

CONTROL OF ASIAN HORNET, *VESPA VELUTINA*, MAINLY BY NEUTRALIZATION OF NESTS

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Abstract The asian hornet is an exotic invasive species according to the law 33/2015 of Natural Heritage and Biodiversity, in the Iberian Peninsula. The first appointment of this insect occurs in 2010, in the Foral community of Navarra. Since its introduction, it has been colonizing a large part of the northern part of Spain, due to its great adaptability and the lack of knowledge of the public and private managers who have been in charge of its control. This non-native vespidae can cause real problems at an environmental level, as well as causing significant losses in some sectors, such as beekeeping, without losing sight of the potential risk it can pose to public health. In this work we show the different methodologies that have been used in the control of the species during these years and we will try to qualitatively evaluate the most interesting aspects of each method. Starting from the base that there is no infallible control method, and that each situation must be addressed through a specific action plan based on a situational diagnosis prepared by experts.

Key words Invasive species, *Vespa velutina*, neutralization.

INTRODUCTION

Since its introduction in the municipality of Amaiur (Navarra) more than 10 years ago, this species has colonized a large area of the northern half of our country. It is present in all the northern communities; there are even records in the autonomous community of Extremadura. The greater distribution of this species in our country can be made clear in the annual increase in nests removed by the different autonomous communities and in the direct perception of this species by citizens: visualization of specimens and nests. We must clarify that this species generates a special rejection by citizens due to the predatory activity it has on honeybees, the lack of knowledge about the danger it poses to humans and the visualization of large secondary nests in deciduous trees when the leaf falls (being nests active or not). The lack of applied knowledge about this species in our territory, as well as the lack of coordination between different public bodies responsible for its management, have left us, during these years of coexistence with the species, multitude control methodologies, some of which lack of scientific and technical basis.

Since 2015, the year in which the "Strategy for the management, control and possible eradication of the hornet or black wasp (*Vespa velutina* spp. *nigrithorax*) in Spain" was drawn up, around a dozen different manuals have been written regarding the control and management of the species, from the autonomous communities (responsible for ensuring the management of invasive exotic species).

MATERIALS AND METHODS

All the guides and protocols issued at a regional and national level have been consulted, and a qualitative analysis has been carried out of those variables that promise efficiency in control, the safety of operators and the possible environmental repercussions that may exist, trying to add to these variables the experience in the

management of some pest control operators.

The different methods of control and neutralization of nests have been divided into four groups depending on if nests are removed or not and the impact we make on them. We have tried to make an attempt to deal with those variables that may be of interest in the applied field of pest control, prioritizing control efficiency, operational safety and economic costs, as well as the legal regulations involved in each of these methods.

RESULTS AND DISCUSSION

The methodologies obtained in the study of the different manuals are shown below:

Physical Removal.

This methodology is usually used with wasps' nests at ground level, but if it is found at a greater height, the operators must use lifting tools. This method consists of removing the entire wasp nest using a bag or box. It is advisable to act at night to prevent the wasps that are outside the nest from being released, since *Vespa velutina* only has activity outside the nest during the day. This is the method that gives us the most guarantees regarding the control of this vespidae, since if we act in a correct time slot, we will be able to eliminate all the individuals in a single action. The economic costs of this method can be very high, and it can be difficult to execute due to the complexity of access. The nest must be inactivated later, usually freezing is the most effective method of eliminating the removed nest.

Neutralization With Insecticides

Application of aerosols (spray). Liquid insecticide for domestic use that is applied by spraying with pressurized gas. This biocide for non-professional use has the advantage of being very easy to use; On the other hand, its components act as a wasp repellent, so if it is not applied correctly, those wasps that are outside the nest will not be eliminated by repellency and will make it difficult to eliminate the entire colony; therefore it is advisable to perform this technique at night. It should also be pointed out that during and after the application of these insecticide sprays technical staff must take care of not to cause sparks or flames because they are explosive and extremely flammable. Its application is extremely complex in very high nests.

Injection with a pole. An insecticide solution is introduced into the nest with the help of a pole, the length of which can vary from 30 centimeters to 20 meters in height. Experienced technical staff using light poles can occasionally reach up to 30 meters in height. The chosen insecticide must be a biocide for specialized professional use and will not be a repellent for these insects, so once it is introduced into the nest, the wasps become contaminated and die when they return. It involves the same problems as all those techniques that require telescopic tools for the application of biocides.

Frozen vectors. This system is based on the freezing of vectors (bullets or projectiles) filled with biocides, chemical or biological, which are subsequently fired at the nest using a compressed air rifle (paintball type). Its use is simple, fast and highly effective in neutralizing nests located up to 40 meters high. It is safe for the operator and very efficient. Sometimes the situation of the nest in the tridimensional space of the tree can prevent the vectors from hitting correctly.

Injection or drone shot. This methodology follows the same patterns as the previously explained methods, with the advantage of being able to approach the nest with the help of a drone. It is especially effective with nests at high altitudes or in inaccessible areas and very safe for the operator. Flight restrictions in certain areas limit its use, and this method requires a highly qualified operator in pest control.

Partial Destruction of The Nest.

Shooting with firearms. This methodology can be applied in two different scenarios. In the first one, the lower part of the nest has an easy access, therefore a single shooter shoots at the upper part of the nest to cause it to break and fall, being subsequently neutralized and removed from the ground.

In the second scenario, there is no access to the area below the nest and it consists of several shooters shooting at the nest to eliminate as many wasps as possible. To achieve greater effectiveness, it is recommended to act at the first hours in the morning. Although this method does not eliminate all the wasps,

it is usually used in the autumn/winter season after leaf fall. The use of this type of weapon is subject to regulations, and may entail risks for pest control operators due to the type of these tools.

Application of pressurized wáter. It maintains the same premises as the previous method, being less efficient. In case of being directed to the elimination of high nests, pressure equipment will be required to be able to reach the nest. It can be a substitute for the use of firearms when their use is not allowed.

Complete Destructionon of the Nest.

Detonation with explosive cartridge (firecracker). This method consists of introducing a P2 category pyrotechnic article for its destruction by explosion. That cartridge can be introduced into the nest with the help of a pole. This methodology will only be carried out by expert personnel who have previously been trained for it and in the territory where this method is allowed. It will be done preferably at first or last hours of the day.

Cremation. This method consists of applying a direct flame to the nest. It is considered as a low efficacy method since wasps can be dislodged by the smoke and heat generated. This method is considered dangerous for the operator, in addition to the potential danger of generating fires in forest areas, it should only be used in very humid areas and only in case of impossibility of applying other methods. Subject to specific local regulations regarding controlled burning.

These are the methods that have been found by consulting the different *Vespa velutina* management manuals, although the most vulnerable phase at a practical level is the primary nest, most of these methods are aimed at eliminating secondary nests (although they can also be applied to the first ones). The great variability of methods shown is the result of the different organizations or managers that have historically intervened in the control of *Vespa velutina* in each territory, as can be seen in some of them there is a clear impregnation of the tools or methods used by firefighters, which in most of the territories were the first bodies involved in its control due to the urgency in the action. It is interesting to see how, as a result of experience and the input of professionals from different sectors, these methods have evolved until they interweave the most innovative biocides, with the most modern application tools and a pest control sector that is increasingly aware of this insect.

CONCLUSIONS

This study was born with the intention of being the starting point of a practical manual for the control of this species in the territory included in Iberian Peninsula, which encompasses all the methods that have been used or can be used in the control and neutralization of each of the different phases of the biological cycle of this allochthonous vespidae, not only in the specific case of secondary nests. From the study of the different methodologies that have been applied, we can extrapolate the need for professionals from different fields to be involved in the development of specific protocols for the control of this species. Technology, biological knowledge of the species and workers safety must be combined, understanding that the economic cost is also a nuclear factor when we talk about the execution of pest management and control services carried out by professional companies. There is no ideal method for dealing with the different problems that we can find in daily work with this insect, for this reason professionals who work in this sector must have knowledge of the different control methods that exist and execute them according to a cost-benefit study resulting from a correct diagnosis of the situation.

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