Agronomy Research **4**(Special issue), 269–272, 2006

Development and control of mound nests of black garden ant (*Lasius niger*) in farmland

A. Lind, A.-J. Martin, Ü. Aron, K. Hiiesaar, E. Koskor and T. Lukas

Institute of Agricultural and Environmental Sciences,Estonian University of Life Sciences, 64 Kreutzwaldi St., 51014 Tartu, Estonia; e-mail: ave.lind@mail.ee

Abstract. The aim of this study was to investigate development of mound nests of *Lasius niger* treated with ant repellents compared with untreated habitats in agricultural landscapes. The research was carried out in Kiidjärve, Põlva County, in 2004. After transferring a group of ant colonies to new locations, some small new nests had been slowly rebuilt on nest bases which had not been treated with repellents. The nest bases treated with repellents were abandoned, and new mounds were not restored in those locations. After treating the interior of undamaged nests with injections of tobacco dust and a water solution of Fairy (a liquid soap used for dishwashing), tobacco dust, and Cayenne pepper, the colonies started to weaken and the mound increase was negative. The height and diameter of the untreated control nests increased. Test results indicate that the best way to eliminate *Lasius niger* and other soil-living ants is to transplant the nests to new sites, then treat transplanted nest bases with repellents. It is necessary to transplant the subterranean part of the nest with hibernation chambers, including removal of the queens and worker ants taking care of them. The treatment of nest interiors with repellents (tobacco dust, Cayenne pepper) caused weakening of the colony, elimination of the brood growth and decrease of the building activity.

Key words: soil living ants, *Lasius niger*, ant control, mound nest, nest increase, natural repellents

INTRODUCTION

The abundance of ants and their impact upon most terrestrial ecosystems makes them a true keystone species, which have direct and indirect effects upon the biodiversity of terrestrial communities (Hölldobler & Wilson, 1990). The abundance of soil-living ants in different agricultural landscapes makes them a dominant species, which have positive effects on the soil genesis and on the regulation of number of insects, including pest insects of agricultural crops.

Specifically, ants are beneficial because: 1) they are important components in different ecosystems, 2) their soil-moving skills make them important in nutrient cycling, 3) they consume large quantities of prey food including pest insects, 4) they are good pollinators of wild berries, 5) they distribute seeds, including seeds of weeds, and improve their germination in forest communities, increasing the plant diversity of natural landscapes.

At the same time, *Lasius niger* may also be a pest. They are troublesome neighbours in our yards, houses, greenhouses, and beehives, invade our homes to

collect food, and they encourage the growth of aphid on cultivated plants, causing damage and decreasing the yield of the cultures.

In low agricultural intensity, the number of black ant colonies rises rapidly and the size of nest mounds increases persistently in fallow areas (Maavara & Martin, 1985). In that way, ants may become a nuisance by constructing mounds or small hills in orchards, front gardens, meadows, wooded meadows, old grasslands, pastures and on lawns, inhibiting mowing. In bee gardens, ants populate the beehives, becoming nuisances for the bee colony and decreasing the honey production.

Although *L. niger* is not under protection, their nests are worth preserving as they are important entomophags in natural communities, having a positive effect on crops growing in their vicinity (Frouz et al., 2003).

The aim of this study was to investigate development and increase of mound nests of *Lasius niger* treated with ant repellents, as well as those which have not been treated, in agricultural landscapes.

MATERIALS AND METHODS

The research was carried out in Kiidjärve, Põlva County, in an old meadow near a railway in summer 2004. We chose 24 mound nests of similar size (diameter 50±10cm, mound height 25±5cm) and conducted three different experiments. Eighteen (18) above-ground mound nests, including their underground hibernation chambers, were removed and resettled into a new location over the railway tracks where it was not possible for them to return to their previous nesting sites. Then, groups of three (3) nests were treated as follows:

1) Nest removed, nest base not treated with repellent
2) Nest removed, base treated with tobacco dust (15 g. per colony)
3) Nest removed, treated with cayenne pepper (15 g per colony)
4) Treated with tobacco dust in soapy water solution (100 lm)
5) Nests were undamaged, but spayed with tobacco dust and soapy water solution
6) Nests were opened; tobacco dust was shaken into nests
7) Nests were opened; cayenne papper was shaken into nests.

Treatments were carried out daily for 10 days.

For control we chose 3 nests of the same size and vitality as the experimental nests. We measured the nests' increase (N-S, O-W diameters), height and temperature once a week. The height and the diameter of nests were analyzed by analysis of variance (ANOVA, Tukey test).

RESULTS AND DISCUSSION

After transferring colonies to new nest sites, some new small nests had been slowly rebuilt on the untreated nest bases. There was no significant increase in size on the removed nest bases. New nests were probably occupied by neighbouring colonies or by ants that had remained behind. There were no brood chambers inside the restored nests in the first experimental year. As there was very great competition for free nesting places, all free territories were occupied. Ants did not return from the

transferred nests due to the long distance; it is probable that the railway was an impassable barrier for them.

The nest bases treated with repellents were abandoned, and new mounds were not built there, suggesting that fresh repellents deterred the ants from occupying the removed nest sites and rebuilding a new nest there.

The height of the untreated control nests increased significantly, by as much as 14 cm, and the diameter of the nests increased by 18.33 ± 1.85. The control nests grew faster due to increased building activity of ants adding fresh sand and soil, in comparison with the treated nests (Fig.1).

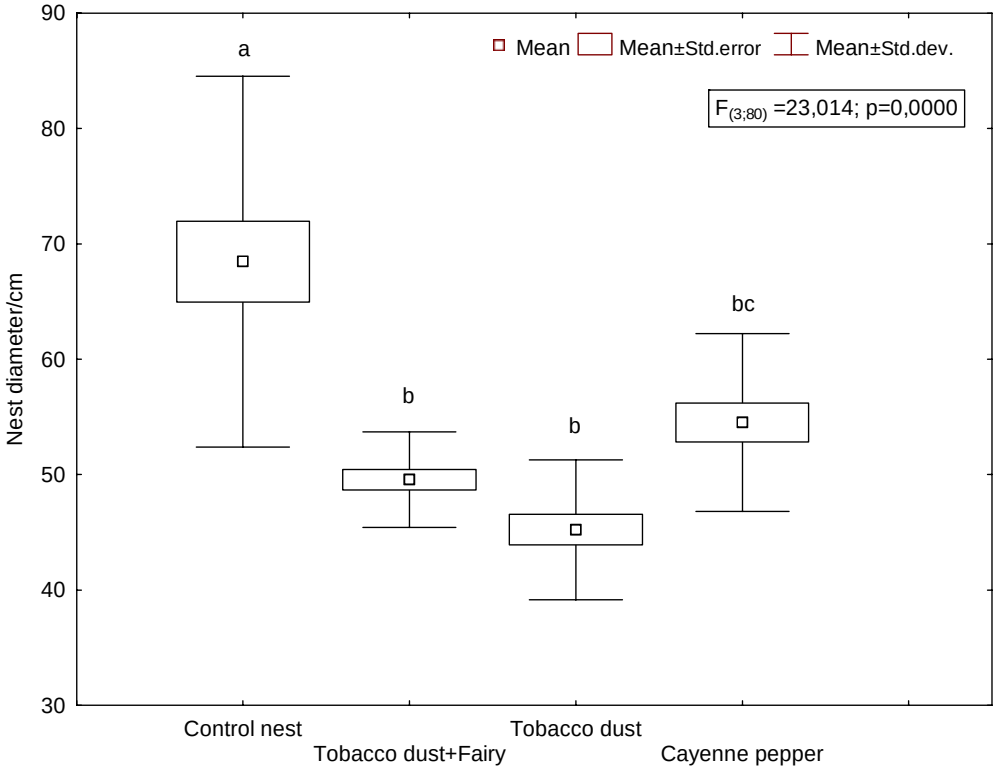

Fig. 1. A comparison of the nest diameter fluctuation in control and experimental conditions of *Lasius niger*. Means followed by the same letter are not significantly different ($P < 0.05$).

The undamaged mounds, whose interior was treated with repellents, started to weaken, and the nest height increase was negative, compared with the untreated control nests (Fig. 2). There was no fresh soil on the nest surfaces. The ants produced a smaller brood and, after third treatment of the nest interior the inside temperature decreased and the brood disappeared. As the colony growth of black garden ants decreased, the building activity decreased as well.

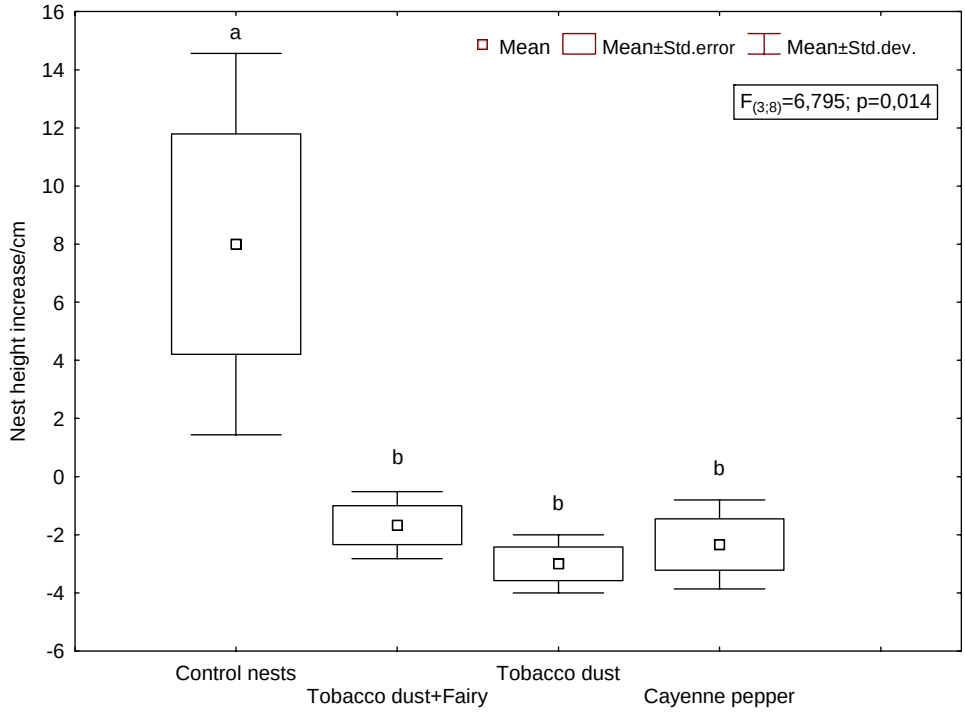

Fig. 2. A comparison of the nest height increase of *Lasius niger*. Means followed by the same letter are not significantly different ($P < 0.05$).

CONCLUSIONS

The most efficient method of eliminating *Lasius niger* and other soil-living ants is to transplant the nests to new sites and treat transplanted nest bases with repellents. It is necessary to include the removal of the subterranean part of the nest with hibernation chambers, collecting the queens and worker ants as well. The treatment of nest interiors with repellents (tobacco dust, Cayenne pepper) caused weakening of the colony, disappearance of the brood growth and decrease of the building activity. The best way to avoid ants in our gardens, pastures and arable land is to use proper agrotechniques. It is important to cultivate, mow and fertilize at the right time, and ants will not be a nuisance.

ACKNOWLEDGEMENTS. The research was supported by the Estonian Science Foundation (Grants no 5330, 5737 and 6722).

REFERENCES

Hölldobler, B. & Wilson, O. E. 1990. *The Ants*. Springer, Verlag, Berlin, Heidelberg, New York, 860 pp

Maavara, V. & Martin, A. 1985. *Terrestrial invertebrates of Matsalu wetland. Matsalu – a Wetland of International Importance* (compiled by Prof. E. Kumari). “Valgus”, Tallinn, pp. 181–185 (in Estonian).

Frouz, J., Holec, M. & Kalcik, J. 2003. The effect of *Lasius niger* (*Hymenoptera*, *Formicidae*) ant nest on selected soil chemical properties. *Pedobiologia* **47**(39), 205–212.