

Enchytraeids (Oligochaeta, Enchytraeidae) from potting compost purchasable in the Hungarian retail trade

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Abstract. The high humus and organic material content of potting compost is favourable for detritivores such as enchytraeid worms. An investigation was carried out to clarify which enchytraeid species can be found in this medium. A really low abundance and number of species were found and all of them were well known cosmopolitan species. Consequently, the use of these composts probably cannot cause the increase or invasion of new species, in spite of the worm's special breeding strategies.

INTRODUCTION

Potting compost, available for purchase in flower shops, have a high humus and organic material content. This is favourable not only for plants but detritivores such as spring-tails (Collembola), millipedes (Diplopoda), woodlice (Isopoda) and many terrestrial worms.

Enchytraeids are important representatives of the mesofauna. They are widely distributed from the tropics to the Polar Regions. Although they are adapted for many habitats, like seaside, mosses, decayed wood or rock grasslands (Dózsa-Farkas, 2002; Boros, 2007) the preference of rich soils is their general trait. Due to compost addition they are common in cultivable lands: farms, gardens, flowerbeds and even they can easily subsist in flowerpots due to their small size. This is the reason why enchytraeids got their common English name i.e. "potworms".

Hereupon it is not surprising at all, if we find them in potting compost bags as well. Strangely enough, until now there were no investigations to clear up what kinds of enchytraeid species are living in this medium in spite of the fact that usage of compost can contribute to the spread of enchytraeids. Especially if we take into consideration that certain enchytraeid species have special repro-

duction methods, which can facilitate their settlement in new habitats.

These special reproduction methods are parthenogenesis (Christensen, 1961), self-fertilization (Dózsa-Farkas, 2002) and 8 species in 3 genera (*Buchholzia*, *Cognettia*, *Enchytraeus*) can multiply by fragmentation in rotation with sexual reproduction. This phenomenon was first recorded by Bell (1959) and since then different fragmenting strategies were observed. *Enchytraeus bigeminus* Nielsen & Christensen, 1963 reaches sexual maturity when its population density is low (Christensen, 1973). Oppositely, *E. dudichi* Dózsa-Farkas, 1995, reproduces asexually by fragmentation, and when the density is high enough the worms become mature and turn to zoogamy (Dózsa-Farkas, 1995). In the case of *E. variatus* Bouguenec & Giani, 1987 only juveniles are able to fragment, mature specimens breed sexually (Bouguenec & Giani, 1989).

It is easy to see the benefits of these reproductive strategies. If environmental factors do not change massively, populations adapted to any given circumstances have an advantage. However, worms moving to a new habitat can be much more effectual with exponential fragmenting. The dominance of parthenogenetic populations over those with sexual reproduction was proved on several occasions. (Christensen *et al.*, 1978, 1992).

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MATERIAL AND METHODS

Soil samples were taken from 40 or 50 kg sacks of potting compost available for purchase in flower shops. Manufacturer companies and brands were selected from all over the country (Fig 1).

Compost usually is made by riddling, mixing and grinding followed by cleaning to eradicate metallic pollution, weed seeds and parasites. The processes can change a little in every company but the main steps are the same. Brands are different in the ratio of the ingredients but all of them made from various peats, soil, decomposed plant waste, clay and sand (Table 1). Primary materials are mainly obtained from Hungary but in a few cases peats are imported from Baltic countries (e.g. Leier Ltd., Specialmix Ltd.).

Examined companies and brands are listed below with the name of the localities in *italics*.

Garri Ltd., *Pomáz-Kiskovácsi*

The company is approximately 10 km north of Budapest, at the foot of the Pilis Mountains. The whole manufacturing process is automated and controlled by computers. The annual volume is 20.000 m³ of soil compound.

Leier Hungary Ltd., *Jánosháza*

Fairly versatile company, which produce numerous products: especially building materials but also potting compost. The industrial unit is approx. 150 km west-southwest from Budapest and 40 km north of Lake Balaton. It is the largest factory in western Hungary, produces 1.5 million bags of potting compost per year.

Biopakk Ltd., *Seregélyes*

The factory is about 55 km southwest of Budapest. Their production is approximately 20.000 m³ of potting compost per year.

Florimo Ltd., *Kecel*

The company is 110 km south-southeast of the capital. The annual production is more than 70.000 m³ potting compost.

Specialmix Ltd., *Gödöllő*

The company is in the suburbs of Gödöllő, 25 km northeast from Budapest. Their production is approximately 30.000 m³ of potting compost per year.

Enchytraeid worms were extracted from the soil by the wet funnel method (O'Connor, 1962). Living specimens and whole mounted specimens were examined and measured with a Zeiss AxioImager A2 microscope using DIC (Differential Interference Contrast) illumination. Important characters were recorded, drawn and photographed with AxioCam MRc5 digital camera and Axio Vision 4.7 Software. For preparation of whole mounts, specimens were anaesthetised in ascending concentration of ethanol than fixed in 70 % ethanol. Specimens were stained with borax-carmin and embedded in euparal.

RESULTS

The abundance and number of species were both very low, altogether 6 species from 3 genera were found. Worms were aggregated in the samples: for the most part there were no animals, but in some instances a few dozen could have been found in a handful of compost. Juvenile *Enchytraeus* species were found in relatively high numbers. Lack of reproductive organs made it impossible to identify these worms so all these specimens were indicated as *Enchytraeus* juveniles.

Species found

Garri Ltd.

Enchytraeus buchholzi Vejdovský, 1879

Enchytraeus juveniles

Fridericia bulboides Nielsen & Christensen, 1959

Leier Ltd.

Enchytraeus juveniles

Biopakk Ltd.

Enchytraeus buchholzi Vejdovský, 1879

Enchytraeus lacteus Nielsen & Christensen, 1961

Enchytraeus juveniles

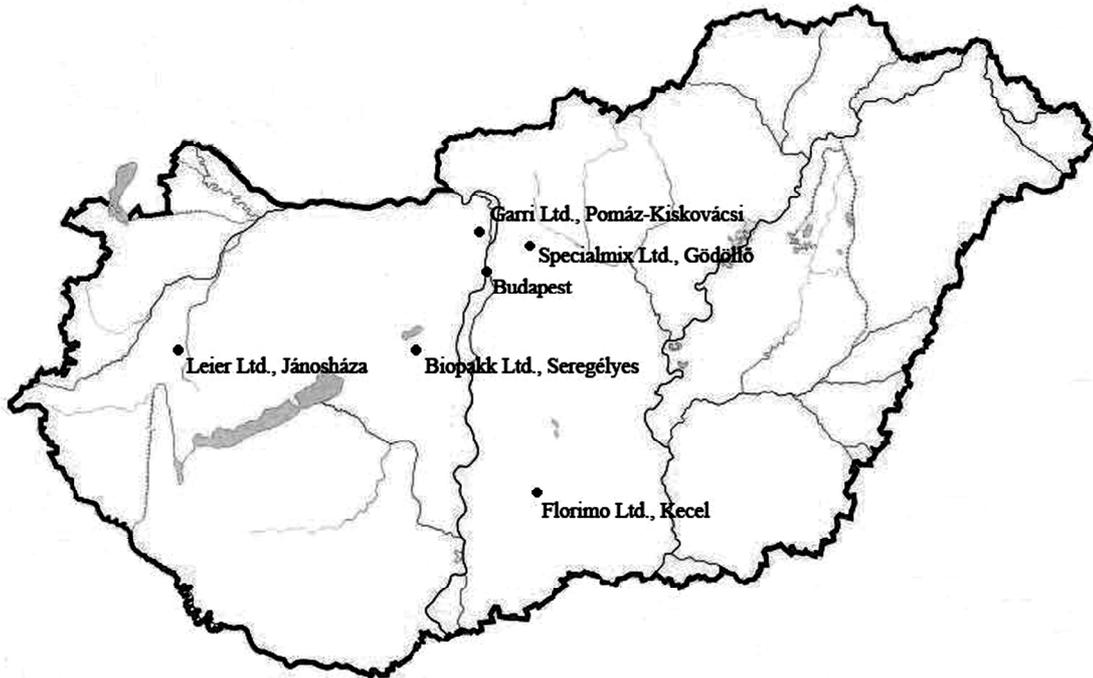


Figure 1. Seats of the compost manufacturing companies investigated in the study

Florimo Ltd.
Enchytraeus bigeminus Nielsen & Christensen,
1963
Enchytraeus juveniles
Henlea ventriculosa (d'Udekem, 1854)

Specialmix Ltd.
Enchytraeus bigeminus Nielsen & Christensen,
1963
Enchytraeus lacteus Nielsen & Christensen,
1961
Enchytraeus juveniles
Henlea ventriculosa (d'Udekem, 1854)
Fridericia composti Schmelz, 2003

DISCUSSION

According to expectations, there was a low abundance and number of species in the samples. Reasons for this could be the relatively pure basic materials and also the storage methods. Most of the compost sacks are kept in the open air, exposed to frost or strong sunshine that can lead to extremely high tem-

peratures in the plastic bags. The species found were essentially cosmopolites, small sized (under 1 cm) and undemanding worms, so they can survive even in very harsh environment.

Usage of these composts in the gardens can result in the colonisation of new enchytraeid worms. These worms can settle down and intermittently infest due to, for example, their effective asexual multiplying strategies. In spite of this the invasion of incoming species is unlikely since the species found in potting compost were all cosmopolitans and are probably present in most gardens anyway. Furthermore, enchytraeids are detritivore animals so the presence of newcomers is not harmful for plants, but explicitly useful since their activity increases the nutritive material content of soil.

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Table 1. Ingredients and pH of the different investigated potting composts

Name of Company / Seat	Ingredients of potting compost	pH
Garri / Pomáz-Kiskovácsi	<ul style="list-style-type: none"> • peat (from Pötréte, Hungary) • sand • humus • artificial additives 	6,5–7,0
Leier / Jánosháza	<ul style="list-style-type: none"> • peat (from Lithuania) • composted bark and/or plant waste • clay • artificial fertilizer 	No data
Biopakk / Seregélyes	<ul style="list-style-type: none"> • peat (both from Hungary and Lithuania) • decomposed manure • dried manure • sand • alginite 	6,5–7,5
Florimo / Kecel	<ul style="list-style-type: none"> • <i>Sphagnum</i>-peat • moor-peat • bio humus • clay • river-sand 	6,5–7,0
Specialmix / Gödöllő	<ul style="list-style-type: none"> • white peat (from Baltic region) • alginite • composted bark • mineral mix • artificial fertilizer 	6,0–7,0

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