

FLUORO-OCTANE-SULFONAMIDE (ALSTAR®) FOR CONTROLLING TAPINOMA MELANOCEPHALUM (F.) (HYMENOPTERA, FORMICIDAE)

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Abstract - Controlling *Tapinoma melanocephalum* (F.) can be extremely difficult and lengthy since the ants' appearance inside a building may vary by day and the location. There are no long lasting ant trails like in other species and even the preference for food may vary within the day (carbohydrates, fruit juice, dead insects, fresh bloody meat). The product ALSTAR® containing fluoro-octane-sulfonamide as active ingredient has been applied to a six-story residence hall since March 1998. The building contains 108 bedrooms, 42 bathrooms, 7 halls, as well as office facilities and a swimming pool in the basement together with changing rooms. All infestation spots within the hall and their exact location have been investigated by use of concentrated sugar and honey solution baits giving the following results: 6 kitchens and 49 of the bedrooms infested with *T. melanocephalum* together with 6 of the halls and 25 of the bathrooms. Through 16 infestation checks the number of infestation spots went down gradually and with fluctuations. Infestation spots were restricted to storie 4 to 6. During the treatment the baits were visited by varying numbers of ants. Distinct ant trails only existed for a short period of time. A massive run on the baits as could be observed for *Monomorium pharaonis*, have not been observed for *T. melanocephalum*. Fluoro-octane-sulfonamide is useful for controlling *T. melanocephalum*, and reduction of the infestation seems to be faster when compared to other applications.

Key words - Ants, buildings, Dolichoderinae, sulfluramide

INTRODUCTION

Tapinoma melanocephalum (F.) is a dolichoderine ant of the tropics and subtropics. Different from *Monomorium pharaonis* L. its petiole is formed by only one segment and not scale-like. *T. melanocephalum* is a polygynous species, the head and thorax of the workers as well as the females and males being colored black to brownish-black. The worker individuals with their gaster colored light cream to brownish-yellow, distinctly differ from the female and male individuals whose gaster is brown to blackish-brown. Workers have a body length of 1.3 to 1.5 mm whereas females and males are 2.3 to 2.5 mm long. In Germany this ant species has been found in the cities of Halle (1982), Rostock (1985), Hamburg (1993), Salzgitter-Lichtenberg (1996), and Berlin (1994, 1996, and 1998). In all probability the species is much more widespread than is known.

Controlling *T. melanocephalum* can be extremely difficult and lengthy since the ants' appearance inside a building may vary by day and location. Furthermore, there are no long lasting ant trails like in other species and even the preference for food (as there are carbohydrates, fruit juice, dead insects, fresh bloody meat, and biscuits) is variable. Since there has not been any satisfactory acceptance of baits containing hydramethylnon, and because special borax baits for controlling *T. melanocephalum* are successful but extremely time-consuming (Scheurer and Liebig, 1998), we have applied ALSTAR® containing fluoro-octane-sulfonamide as active ingredient (0.5%) to a residence since March 1998.

MATERIALS AND METHODS

To investigate the efficacy of fluoro-octane-sulfonamide (0.5%) no choice as well as multiple choice experiments were carried out in the laboratory. Since March 1998 the product is applied to a building in a field experiment.

No choice experiments

A small *T. melanocephalum* colony consisting of 1-3 females and 150-250 workers as well as eggs, larvae, and pupae was located in a Petri dish which was 18 cm in diameter. The only food offered was fluoro-octane-sulfonamide (0.5 %). In a small receptacle water was supplied at an adequate amount. Every day the acceptance of the bait, the colony's behavior, their running intensity, the brood's development, and the number of dead individuals were recorded. These data were compared to data obtained from a control colony which was fed the conventional basic food. These experiments were carried out three times with different colonies.

Multiple choice experiments

A *T. melanocephalum* colony consisting of 1- 3 females and 150-250 workers was located in a cage (35 x 20 x15 cm) together with their brood. Different food was offered simultaneously at a distance of 30 cm from the nest as there were fresh liver, a 1:1 mixture of egg yolk powder and biscuits, honey solution, and fluoro-octane-sulfonamide (0.5%) to choose from. Water was also supplied. A control colony was kept under the same conditions but without fluoro-octane-sulfonamide as food. Again the acceptance of the bait, the colony's behavior, their running intensity, the brood's development, and the number of dead individuals were recorded every 24-48 hours and compared to the control colony. These experiments were carried out three times.

Testing containing fluoro-octane-sulfonamide (0.5 %) under field conditions

During March 1998 the infestation of a hall of residence with *T. melanocephalum* became known. This ant species had presumably been introduced 2-3 years before, following some students' work abroad and brought in together with plants or fruits from Central or South America. The ants spread across the whole building. The building consists of office and rooms on the ground floor, a swimming pool in the basement, 108 bedrooms together with 42 bathrooms on the six storie above (shared by 4 and 2 residents, respectively), as well as 6 halls, 6 kitchens, and 6 living-rooms. Therefore there are 18 bedrooms, 7 bathrooms including toilets, one kitchen, one living-room, and one hall on each story.

The infestation state of each room was investigated by means of a saturated sugar solution. The thereby traced infestation spots were treated with fluoro-octane-sulfonamide (0.5%) baits. These were checked after 1 week, 3 weeks, and 7 weeks for their acceptance and consumption. Dead individuals inside and around the bait box were also recorded. About 10 -11 weeks after fluoro-octane-sulfonamide has put down for the first time a second infestation check was carried out by means of a saturated sugar solution to confirm the success of reducing or even terminating the infestation. From March 1998 on, three similar controlling cycles were carried out.

RESULTS

No choice experiments

In none of the three reiterations of the experiment the fluoro-octane-sulfonamide (0.5%) bait was accepted satisfactorily, nor did any ant trails occur. The occasional worker could be seen near the bait at time intervals of 15-30 min. Three days after the experiment started almost all workers stayed inside the nest together with the females, only the occasional worker was foraging outside, partly moving very slowly. Already dead individuals could be found and their numbers increased continuously. Very often the dead workers stuck to the ground surface of the nest box and the cage. Inside the nest box dead individuals were spread amongst obviously harmed and motionless ones which could not even move their antennae and had them sometimes kept aside. Repeatedly, dead ants were found stuck to the bait paste inside the bait box but they did not have a repellent effect on the remaining workers. The eggs and larvae that were in the nest box when the experiment started did not continue their development and died, nor

did any adults emerge from the pupae, presumably due to waning attention by the workers. After 7-10 days all individuals had died. The behavior of the control colonies not being offered fluoro-octane-sulfonamide baits did not differ from normal, they showed the usual mortality of 2-5 %.

Multiple choice experiments

In all three choice experiments the females and workers died after about 21-28 days, with the first dead workers already being found after one day inside the nest box as well as inside the bait box. At the beginning of the experiments, each nest contained 60-100 eggs. These eggs started to shrink after around one week time until they could not be detected anymore two days later. Similarly, the numbers of both larvae and pupae decreased from 40 and 25, respectively, down to zero within 14 days. From the seventh day on they already were not looked after by the workers. During this period of time the females were still very agile whereas the workers were already increasingly immobilized. Both groups very often gathered at the water supply. Numbers of dead individuals mostly stuck to the ground or the fluoro-octane-sulfonamide bait steadily increased. The individuals still alive did not make any antenna contact to each other.

Even in these choice experiments there were no distinctive ant trails neither towards the different food provided nor towards the fluoro-octane-sulfonamide bait. In all three experiments the food sources were visited only sporadically. Females lived longer than workers. In two experiments only one female survived till the end but died three days later. In the third experiment the two females died before the last 10 workers. The control colonies showed a 5% mortality, their behavior did not differ from normal.

Testing fluoro-octane-sulfonamide (0.5 %) under field conditions

The windowless, quite wet and very warm bathrooms of the treated hall of residence with their loose tiles and loose floor covering together with the water from the showers not ensured to drain properly provided best establishing and breeding conditions for *T. melanocephalum*. Groceries, fruits, and fruit juices not stored properly as well as objects lying around and containing remains of food and drinks served the ants as adequate and varied food. The ants run around up the tiles and all over the kitchens and bathrooms. Checking the infestation situation thoroughly on the 11th of March 1998 we detected *T. melanocephalum* in the hall of residence mentioned above at 86 sites altogether, i.e. 6 kitchens, 49 bedrooms, 25 bathrooms, and 6 halls. Infestation was greatest at the 4th-6th floor of the west-side containing the kitchens.

Immediately applying fluoro-octane-sulfonamide (0.5 %) reduced infestation down to 10 sites until the 11th of June 1998. These remaining sites contained 6 bathrooms extremely infested together with 4 bedrooms which showed groceries and fruit juices spread all over the place. As could be observed through 16 infestation checks from March until September the number of infestation spots went down to only two, that were the 5th and 6th floor kitchens. To achieve final control even in this difficult location, a bendiocarb barrier was placed in the cavity behind the kitchen's cupboard. Since in these kitchens *T. melanocephalum* had repeatedly taken parts of insects and the remains of biscuits into their hidden nests, the fluoro-octane-sulfonamide baits were added parts of killed *Blattella germanica* (L.) or combined with sweet liquid or paste baits containing borax as active substance. These additional baits were here accepted much better than freshly set fluoro-octane-sulfonamide baits, even two dead females were found at the borax paste bait.

DISCUSSION

According to the obtained results fluoro-octane-sulfonamide (0.5%) is very useful for controlling the polygynous ant species *T. melanocephalum*. Under field conditions a distinctive decrease of the population already occurred after 6-8 weeks, the effect is therefore much faster compared to the borax baits usually used. The results confirm and add to the work done by Rettich et al. (1998) who suc-

cessfully used sulfluramide for controlling *M. pharaonis*, *B. germanica*, and *Blatta orientalis* L. The fact that ALSTAR® bait boxes are transparent makes them easy to check for acceptance and consumption of the bait.

The baits were visited at different frequencies, only sometimes short-term ant trails existed and a long lasting rush on the baits as known for *M. pharaonis* did not occur at any time. Only few *T. melanocephalum* individuals were found at the fluoro-octane-sulfonamide (0.5 %) baits when at the same time other members of the colony were feeding on sugar, juices, and food remains or moved about. The decreasing activity inside the nest area together with the dying brood and the steadily increasing numbers of dead individuals in both no choice and multiple choice experiments confirm that even little amounts of the fluoro-octane-sulfonamide bait transported into the nest were given to all members of the colony enabling it to kill all individuals. Also females could be found at the baits. This shows that they are able to forage for food on their own when the workers are already killed. It is possible that some of the females not killed manage to form new colonies (Scheurer, 1989).

In spite of taking steps to control *T. melanocephalum* in buildings like the hall of residence mentioned above this ant species may be introduced once again from the tropics and subtropics at any time. That makes it necessary to check all newly imported fruits, plants or sweets for infestation. There are observations that this ant species can be spread across different stories of an infested building by means of material passed on to other people. Taking into account this ant species' great variability of food preference baits containing fluoro-octane-sulfonamide as active substance should be produced as fluid baits, gel baits or paste baits with different taste components. Such baits are recommended to be available for professional pest control for the future.

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