50

In the field



The control of the treatment efficacy was followed for a novel amitraz-based strip acaricide in La Rochelle (France) on eleven beehives. This acaricide has a flash effect on mites with a higher drop-dead mites in the first days compared to other amitraz acaricides (figure 4). The field efficacy was around 99%. The treatment efficacy was compared to the mortality with the laboratory test at the LC90 (figure 5).

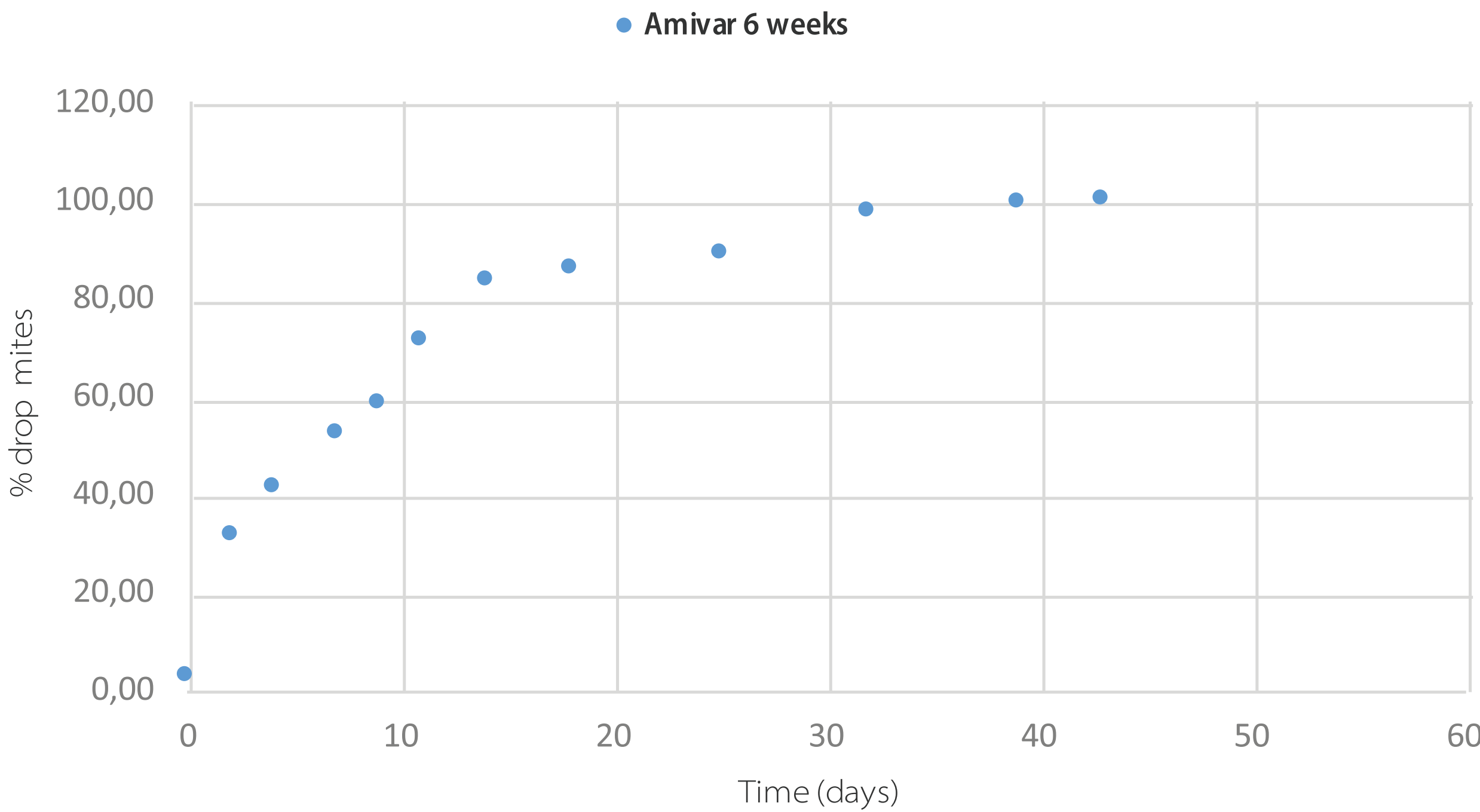


Figure 4 : Drop dead mites percentage during novel amitraz-based strip stroke treatment

Population of La Rochelle	Laboratory (LC90)	Field efficacy
% efficacy	60	99

Figure 5 : Comparison of the efficacy in the laboratory and in the field

CONCLUSION



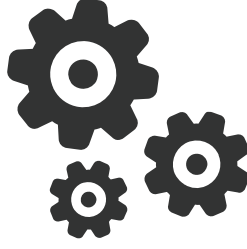
French varroa populations seem to be losing their sensitivity to amitraz but few resistant populations have been detected for now. Despite a loss of sensitivity with the laboratory test, a novel amitraz-based strip demonstrated good efficacy in La Rochelle (France).

OBJECTIVES



This research project involves in the detection and prediction of the varroa resistance development to acaricides. The main objective is to advise beekeepers in the choice of control treatment to conserve the efficacy of the treatment.

METHOD



REFERENCES



Pires, S., Pereira, Ó., & Muriilhas, A. (2007). Field and laboratory testing for amitraz-tolerant varroa populations. How comparable are their results?. In 40th Apimondia International Apicultural Congress (No. 212, pp. 141-141). Apimondia. Kamler, M., Nesvorna, M., Stara, J., Erban, T., & Hubert, J. (2016). Comparison of tau-fluvalinate, acrinathrin, and amitraz effects on susceptible and resistant populations of Varroa destructor in a vial test. Experimental and applied acarology, 69(1), 1-9. Maggi, M. D., Ruffinengo, S. R., Gende, L. B., Eguaras, M. J., & Sardella, N. H. (2008). LC50 baseline levels of amitraz, coumaphos, fluvalinate and flumethrin in populations of Varroa destructor from Buenos Aires Province, Argentina. Journal of apicultural research, 47(4), 292-295

