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OCCURRENCE OF TROPICAL AND IMPORTED ANT SPECIES IN EUROPE (HYMENOPTERA: FORMICIDAE)

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Abstract Climatic changes, tourism and travel, intensive product deliveries, especially of tropical plants, all contribute to the growth of ant infestations in Europe. These rapidly adopting ant species might need to be more thoroughly learnt and understood and possibly new, inventive eradication systems be developed. The black ant (*Lasius niger*) is popular indigenous species and present nearly everywhere in Europe. *Lasius neglectus* is a new introduction in Europe. The most widely present tropical ants are the Pharaoh's ants *(Monomorium pharaonis)* and the Argentine ant (*Linepithema humile*) in the Southern European region. The Crazy ant (*Paratrechina longicornis*) in the UK may grow to a heavy infestation as well. The traditional insecticides spraying seem to remain insufficient, and the European Directives that gives less opportunities of using insecticides. As most tropical ant species are invasive and aggressive they inhabit built-up areas. There is a considerable danger of spreading diseases, especially in public health institutions. The authors give an account of the current European tropical ant infestations. They also introduce their recent results of an insect growth regulator containing baiting systems that where used to eradication of the Pharaoh's ant colonies.
Key Words Tropical ant species, S-methoprene

INTRODUCTION

The rapid increase of the world population, as travel and tourism becomes more and more popular, as the exchange of goods and commodities are ever increasing, as national borders are diminishing, together with these events the travel and exchange of different insects has also continued. We must note that localized species suddenly appear in other climatic regions, that even in densely populated areas, where public health is very well organized, unknown diseases, infections may emerge suddenly.

This paper primarily wishes to deal with ant species of other continents, mainly from the tropics, settled and are not only emerging, but are spreading rapidly in Europe. Europe has four main climatic regions: the semi-arctic, Atlantic, moderate and the Mediterranean, which are very different from the habitat these species come from. The paper attempts to summarize the current situation and wishes to introduce the recent results and methods achieved against the most common tropical species in Europe, the Pharaoh's ant. The authors also wish to make certain deductions from their observations and call for the establishment of a centralized information bank, where information, primarily from European sources may be gathered to have a better insight on the actual situation, proliferation and prevention of the spreading of tropical ants and perhaps of other species.

ANT SPECIES ALREADY PRESENT IN EUROPE

Black Ant, or garden ant *(Lasius niger)*

Although the black, or garden ant is of no tropical origin, as it's not only the most common species of Europe but for the population it is also the most common sight, they do deserve to be mentioned. They are the most widely distributed ants, which is present in almost all gardens throughout Europe. They are nesting under stones, paving slabs or taking over the nests of meadow ants amongst grass. Quite occasionally, this species comes into houses, flats and makes somewhat of a nuisance of itself. Ants frequently build their nests in the insulation layers of houses and from there they penetrate up into the house itself — especially before heavy rains - through the cracks which inevitably appear in the piles of concrete and cement. It also rears aphids on many garden plants, making honeydew their favorite food, but may make considerable damage in strawberry fields as well. They become most visible when swarming occurs, usually midsummer, when flying ants, fertile males and females, from nests across a very wide area all emerge at once to mate. Most of the insecticides developed during the past and present centuries were aimed against this species. The possibly undereducated population in ant recognition and behavour are still using these insecticides in vain.

Lasius neglectus

Lasius neglectus is a recent arrival in Europe. Taxonomic name: *Lasius neglectus* (Van Loon, et al., 1990). Some of its populations have attained pest status. Its negative effects are caused by the enormous numbers of ants tending aphids on trees and occupation of electrical conduits in homes and gardens. *Lasius neglectus* is probably native to Turkey, though known to be present at locations in Budapest, Hungary, was only described in 1990 (Van Loon et al., 1990). It is a member of the sub-family Formicinae. The length of the workers: 2.5-3 mm, the queen 5.5-6 mm and the males 2.5 mm. The mandibles are 7-toothed; hairs are lacking on the scape (first segment of antenna) and usually on the legs. Their colour is yellowish-brown with the thorax somewhat paler. The live weight of the worker is 0.65-0.80 mg and the queen, 6.8-9.6 mg. Espadaler and Bernal (2004) observed that "the female is immediately recognisable within the European *Lasius* by its comparatively reduced size and proportionately smaller gaster, as compared with the thorax. The male is the smallest within the European *Lasius* (s. str.) species".

Polygyny in the nest (the presence of more than one functional queen), and most well recognizable as the characteristic of the species is that enormous number of workers are travelling up and down trees. In Europe *Lasius neglectus* is found in urbanised areas, from city streets to semi-urban lots with some natural vegetation. *Lasius neglectus* may also invade the interior of houses and occupy electrical conduits, causing short-circuits or damage to electro-mechanical devices. Outdoors, it usually nests at the base of plants and attends aphids on trees, often producing negative effects. As a result of the ants protecting aphids and "milking" them for their honeydew it causes honeydew to be produced in large quantities, in turn causing sooty mould to grow on leaves. To car owners it is immediately recognizable from the huge number of droplets caused by the sticky honeydew. *Lasius neglectus* is a poorly known species living in huge supercolonies with no apparent within-colony boundaries, and with a highly polygynous kin-structure (Van Loon et al., 1990; Boomsma et. al., 1990). Invasion pathways to new locations are mainly done by transportation of habitat material: movement of potted plants, turf peat, soil from construction.

Pharaoh's ants (*Monomorium pharaonis*)

Pharaoh's ants originate from the tropics and subtropics and therefore their preference is for warm and humid conditions. However, their adaptation to continental climate has taken place rapidly. The already well-known trends of European climatic changes serves well for the Pharaoh's ant's invasive lifestyle. The extensive and large inhabited areas in Europe with a huge number of standard and general technology of housing — with central heating, hot and cold water, gas pipes, electricity and media lines, garbage shoots, give a natural highway for these invasive species. The development and settlement of Pharaoh's ants and their colonies also disclose certain difficulties in control. In areas where climatic conditions are unfavourable (colder weather) the time span can be longer, due to slower developments. A colony may vary in size from the few dozen to hundreds of thousands of ants. The visible part of a nest is the foraging ants that represent only approx. 10 % of the total population. Their main food source is proteinaceous, but at different stages will consume other variety of food. The time and reason for budding is yet not explored well, but the general concept is the lack of appropriate food source and also simple nest over-population.

Pharaoh's ants pose a risk of spreading a number of pathogens such as *Streptococcus* and *Staphylococcus sp.* from unhygienic areas (Adams et al., 1999). Therefore special attention must be paid to hospitals, schools, kindergartens, restaurants, public kitchens etc. Beside the capability of spreading diseases it is worthwhile to mention that visible ant infestation causes aversion to the tenants, but even to municipal authorities who may shut infested restaurants until total eradication is not achieved.

Beside the adaptability of Pharaoh's ants, their exceptional survival ability by producing several queens and budding establishes a number of new nests. The nests are usually well hidden, remain totally inaccessible.

Figure 1. Estimation of the distribution of Pharaoh's ant in Europe.

European Pharaoh's ant infestation. Based on a number of written, verbal and sales information the authors have tried to reconstruct the propagation and rate of infestation of the Pharaoh's ant in Europe. Figure 1 is an estimation only, however it is evident that while Southern Europe is almost free of the Pharaoh's ant, Central and Northern Europe is well infested. This might be attributed to the well developed heating systems and humidity. Recent news gave account of Ireland where infestation, especially in hospitals, are also rapidly spreading. The authors believe that further data input and understanding is necessary to draw a more precise map and locate the real situation of infestations.

Pharaoh's ant propagation and infestation rates in Europe. Having no other and better method for the evaluation of the Pharaoh's ant infestation rate in Hungary, estimation has been based on the number of sold baiting stations and bait quantity (Figure 2, 3). It may give the information on the estimated number of flats infested as there is only one methoprene based product available on the market. On the other hand Pharaoh's ant

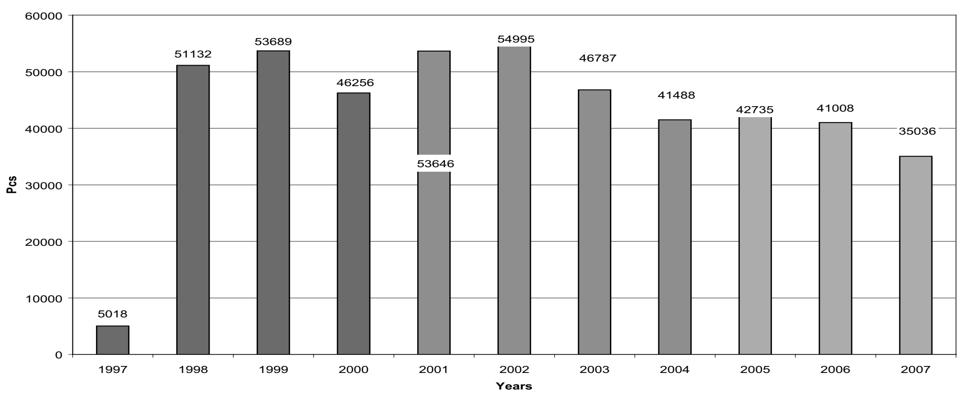

Figure 2. Sales of Pharaoh's ant baiting station in Hungary, 1997-2007

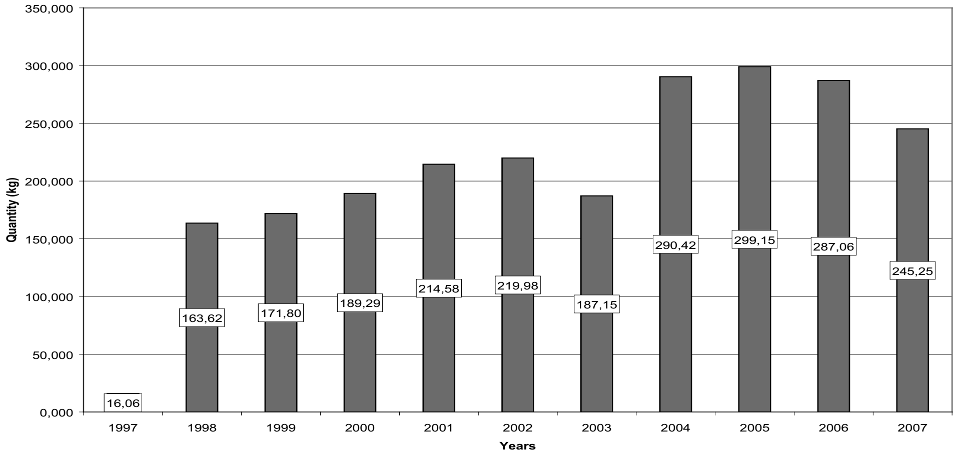

Figure 3. Quantity of Pharaoh's ant bait (kg) sold in Hungary, 1997-2007

control is usually not carried out by pest control operators. Since the introduction of the baiting station in 1997, the gradual increase shows the essentiality of the need for the product. Buyers have gradually understood the mechanism and accepted that although final result may come later than sometimes anticipated, it proved to be more effective than traditional use of different sprays. The difference between the sold baiting station pieces and the overall product in kilograms is only contributed to the changes of bait quantity in grams per stations. Based on the figures it becomes visible that the number of baiting stations sold decreased, but on the other hand the bait quantity decreased less, because the size of baiting stations has been increased.

Argentine Ant (***Linepithema humile***)

The Argentine ant is about 3 mm long dark-colored, that invades homes in search of food and water. The nests are in exposed soil and under cover at any dark, protected moist situation. May move indoors if too wet or dry outdoors. The Argentine ant is a highly invasive species that has spread from South America to many countries around the world. These ants have successfully established themselves on six continents and many islands. They reach new areas by hitching a ride with humans or their goods. They are especially fond of sweets, but will feed on practically any food. These ants are extremely well adapted to urbanized areas with mild climates and well-watered gardens. Argentine ants are polygyne and monomorphic. They pose a serious threat to native wildlife by upsetting delicate food webs. They are especially formidable due to their aggressive behavior and the enormous size of their colonies which can literally „team up" with other colonies.

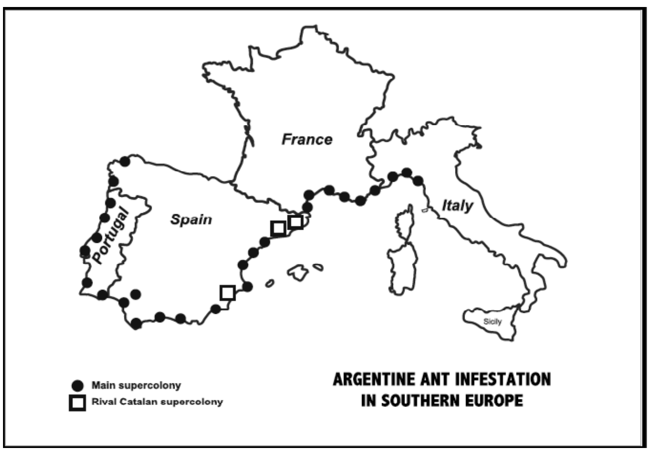

Figure 4. Argentine ant infestation in southern Europe.

It seems that the Argentine ants invaded Europe in 1920 and they entered by settling around the coast of the Mediterranean from Portugal to Italy (Fig. 4). The Argentine ant having an extraordinary unicoloniality social organization, whereby individuals mix freely among physically separated nests. This type of social organization is a key attribute for the ecological domination of these ants. The introduction of the Argentine ant in Europe was apparently accompanied by a dramatic loss of inter-nest aggression and the formation of two immense supercolonies (which effectively are two unicolonial populations). Introduced populations experienced only limited loss of genetic diversity at neutral markers. Workers of the same supercolony are never aggressive to each other despite the large geographical distance and considerable genetic differentiation between sampling sites. By contrast, aggression is invariably extremely high between the two supercolonies, indicating that they have become fixed for different recognition alleles. But this did not prove to be true.

A genetic analysis done by Keller's team revealed that the European Argentine ants are a diverse lot. The main supercolony, which ranges over 6,000 km from Italy to the Span cooperative unit ever recorded. What is clear is that the recognition genes between the main European supercolony and the Catalonian supercolony are very different. Ants from these colonies effectively forms the largest aggressively, biting at the head, releasing venom and locking body parts in the jaws.A supercolony is a remarkable structure because it involves hundreds of billions of in-dividuals. The social organization of an entire species can change by changing their environment. Argentine ants are a particularly aggressive invasive species. Away from their homeland they tend to displace or eradicate the local ant populations as well as spiders and other insects. The ants destroy fruit and buds, and tend to protect insects that devastate plant life. Their tremendous destructive power is due in part to their ability to form vast cooperative colonies

Crazy Ant (*Paratrechina longicornis*)

The occurrence of Crazy ants, *Paratrechina longicornis* (Latreille) in Europe has only been a recent observation. We have little information: it has been reported from Amsterdam and London and also in Switzerland. It occurs in large numbers in homes or outdoors. They often forage long distances away from their nests, so nests are often difficult to control. The name "crazy ant" arises from its characteristic erratic and rapid movement not following trails as often as other ants. The crazy ant is so morphologically distinctive that it is one of the few *Paratrechina* that is not consistently misidentified in collections.

The crazy ant is found in various parts of the world. It is of Asian or African origin but is found in tropical cities worldwide. The slender- bodied, long-legged worker is capable of extremely rapid movement. The crazy ant is highly adaptable, often nests some distance away from its foraging area. It nests in such places as trash, refuse, cavities in plants and trees, rotten wood, in soil under objects and also have been found under debris left standing in buildings for long periods of time. These ants can nest in a variety of locations from dry to moist environments. Workers are omnivorous, feeding on live and dead insects, seeds, honeydew, fruits, plant exudates, and many household foods. They apparently have a seasonal preference for a high-protein diet, and during the summer months may refuse honey or sugar baits. They are attracted to honeydew producing homopterans in spring and fall. Large prey items are carried by a highly concerted group action (Trager, 1984). In cold climates, the ants nest in apartments and other buildings where they are potential pests year round. Workers feed on many household foods such as meats, grease, sweets, fruits, vegetables, and liquids.

White Footed Ant (*Technmyrmex albipes*)

It has been published that the White footed ant (*Technmyrmex albipes*) are in great number present at the highly visited and extremely popular Eden project, located in England. The White footed ants are medium size, 2 -3 mm in length, usually black with a lower part of the foot pale yellow to white. The nest produces a number of queens, budding is usual. Worker ants collect honeydew. By August 2005 the estimated infestation rate at the Eden project reached 14.5 million ants. After the introduction of integrated pest management and the use of Biopren® BMS, baiting stations containing S-methoprene and also Gourmet Ant bait, containing boric acid their number has dropped to an estimated 4.5 million. Project managers are aware of the fact that by bringing in plants, soils, building materials etc. into the Eden Project biomes, there is a higher risk of invasion from a wide range of pests. Continual vigilance and monitoring remains their priority.

DIFFICULTIES OF EFFICIENT ANT CONTROL AND TREATMENTS

The defense against newly introduced ant species requires new approaches, insecticides and mostly, further education. The general approach of the population and even of the PCO experts stands for the interest of a rapid elimination of the infestation. Preferences for control work are different chemicals, but these are not the ideal control methods at all as they rather cause the nest to disperse. Insecticides usually do not reach the nest itself, but primarily hit the foraging ants only. It may look like efficiency has been achieved, but to the contrary several new nests are being established at other areas of the buildings. As nests usually have a considerable amount of food reserved and piled up, the survival rate is high and the queen will carry on its reproduction. Shortly after the insecticidal treatment the foraging ants explore new territories and food sources. So instead of achieving a good result, such treatment adds up to a rapid proliferation of the species. One of the most challenging jobs is to eradicate species that have multiple queens and invisible, inaccessible nests. When dealing with newly imported ant species it is most important to understand their social structure. The main problem is represented by the number of queens within a colony and very unfortunately Pharaoh's ant, Argentine ant, the Crazy ant and the White footed ant are all polygyne, having multiple queens. This fact gives a high survival and proliferation capacity to these species. The multiple food preference is another capability that adds up to colonies' successful overwintering, even under moderate or cooler European winters. As seen below these species may change their food preference, probably by seasonality and at development stages. They are not too selective in choice, and this fact must be taken in consideration when developing baits, traps etc. Basic preferences of imported tropical ants are: Sweets: Argentine, Pharaoh's, Crazy, White footed ants, Protein: Pharaoh's, Crazy ants, Oils: Argentine, Pharaoh's (rarely) ants.

Baiting and Active Ingredients

Pest control must focus on total eradication of pests, or in case this is not possible, at least to achieve a successful perimeter treatment to keep infestation under control. One of the most complicated pest control operation is ant control. The European tradition is based on a number of outdated insecticides with different applications (spray, aerosol, dust). Pest control operators and the public in general are undereducated in respect of ants, especially when it comes to relatively newly imported species. When applications are made they are not really aware that mostly the foraging workers are hit, which may only be a small proportion of the colony. This specifically stands for Pharaoh's ants. It is an interesting experience that in France for example pest control operators do not realize, nor do they differentiate the Pharaoh's ant from the *Lasius* species.

It has been proven that based on S-methoprene insect growth regulator with different food grade matrices, although the result may not be immediate, but rather slow, however 100 % eradication is the result. Since, different baiting systems has been trialed and introduced worldwide against a number of tropical and other ants, the common in these systems are the following: Formulations begin to contain slow action insecticides; The baiting stations are designed to the special requirements of each species; Solid and liquid baiting containers are becoming more common; Baiting station developments consider in and outdoor use. Because of the 98/8 EU Europen Biocidal Directive a number of common, efficient and well known insecticides have already, or must be phased out from 22nd August, 2008. For example boric acid, chlopyrifos and methomyl will no longer be at our disposal. Substitution of these active ingredients is possible (eg. S-methoprene, fipronil, hydramethylnon), but it is difficult to forecast their success, because the number of European laboratory and field trials against imported ants are not as much tested yet as it would be desirable.

Because of efficacy and safety reasons an insect growth regulator, methoprene has been chosen as active ingredient. Methoprene is a juvenile hormone analogue that inhibits the development of the queens and the brood. Although methoprene is relatively slow acting but has international literature, studies and the Biological Laboratories of Univesiti Sains Malaysia and Babolna Bio Ltd. have proven the efficacy capacities of S-methoprene (Hendrick et al., 1973; Staal, 1975). The main benefits of using insect growth regulators in a well established, consumable bait are their harmlessness against humans and other species, environmentally fairly hazardless, and the target of the control measures is the colony and the nest itself, specifically the queens and the brood. Queens are responsible for reproduction and the main function of a nest is to serve the queen and defend the eggs and brood. Unfertile queens and brood inhibited in development, leave the workers and the foraging ants "jobless". Such an event will cause the gradual decrease of the nest until their final disappearance. When this stage is achieved the use of insecticide spraying is permitted for the final eradication of the foraging ants.

Laboratory Trial With 0.5 % S-methoprene

In case of the Pharaoh's ants, during the years of developments the authors have understood the importance of bait matrices in competing for food, special emphasis was layed on bait particle size, non-repellency, slow action etc. and have successfully developed different baiting systems. The latest development is the so-called Biopren® Duo. This is a two chamber baiting system containing two different matrices. Our previous observation in studies carried out earlier was that while M-matrix proved to be more preferred by ants, T-matrix seemed to be faster acting. Both compositions are based on 0.5 % S-methoprene IGR, with different proteins and carbohydrates in different proportions. The overall result was that the Pharaoh's ant colony has disintegrated within 8 — 9 weeks, while with previous formulations, this period lasted for 12 — 14 weeks. The queens remained infertile and no budding, or re-establishment of the colony occurred.

The aim of the study was to determine appetibility and the duration of nest elimination. Studies have been conducted in four different vessels, with M-matrix, T-matrix, with the duo baiting stations containing both matrices and a control group was established. Conditioning started on December 20, 2007 and lasted until January 21, 2008 when the colonies established themselves and propagation has started. The room temperature was 25ºC with a 50 % relative humidity. Light period was 12/12 hours. The vessels were placed at 120 cm height to avoid direct sunshine. The study vessel was a polyethelene 17.4 l rectangular bucket with a 627 cm2 ground surface. Fluon has been used to avoid the escape of ants. The artificial nest was a 6.5 x 5.5 cm polyethelene box with an open entrance part on the top. Prior, a wetted paper napkin was placed inside. For the food 9 cm diameter petri dishes were placed in with fresh cockroach and housefly carcasses and sugar. Similar arrangements were made for drinking, by a wetted napkin placed in a petri dish. The different bait matrices were also placed into a 9 cm diameter petri dish. The baits were placed in the testing arena on January 21. On every seventh day counting has been made on: Change of number of queens by percentage; Change of number of workers by percentage; Change of number of larvae and pupae by percen; Bait consumption by gram. Because the number of ants placed in the arena, were different, each calculation was based on the initial quantity as being 100%. Every change was measured to this initial figure.

Table 1. Change in the number of queens (pcs/relative change by %).

Days of reading	087.003. T matrix		087.004. M matrix		087.005. T + M matrix		087.006. Control	
	No.	%	No.	%	No.	%	No.	%
01.21. — 0. day	13	100.0	18	100.0	26	100.0	20	100
01.28. — 7. day	15	115.4	23	127.8	29	111.5	22	110
02.04. — 14. day	15	115.4	25	138.9	35	134.6	25	125
02.11 . — 21. day	16	123.1	26	144.4	36	138.5	27	135
02.18. — 28. day	15	115.4	23	127.8	37	142.3	28	140
02.25. — 35. day	13	100.0	24	133.0	40	153.8	30	150
03.03. — 42. day	11	84.6	22	122.2	40	153.8	35	175
03.10. — 49. day	8	76.9	20	111.1	36	138.5	40	200
03.17. — 56. day	7	53.8	19	105.6	34	130.8	42	210
03.24. — 63. day	4	30.8	15	83.3	23	88.5	44	220
03.31. - 70. day	1	7.7	10	55.6	12	46.2	50	250

Observations: At the beginning the number of queens have increased, but following weeks 6 — 7. in the case of the T-matrix gradually began to decrease. In case of M and T + M — matrices" the number of queens have not decreased, but began to wander together with the decrease of workers, they left the nest more and more often. Very probably the wandering queens were infertile. In the control vessel the number of queens have more than duplicated.

Table 2. Change in the number of workers (pcs/relative change by %).

Days of reading	087.003. T matrix		087.004. M matrix		087.005. T + M matrix		087.006. Control	
	No.	%	No.	%	No.	%	No.	%
01.21. — 0. day	550	100.0	1100	100.0	1500	100.0	900	100.0
01.28. — 7. day	600	109.1	1200	109.1	1500	100.0	1000	111.1
02.04. — 14. day	650	118.2	1300	118.2	1550	103.3	1050	116.7
02.11 . — 21. day	600	109.1	1200	109.1	1550	103.3	1150	127.8
02.18. — 28. day	600	109.1	1150	104.5	1200	80.0	1250	138.9
02.25. — 35. day	450	81.8	1150	104.5	950	63.3	1300	144.4
03.03. — 42. day	400	72.7	750	68.2	850	56.7	1300	144.4
03.10. — 49. day	250	45.4	440	40.0	650	43.3	1350	150.0
03.17. — 56. day	10	1.8	19	1.7	15	1.0	1500	166.7
03.24. — 63. day	4	0.7	10	0,9	10	0,7	1600	177.8
03.31. - 70. day	1	0,2	2	0,2	2	0,1	1800	200.0

Observations: During the first weeks the calculation of the workers was only possible by observations and was rounded up to the hundreds. Calculations were helped by digital standstill photos. When the number of workers decreased to approximately the 100, counting became much more precise. During the first weeks of the trial the number of workers increased, but from weeks 4 — 6. rapidly decreased. By the eights week 98 — 99% of the workers were dead. In the control arena the number of workers consistently increased, by the 8th week it has increased by more than 150%.

Table 3. Change in the number of larvae and pupae (mm/relative change by percentage).

Day of reading	087.003. T matrix		087.004. M matrix		087.005. T + M matrix		087.006. Control	
	No.	%	No.	%	No.	%	No.	%
01.21. — 0. day	10	100	18	100	12	100	12	100
01.28. — 7. day	9	90	18	100	13	108	13	108
02.04. — 14. day	9	90	20	111	13	108	13	108
02.11 . — 21. day	8	80	21	116	11	91	14	116
02.18. — 28. day	8	80	15	83	8	66	14	116
02.25. — 35. day	7	70	12	66	5	41	18	150
03.03. — 42. day	6	60	9	50	3	25	20	178
03.10. — 49. day	2	20	2	11	0	0	20	178
03.17 — 56. day	0	0	0	0	0	0	22	183
03.24. — 63. day	0	0	0	0	0	0	22	183.3
03.31. — 70. day	0	0	0	0	0	0	23	191.7

Observations: The larvae and pupae were within the nest in one or more piles. In order to make a distinction between the development stages the calculation was made by their diameter in mm. During the first weeks, by their numbers no observable changes occurred. From weeks 3 — 4. the number considerably decreased and by week 8 no larvae and pupae were in the nest. In the control group the number of larvae and pupae continuously increased.

Table 3. Bait delivery (in grams).

Days of reading	087.003. T matrix	087.004. M matrix	087.005. T + M matrix	
	gr	gr	gr	gr
01.21. — 0. day	0.00	0.00	0.00	0.00
01.28. — 7. day	0.72	1.35	0.14	0.50
02.04. — 14. day	0.50	0.43	0.07	0.37
02.11 . — 21. day	0.08	0.19	0.07	0.32
02.18. — 28. day	0.06	0.18	0.04	0.06
02.25. — 35. day	0.00	0.15	0.02	0.03
03.03. — 42. day	0.00	0.11	0.00	0.00
03.10. — 49. day	0.00	0.02	0.00	0.00
03.17. — 56. day	0.00	0.00	0.00	0.00
03.24 . - 63. day	0.00	0.00	0.00	0.00
03.31. — 70. day	0.00	0.00	0.00	0.00

Observations: At the beginning of the trial every type of bait has been weighted and this has been repeated on a weekly basis. Pharaoh's ant workers have very quickly identified the food source and began to deliver it into the nest. During the first three weeks deliveries were the most intensive, following it has decreased drastically. A part of the bait was piled up within the nest and most probably food intake was delivered from the piled bait within the nest. It can be assessed that M-matrix was more favorably delivered than the T-matrix.

CONCLUSIONS

Imported ant species are in a growing number present in Europe. While some are already spreading at high speed (Pharaoh's and Argentine ants) some are remaining localized (Crazy ant, White footed ant). There may be certain climatic or other natural barriers against their spreading, but within a short period they may also accustom and overcome these obstacles. Only a systematic surveillance, the development of special, species orientated monitoring systems (especially at borders), setting up of early alert systems and up-to-date insecticides may battle against them successfully.

Urgency treatments in case of new emergences and systematic eradication programs might become necessary if spreading of the infestation changes from local to larger areas. The authors' systematic approach, favorable results and the deductions from their work might be useful in the development work against other imported ant species. The exchange of information, experience on international level, primarily within the European Union, especially if a new, imported species occurs is of high importance. The built-up of an early alert system either by the EU, or European Federation of Pest Controllers or any other international body may help to localize the infestation by special urgency treatments, or if a higher infestation is dealt with, than a systematic eradication program could be carried out. The quick and immediate publications through the internet would highly contribute to keep Europe free of tropical ants and other non-indigenous species.

The biological laboratory trials have proven the successful use of the S-methoprene based two different matrices. The number of queens has decreased by the T-matrix from the 35th day and resulted by the 56th day a 50 percentage decrease. The number of workers has decreased almost by the same proportion both by the T and the M matrices and by the 56th day only 2% of workers remained compared to their original numbers. T matrix has more rapidly decreased the number of larvae and pupae and by the 56th day all have died. T and M matrices together resulted an efficient result by a week less than expected. Overall it can be stated that the Pharaoh's ant bait containing S-methoprene, following a slight ant population increase at the early stages, has the capacity to eliminate the number of workers, larvae and pupae to nil, within 50 — 60 days. If T matrix is used alone, the number of queens started to decrease from the 35th day. During the use of T + M matrices together the number of queens did not decrease, to the contrary slight increase was observable, but they have left the safeness of the nest and began to forage, wonder aimlessly, which is typical of the

S-methoprene effect. The miss of the workers, larvae and pupae the mortality of the queens is only a matter of time, which is equivalent with the total elimination of the nest.

REFERENCES CITED

Global Invasive Species Database, *Lasius neglectus* - www.issg.org/database/species/ecology.asp?fr=1&si=663

Daniel Bajomi, Janos Szilagyi, Jozsef Schmidt. 2006. Elimination of ant nests with different Baiting systems based on S-methoprene insect growth regulator. In: C.-Y.Lee and W. H Robinson, eds. Proceedings International Conference on Urban Pests, Singapore 2005

Adams, A., Kunkel, S., Todd, G., Höbel, S. 1999. Method and procedure for evaluating biological performance of Pharaoh ant, *Monomorium pharaonis* (Hymenoptera: Formicidae), baits. In, W. Robinson, G. Rambo, and F. Rettich, eds. Proceedings of the Third International Conference on Urban Pests, Praguen Czech Republic.

Bajomi, D. 2004. BIOPREN BMS Pharaoh's ant colony eliminator and monitoring system 'The novelty ant nest destroyer'. International Pest Control.

Stowaways Kids' pages, Kids' Information, Invader Fact Sheet www.landcareresearch.co.nz/education/stowawayskidspages/invaderfactsheet.asp

Michner , C.D. 2002. Evolution of supercolonies: The Argentine ants of southern Europe. Tatiana Giraud Jes S. Pedersen and Laurent Keller - Edited by Charles D. Michener, University of Kansas, Lawrence, KS

Bijal Trivedi, Ant "Supercolony" in Europe Raises Questions About Getting Along National Geographic Today, Updated April 23, 2002, National Geographic News http://news.nationalgeographic.com/news/2002/04/0418_020418_TVantcolony.ht ml - Ant supercolony dominates Europe, BBC News / 16 April, 2002, http://news.bbc.co.uk/1/hi/sci/tech/1932509.stm

Freitag A., Dorn K., Cherix D., 2000. First occurrence of the crazy ant *Paratrechina longicornis* (Latreille) (Hym. Formicidae: Formicinae)in Switzerland. Bull. Soc. Entomol. Suisse 73(7434), 301-303.

Trager JC. 1984. A revision of the genus *Paratrechina* (Hymenoptera: Formicidae) of the continental United States. Sociobiology 9: 51-162.

J.C. Nickerson, Kathryn A. Barbara: Crazy ant, Featured Creatures, June 2000. Latest revision: July 2007, University of Florida: http://creatures.ifas.ufl.edu/urban/ants/crazy_ant.htm#intro#intro

Smith M.R. 1965. House-infesting ants of the eastern United States; their recognition, biology, and economic importance. USDA Technical Bulletin 1326. 105 p.