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WASMANNIA AUROPUNCTATA (ROGER, 1863) (ARTHROPODA: HYMENOPTERA: FORMICIDAE). AN ANNOYING ANT

WASMANNIA AUROPUNTATA (ROGER, 1863) (ARTHROPODA: HYMENOPTERA: FORMICIDAE). UNA HORMIGA ANUNCIADORA

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Armiñana García, R., Mora Quintana, E. C., Padilla Gómez, A., Expósito Pérez, M. (2023). *Wasmannia Auropunctata* (Roger, 1863) (Arthropoda: Hymenoptera: Formicidae). An annoying ant. *Revista Científica Agroecosistemas*, 11(2), 45-53. http://aes.ucf.edu.cu/index.php/aes/index

ABSTRACT

The research proposes, through interviews, participative workshops, talks and socio-cultural meetings, to link the inhabitants of the "Jumagua" village located in the municipality of Sagua La Grande in the province of Villa Clara, Cuba, to the knowledge of Invasive Alien Species and their undesirable effects on the vulnerable Cuban ecosystems and on human health, and in particular to the knowledge of the species *Wasmannia Auropunctata*. For the development of the research, methods of information collection and processing of the information collected were used. During the interviews, it was found that some inhabitants had some knowledge about the Santanica, but not about the harmful effects that this animal can cause to vulnerable Cuban ecosystems and human health. Through these activities, spaces were created for exchange and reflection on the importance of knowing important aspects of this Invasive Exotic Species. This linkage of cooperation and sensitization allowed a rapprochement of the inhabitants with the researchers and the feedback of scientific knowledge with popular knowledge. The workshops, talks and socio-cultural meetings were evaluated as pertinent by the different external evaluators.

Keywords:

Population settlement, Invasive Alien Species, "Jumagua", Santanica, participatory workshops.

RESUMEN

La investigación propone, a través de entrevistas, talleres participativos, charlas y encuentros socioculturales, vincular a los habitantes de la aldea "Jumagua" ubicada en el municipio de Sagua La Grande en la provincia de Villa Clara, Cuba, al conocimiento de las especies exóticas invasoras. Las especies y sus efectos indeseables sobre los vulnerables ecosistemas cubanos y sobre la salud humana, y en particular al conocimiento de la especie *Wasmannia Auropunctata*. Para el desarrollo de la investigación se utilizaron métodos de recolección de información y procesamiento de la información recolectada. Durante las entrevistas se constató que algunos pobladores tenían algún conocimiento sobre la Santanica, pero no sobre los efectos nocivos que este animal puede ocasionar a los vulnerables ecosistemas cubanos y a la salud humana. A través de estas actividades se generaron espacios de intercambio y reflexión sobre la importancia de conocer aspectos importantes de esta Especie Exótica Invasora. Este vínculo de cooperación y sensibilización permitió un acercamiento de los habitantes con los investigadores y la retroalimentación del saber científico con el saber popular. Los talleres, charlas y encuentros socioculturales fueron evaluados como pertinentes por los diferentes evaluadores externos.

Palabra clave:

Asentamiento poblacional, Especies Exóticas Invasoras, "Jumagua", Santanica, talleres participativos.

INTRODUCTION

Biological invasions are considered worldwide as the second cause of species extinction, after habitat loss (Armiñana et al., 2017, 2020). Invasive Exotic Species (IES) are those introduced species that are instituted in a new environment, and spread destructively, for human interests (Armiñana, 2017; Cassini, 2020).

The global economy, with increased transportation of goods and travel, has facilitated the movement of living species across long distances and beyond natural boundaries. Although only a small percentage of transported organisms become invasive, they have an enormous impact on the health of plants, animals and even people, threatening their lives and affecting food security and ecosystem health (United Nations Decade on Biodiversity, 2020).

Different researchers have written on the topic related to IES, such as: (Nong et al., 2019; Penagos-Tabares et al., 2019; Armiñana et al., 2017, 2019, 2019, 2020; 2021a).

Many exotic animals have become pets and have then moved on, either by escaping or being released by their owners, to natural environments (Armiñana, 2017, 2019).

Not all introduced species will wreak great havoc on the relationships between other species, since many will not be able to adapt to the new environment and will not survive. However, those with a greater capacity for adaptation will survive, even causing the denaturation of the ecosystem and the loss of biodiversity as key native species die off and are displaced by the new arrivals. The result is an ecosystem in which species have no relationship with each other (Moriana, 2023).

Santanica or Santanilla ***Wasmannia Auropunctata*** is an ant native to Central and South America and is widespread in different parts of Africa, North America, the West Indies and six Pacific Island groups (including the Galapagos Islands, Hawaii, New Caledonia and the Solomon Islands) and northeastern Australia. It is included in the International Union for Conservation of Nature's list of the 100 most damaging invasive alien species in the world (Salguero et al., 2011; Armiñana et al, 2017; Esdadaler, Pradera & Santana, 2018;).

This species has been unintentionally introduced worldwide, severely affecting native ant biodiversity, societies and economies, as well as human and animal health, due to its potentially dangerous stings (Demetriou et al., 2022).

In countries where it is native, *Wasmannia Auropunctata* is a pest in forests and agricultural areas. Its densities can be very high in plantations, such as sugar cane plantations and cocoa plantations. In fragmented forests the density of Wasmannia Auropunctata is correlated with a poor diversity of other ants. They compete successfully in the exploitation of environmental resources, and can diminish or nullify other competing ants. The species is also a generalist in nest site choice (Armiñana et al., 2017).

There is no history of this issue having been worked on directly in the "Jumagua" community in the municipality of Sagua la Grande through sociocultural activities with the community's inhabitants. In addition, it has been possible to verify the presence of Santanica in different places in the community and the inconvenience they cause to the inhabitants. However, the authors of this research have been able to verify through direct observation that there is a lack of knowledge about the biology, ecology and the harmful effects caused by this tiny ant to vulnerable Cuban ecosystems and human health, as well as about the control of the species. In this sense, the following problematic situation arises related to the insufficient knowledge that the inhabitants of the "Jumagua" community located in the municipality of Sagua la Grande in the province of Villa Clara have about the Santanica as an IES.

The objective of this research is to propose a set of activities that favor the knowledge of the Santanica (***Wasmannia Auropunctata)*** as an Invasive Alien Species in Cuba and its undesirable effects on the vulnerable Cuban ecosystems and human health, among the inhabitants of the "Jumagua" community in the municipality of Sagua la Grande, province of Villa Clara, Cuba.

MATERIALS AND METHODS

The research was carried out in the village of "Jumagua" (fIG.1), located in the municipality of Sagua La Grande in the province of Villa Clara, Cuba (Fig. 2).

"Jumagua", is a neighborhood located only 1 kilometer west of the city of Sagua La Grande (central Cuba). It is a Cretaceous terrain where in the middle of its great plain there are eight small hills fused together and crossed by caverns of fluvial origin; these elevations are known in Cuba as: Mogotes de "Jumagua".

The small town of "Jumagua", crossed by the Sagua-Habana highway, is part of the old farm called Sabana de Sagua which was granted by the Cabildo of Sancti Spíritus in 1596 and moved a year later to the Sabana del Ciego on the outskirts of the current Villa del Undoso (National Statistics and Information Office (NSIO, 2020).

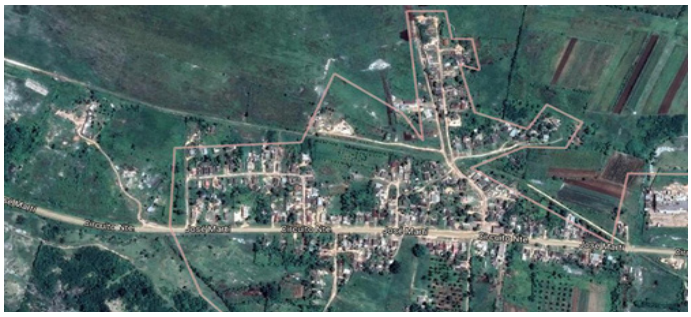


Figure 1. "Jumagua" is located west of the head of the municipality of Sagua la Grande, about 2 kilometers approximately from it, and is also located as a reference point on the Circuit Norte highway that connects the city of Sagua la Grande with the municipality of Quemado de Güines. Google Maps

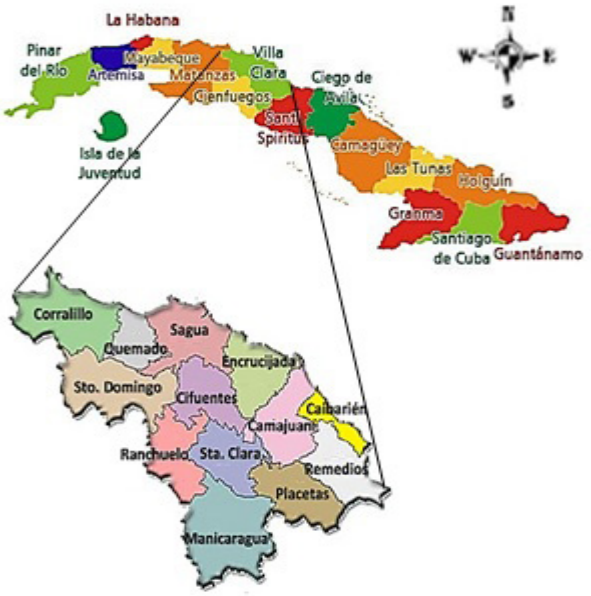


Figure 2. Map of Villa Clara province with its 13 municipalities. Google Maps

For the development of this research, methods of information collection and processing of the information collected were used to approach the multilateral study of the object of research. Methods of information gathering

Participative observation: to reveal insufficiencies of the sample and to estimate the transformations that were appreciated by the settlers of the village of "Jumagua" during the development of the set of activities.

Document review: to provide accurate information on the current state of the object of research, considering different authors who have addressed the subject and their results.

Interview: to know the opinions of the inhabitants of the "Jumagua" community about the Santanica (*Wasmannia Auropunctata)* as an Invasive Alien Species and its undesirable effects on the vulnerable Cuban ecosystems and human health.

The following is the interview conducted with the selected villagers.

Interview with residents of the community "Jumagua".

Objective: To explore the state of knowledge that the inhabitants of the "Jumagua" community have about IES and especially about the Santanica.

Slogan

Partner

The following is an instrument that will allow us to determine important aspects to improve our work. The achievement of the objectives of this research depends to a great extent on the sincerity of your answers.

Thank you

Questions to be asked to the interviewees

1. Do you know what an Invasive Alien Species is?
2. Do you know the Santanilla?
3. Have you had the opportunity to confirm the presence of Santanilla in your community?

a. If you have been able to corroborate the presence of Santanilla, tell us in which specific areas this species has been present.

4. We would like to know your opinion about the harmful effects that the Santanica can cause to the community where you live?
5. Have you ever been bitten by the Santanica?
6. How can Santanica be controlled in your community?
7. Have talks, workshops, video projections or other activities been carried out in your community by specialized personnel, where the population has been informed about the undesirable effects that Santanilla can cause to biological diversity and human health?

Would you like to receive updated information about the Santanilla as an IES and its undesirable effects on vulnerable Cuban ecosystems and human health, as well as how to control it?

Experts' criteria: to evaluate the proposal and improve it according to the indications mentioned by them in order to achieve the proposed objective. The evaluation criteria used to determine the experts' level of competence were: high competence (0.8 to 1); medium competence (0.5 to 0.7) and low competence less than 0.5. The use of the competence coefficient made it possible to select 5 highly competent experts.

An expert was assumed to be a person or persons with experience in the subject, with the capacity to make judgments, criteria and evaluations that would make it possible to improve the proposal prepared. The competence of the experts was determined by the K coefficient, calculated according to the opinion of each of the candidates, with respect to their level of knowledge on the subject to be addressed and the relations with the sources to argue their criteria (Table 1).

Table 1. Level of competence of the 5 experts consulted for the assessment of sociocultural activities

EXPERt	K	LEVEL OF COMPETENCE
1	1	HIGH
2	1	HIGH
3	1	HIGH
4	1	HIGH
5	1	HIGH

Authors' Elaboration

Statistical and mathematical methods are also used, among which descriptive statistics are emphasized for the

elaboration of the graphs, and percentage analysis is also used as a procedure.

The methods used for processing the information collected (intellectual) were the following:

Analytical-synthetic: to evaluate the main contributions of Cuban and foreign scholars to the research topic. In addition, the arguments coming from the sources consulted and in the examination of the results of the diagnosis are summarized and verified with the objective of locating the requirements, structure and organization of the set of activities.

Historical-logical: to examine the behavior of the research problem in other studied directions, the progress of the proposed solutions, and to implement the particularities of the theory in the preparation of the activities.

Deductive-demonstrative: to make deductions around the real situation about the knowledge that the inhabitants of "Jumagua" have about the IEEs and in particular about the Santanica, and the ways to solve them, reaching conclusions about the way to give answers, through the implementation of the activities to the problem under investigation.

Ascension from the abstract to the concrete: to reveal the theoretical and practical elements necessary for the preparation of the activities.

Modeling: to represent theoretically the set of activities, which supports their design, the correspondence between the conceptual, theoretical, methodological and practical aspects, as well as their integral construction.

The population is made up of 732 inhabitants and the sample is made up of 40 inhabitants of the "Jumagua" community, which represents 40.0% of the population of this community.

ETHICAL ASPECTS

The research was subject to ethical norms that made it possible to promote and ensure respect for all participants in the study, so that their criteria/ opinions and individual rights were respected, in order to generate new knowledge without violating the ethical principles of privacy and confidentiality of personal information of all research participants (DHAMM, 2013).

RESULTS AND DISCUSSION

Determination of needs

In order to carry out specific activities to promote community involvement in the knowledge of Santanica as an IES and its undesirable effects on vulnerable Cuban ecosystems and human health, by the inhabitants of the "Jumagua" community in the municipality of Sagua la Grande, the methodology of Action-Participatory Research (APR) (Alberich, 2008) was used (Alberich, 2008). This methodology is based on the application of interviews, participatory workshops, talks, meetings and direct observations; which allowed increasing and evaluating the knowledge of the inhabitants of the "Jumagua" community about Santanica and the need to control it.

A representative sample of 40 inhabitants of the "Jumagua" community were interviewed in a programmed manner and the questions were directed to determine the knowledge of each interviewee about the studies that have been carried out in the community about Santanica, about the experiences that the people interviewed have about this IES and about the local problems that can be identified related to the presence of Santanica in the community. The interviews allowed for the identification of needs.

Results obtained by the researcher from the application of the interview with the adult inhabitants of the community "Jumagua".

100% of those interviewed do not know for sure what an IES is. The following are some of the answers given by them.

- It is a species that is not Cuban.
- Some animal that is not from here, but has stayed to live in Cuba and is doing harm.
- Something that comes from another planet from outside.
- An EEI is the ferret, which is not from Cuba.
- Anything that is not from the country.

All those interviewed say they do not know what animal the Santanilla is; on the contrary, they do recognize the Santanica as an ant that is annoying. Evidently in the community the Santanilla is known as Santanica. In Cuba this species receives two common names.

100% say that the Santanica is present in their community and that they have been able to see it in many places.

100% of those interviewed stated that they have been stung by Santanicas in different places where they have been and that they have caused discomfort, including a very strong burning.

All the interviewees stated that they do not know how to control the ant, as they do not have any knowledge.

The following are some of the ways of control described by the interviewees.

- Alcohol is poured on the places where the ants are found and they are set on fire.
- Oil is poured on the ants.
- Salt is sprinkled on the anthill.

100% say that in the community where they live, no activities have been carried out by specialists, health institutions or other organizations related to the negative effects caused by this animal to vulnerable Cuban ecosystems and human health, and all are willing to receive information on the subject.

The interview revealed the following shortcomings:

- There is little knowledge on the part of the villagers interviewed of what an IES is.
- They do not recognize Santanilla, but they do recognize Santanica.
- Insufficient knowledge about the undesirable effects of Santanilla on vulnerable ecosystems.

Santanica to Cuba's vulnerable ecosystems.

- No activities are being developed to promote knowledge of Santanica as an IES.

Santanica as an IES

Among the potential for developing the work, the following can be mentioned:

- There are possibilities to carry out multiple activities in the community, which would

contribute to the dissemination of knowledge about Santanica and its harmful effects.

harmful effects.

- The motivation of those interviewed to help disseminate important aspects related to Santanica.

important aspects related to Santanica as an IES.

- Unconditional support from the researcher for transmitting knowledge to the community not only about Santanica but also about the

not only about Santanica as an IEE, but also in general.

Based on the results of the interviews and the diagnosis made with the community members during the meetings held in their homes, the task of preparing the workshops was proposed based on what they needed and were interested in knowing, with the topics corresponding to: the simplest, the simplest, the best known, the most concrete and the closest, taking into account popular knowledge.

The topics were fundamentally focused on the knowledge of Santanica as an IES and its undesirable effects. the activities that were programmed were not extensive, as there was a risk of losing interest or abandoning them because the villagers had other tasks to do. In this sense, the researchers assumed that each activity would last approximately 45 minutes.

Before implementing the set of activities, these were submitted to expert criteria. The following are the results of their evaluation:

- 100.0% of those surveyed stated that the proposal is very necessary, given

100.0% of those surveyed stated that the proposal is very necessary, given the lack of knowledge that the inhabitants of the "Jumagua" community have about the incidence of IES on human health.

- 100.0% stated that it is very pertinent.
- 80.0% said that it is a novel and original proposal.
- 100.0% consider it to be generalizable.

THE ACTIVITIES

The following are the different activities carried out in the community, as part of the proposed solution to the problems detected in the research.

Activity 1. Talk: Getting to know Santanilla or Santanica

Objective: Characterize biological aspects of the Santanilla.

Key words: formicidae, morphology, social organization

procedures to be developed: Using images, the researchers proceeded to establish the fundamental differences between Santanilla and other species of formicidae present in Cuba. Emphasis was placed not only on morphology but also on ecological aspects, such as the social organization of the group.

It was explained to the villagers in a pleasant way why the ants are called formicidae, emphasizing that they are part of a family called (Formicidae). They were told that the Santanica is a social insect that, like wasps and bees, belongs to the order of Hymenoptera.

One of the researchers told the selected villagers that ants evolved from wasp-like ancestors in the mid-Cretaceous, between one hundred and ten and one hundred and thirty million years ago, diversifying after the spread of flowering plants around the world. They are one of the most successful zoological groups, with about fourteen thousand described species, although it is estimated that there may be more than twenty-two thousand.

It was noted that they are easily identified by their angled antennae and three-sectioned structure with a narrow waist. Positive experiences in the control of the species were socialized.

Conclusions: the villagers expressed in one word what this exchange with the specialists gave them.

Activity 2. Video-debate: The Santanica, an annoying ant.

Objective: to discuss the external morphology of the Santanica, and the effects of formic acid on the ant's sting.

Key words: video, ***Wasmania***, formic acid.

procedures to be developed: the villagers were invited to watch three videos on Santanica (Fig. 3).

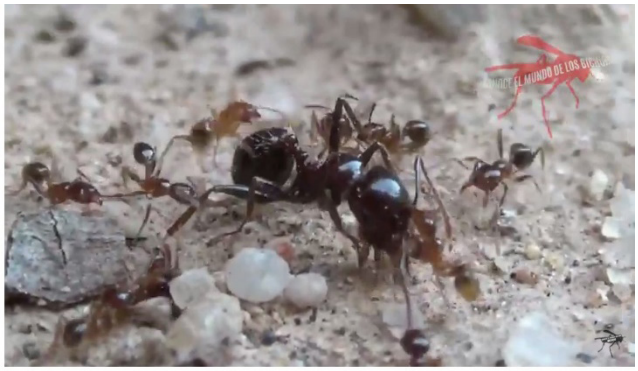
Subsequently, a discussion was held on the videos watched.

The need and importance of identifying the location of this troublesome species in the village of "Jumagua" was emphasized.

Conclusions: The villagers of "Jumagua", managed to acquire knowledge, about the effects of formic acid and the aggressiveness of Santanica.

Dumping Wasmannia auropunctata Tube

Little Red Fire Ant (Wasmannia auropunctata)



HORMIGAS - WASMANNIA VS MESSOR PROVOQUÉ UN CONFLICTO SIN QUERERLO | COMENTADO

Activity 3. Workshop: Control techniquesObjective: To explain some techniques for the control of Santanica.

Key words: insecticide, poison, boric acid, anthil

procedures to be developed: with the presence of a specialist from the Plant Health Institute of Villa Clara, there is an exchange with the villagers where tools are provided to identify the places where the Santanica colonies are.

Different control techniques are explained.

The specialist informed the villagers that one of the most effective poisons for ants is made with boric acid. This product has been used for a long time as an insecticide and is found in many minerals, including sea water and plants.

It is made known to the inhabitants that, boric acid is used today for pest control of many insects, including ants. In general, it acts on them because they do not detect its smell or presence, so they ingest it, causing problems in their digestive system that appear progressively, which allows other ants in the nest to become infected, including the queen.

Boric acid can be effective on its own by simply placing a little of its powder in the ants' path or by depositing the product at the entrance of the anthill.

Another way to prepare effective ant poison is to make use of boric acid and boiled corn meal. The preparation is simple, although it requires a little more time:

Here is how to prepare the homemade poison.

- Put a saucepan with two tablespoons of water to boil.
- When the water is boiling, add a little boric acid and two tablespoons of flour (previously you had to boil the flour in another pan).
- Stir to form a paste.
- When you have already made a homogeneous paste, you have the poison for ants.

The use is the same as with the mixture of boric acid with sugar: put small pieces of this paste near the area where there are ants so that they can take it to the anthill and eat it.

In addition to the homemade poisons, the specialist states that there are other remedies that allow the ants to leave. In such sense, there are the wastes when it is made to coffee, because the ants do not support the smell that gives off these residues, reason why they leave and they will not approach the zones in which you place it. Finishing with them this way is as easy as making coffee and not throwing the grounds in the trash, but depositing them near them.

Another method is the shampoo for lice: this product, mixed with a little water, also helps to finish with the ants, although it is indicated for other insects by the foam that makes. Just put it inside the anthill to finish them off.

Conclusions: The villagers gained new knowledge about control and what should be done to minimize the presence of Santanicas in the locality.

Activity 4: Art Festival

Objective: socialize information

Key words: posters, socializing, graphic advertisement, socializing, socializing

This activity was organized with the children of the community where an art festival was held with the modalities of painting, literature (stories, poetry), graphic propaganda (elaboration of leaflets, posters, advertisements). In all cases, the information to be socialized was the ways to control and manage the species, and the damage it can cause to health.

All the works presented were placed in different places in the community; such as, for example, murals in the school, medical post, warehouses, small squares or any other place that was decided, with the objective of socializing the information among the villagers who were not part of the sample.

Conclusions: The villagers of "Jumagua" socialized the knowledge acquired about Santanica as an IES.

The authors of the research wish to express that the set of activities implemented has no precedent in the village of "Jumagua", which represents a new way of working on biological diversity, of appropriating knowledge about IES and in particular about Wasmannia Auropunctata and its impacts on vulnerable Cuban ecosystems and human health.

The theoretical foundations assumed in the research allowed establishing the set of activities as a way to insert Environmental Education in relation to IES, in different communities in full correspondence with what was referred to by Expósito et al., (2021), and Armiñana et al. (2021a).

The experts consulted provided indications that allowed the enrichment of the proposal, emphasizing that it is necessary, pertinent, novel, original and generalizable to be implemented among the inhabitants of "Jumagua". In addition, they asserted that it complied with the theoretical principles that sustain it, favoring the achievement of the objective for which it was elaborated, providing a solution to the problem posed within the real possibilities of its implementation in situ.

It should be noted that this work carried out in the village of "Jumagua" favored, in general and from an integrating perspective, community work and social participation. From these premises, it was possible to make a modest contribution not only to the development of the fundamentals, but also to the practical application of Agenda 21, which coincides with what was expressed by (Proenza et al., 2020). In this sense, through these activities, spaces of reciprocity and meditation were created about the importance of knowing important aspects of this IEE. This collaborative and sensitization linkage allowed for an approximation of the inhabitants with the researchers and the feedback of scientific knowledge with popular knowledge. The workshops, talks and socio-cultural meetings were considered pertinent by the different external evaluators, which coincides with what was pointed out by (Barreda, 2010).

In the opinion of the authors, the activities improved the general integral culture of the villagers and favored the strengthening of values and the search for information and research on the Santanica, which is not different from what was stated by (Reyes, 2009; Hernández, 2014, Armiñana et al., 2020), when they assert from their point of view that activities related to the knowledge of IES and in particular of different species, make it possible to systematize knowledge, and above all to obtain recreated, conscious and well-founded knowledge through communication and debate.

The knowledge acquired by the villagers during the meetings made them reflect on how they could contribute to the dissemination of their new knowledge about the Santanica from their point of view. This meant that the villagers and facilitators were willing to return to their daily activities, but this time reviewing how they could contribute to control Santanica in other places where it appeared, even outside the municipality of Sagua la Grande. In addition, they shared what they had learned, not only with the inhabitants of the town where they live, but also with other neighboring communities. This is in agreement with what was stated by (Armiñana et al., 2021b).

CONCLUSIONS

The results obtained from the evaluation issued by the external evaluators reaffirm the value of the conception on which its design and elaboration are based. Taking into consideration that the research is qualified as sociocultural, it was complicated to evaluate behavior, but it can be affirmed that during the presence of the researchers in the village of "Jumagua", it was very flattering the horizontality that existed during all the development of the activities carried out, where the receptivity of all the participants to each explanation and criterion prevailed.

Numerous inhabitants were motivated to get involved in the search for solutions to the problems detected in the village related to the presence of Santanica. Finally, it was agreed to reflect, for new meetings, on possible actions to solve the problem of the Santanicas presence in various unsuspected places in the community. This coincides with Armiñana et al., (2020).

The knowledge acquired by the villagers during the meetings made them think about how they could help in the dissemination of the new knowledge they had acquired about Santanica.

This meant that the selected adults were ready to resume their daily practices, but this time reviewing how to contribute to the control of Santanica. In addition to sharing

what they learned, not only with the inhabitants of the village where they live, but also with other neighboring communities, which is consistent with what was expressed by Armiñana et al., (2019).

Six months after the research was conducted, and to the researchers' satisfaction, the villagers had eradicated the presence of Santanica in the village of "Jumagua".

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