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A humane trap to catch mole rats

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ABSTRACT

SHORT COMMUNICATION

Mole rats, *Spalax leucodon* Nordmann, are fossorial rodents which live in underground galleries. Since they are active all year long, foraging for vegetation both above and below the ground, these animals cause significant damages to agricultural crops, forest resources, field areas and ecosystems. Because of the damage caused by these animals, everyone wants to get rid of from these animals. To capture these animals, a lot of traps have been developed up till now. These traps are entitled as "kill traps" or "kill trapping". But, due to perception from these animals, most of them are abandoned. Kill traps are available on the commercial markets, but live traps are very difficult to obtain. In this study, a live trap (humane trap) has been proposed as an alternative trap to catch these animals. By these traps, a lot of mole rats could be captured very easily.

Introduction

Mole rats, *Spalax leucodon* Nordmann, are fossorial rodents which live in underground galleries. They are mainly phytophagous animals and make their habitats by burrowing in soft and productive agricultural plantations, steppes and gardens. These animals use their extremities for burrowing and shoveling and they are often confused with moles (*Talpa europea* Linnaeus) (Ozkan, 2002). The fossorial mammals are well adapted to an underground life in closed burrow systems (Zubidat *et al.*, 2009).

Mole rats are solitary animals and they live alone except during their breeding season. The soil mounds from tunnel excavations are quite distinctive and the most obvious sign of the presence of mole rats. Each mound contains only one animal. Breeding mounds used by female mole rats consist of a nest chamber lined with plants, two or three storage chambers and a toilet chamber. The smaller mounds surrounding the breeding mound are inhabited only by males (Nevo, 1969; Cooper *et al.*, 1993). Males and females come together only for a brief encounter in spring to mate. After a 45 day gestation period, 2 to 5 young are born in the underground nest chamber. When the young are a few months old, they leave their mother's burrow system and establish their own territories (Zuri and Terkel, 1998). The galleries under the mounds are round and their diameter varies according to the size of the animal, food source and the texture of

the soil (Yagci and Asan, 2007). The mole rats use incisors and front paws to break the soil and kick back the excavated soil with the hind feet. At intervals, the animal turns 180° and rams the earth back along the tunnel. The head is used like a bulldozer blade during this activity (Nevo, 1969; Yagci and Asan, 2007) (**Figure 1**).

Mole rats are active all year, foraging for vegetation both above and below the ground, and storing clipped foods in underground food caches. Burrowing systems are quite complex with a nest chamber about 1 m below the ground surface. Mole rats may cause considerable damage to ecosystems, various agricultural crops, reforestation and many resources because of foraging, digging and gnawing habits (Witmer *et al.*, 1999; Reynolds *et al.*, 2006). Efforts to reduce the damage by mole rats have relied upon population reduction, primarily by the use of kill traps or toxicants (Witmer *et al.*, 1999). In some situations, these methods can be effective, but they are relatively labor intensive. Additionally, they must be repeated, usually on an annual basis, because of the high reproductive rate of surviving or reinvading animals (Baker *et al.*, 2012).

These animals are not only interesting subjects of biomedical research but also important agricultural pests (Nevo *et al.*, 1999; Dillman *et al.*, 2014). That's why, an effective live trap model was reviewed to catch the mole rats alive. This type of trap is much more humane than others.

Figure 1. A mole rat (*Spalax leucodon*) and its incisors (arrow).

Material and methods

The basic equipment includes a stick, a spade or shovel, a hand trowel, wood boards, gloves, thorns or flags (for marking trap locations), a plier and appropriate materials for processing live animals. The basic procedure for trapping mole rats involves finding and excavating burrows, placing traps, marking trap locations, checking the traps, processing captured animals, and finally, removing traps and filling in the excavations.

Kill traps are used for controlling the mole rats. Many kinds of kill traps, like trapping, fumigation, gassing, flooding, exclusion, using toxicants and gas explosive devices, have been developed and tried for years, but only a few types are in common use and available on the commercial markets (Mursaloglu, 1964; Richards, 1982; Baker *et*

al., 2012). Most types of traps kill the animals by striking, constricting, or puncturing the animal's body (Witmer *et al.*, 1999). However, most of these methods were abandoned, because the animals were caught as dead. In addition, these traps are frequently perceived by the mole rats and filled with soil to prevent activation of the mechanism during the application (Baker *et al.*, 2012).

Live traps are mainly used for research purposes presented pipe-type traps to capture mole rats live (Mulder, 1979; Soriguer *et al.*, 1984; Yagci and Asan, 2007). But these traps were less successful to capture mole rats alive.

Setting a humane trap

The mole rats maintain a closed burrow system (gallery system) and "patrol" in the system regularly. Burrow systems usually have “main tunnels" with much sides, "lateral” tunnels that lead to soil mounds where the mole rats pushed the soil from excavations or to earthen feeding plugs where the mole rat had surfaced to clip vegetation and take it back into its burrow (**Figure 2**). The mole rats are captured while they are foraging, or attempt to repair their burrow systems. In the case of live traps, putting a piece of carrot or apple and some grass in front of the mouth of burrowing system will help to capture the animals alive. After arranging the traps, the location of traps should be well marked so as to be visible from a distance and checked continuously.

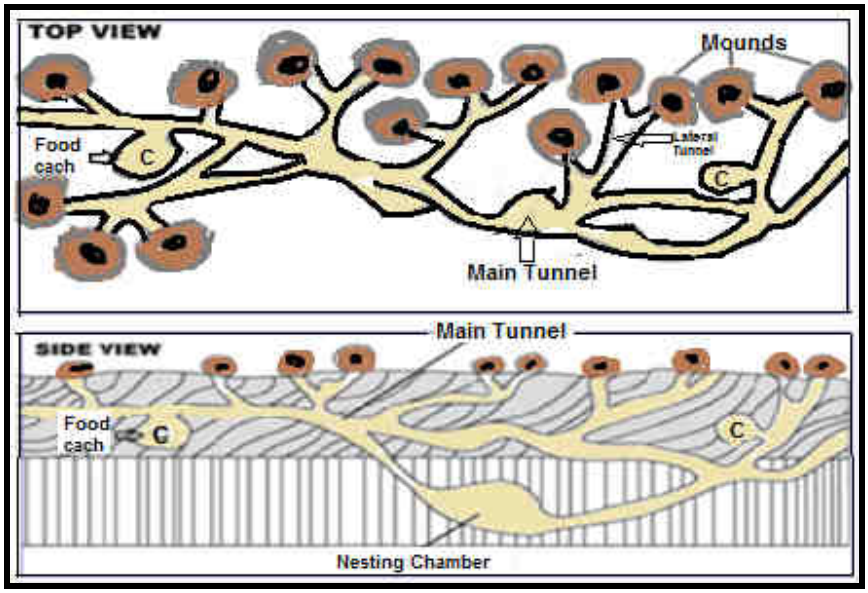

Figure 2. Mole rat burrowing system (Top view and side view). The main tunnel has lateral tunnels that terminate with above-ground mounds. Food caches (C) and a nesting chamber (deepest chamber) are shown.

Fresh soil mounds are good sign as to where to set traps. The mounds will be connected to lateral tunnels that connect to a main tunnel. You can determine which direction the lateral tunnel goes by looking at the fan of loose soil. This is where the mole rat push the soil above the ground (**Figure 3, Figure 4**). The small plug will be where the burrow begins. However, these lateral tunnels are often backfilled with soil for a foot or so.

Using a stick, follow the lateral back to the intersection where the lateral joins the main tunnel. After you think you've located the main tunnel, dig a hole to expose both ends. After setting traps, kick over all fresh soil mounds in the area so that any new activity can be easily detected.

Figure 3. Mole rats mounds

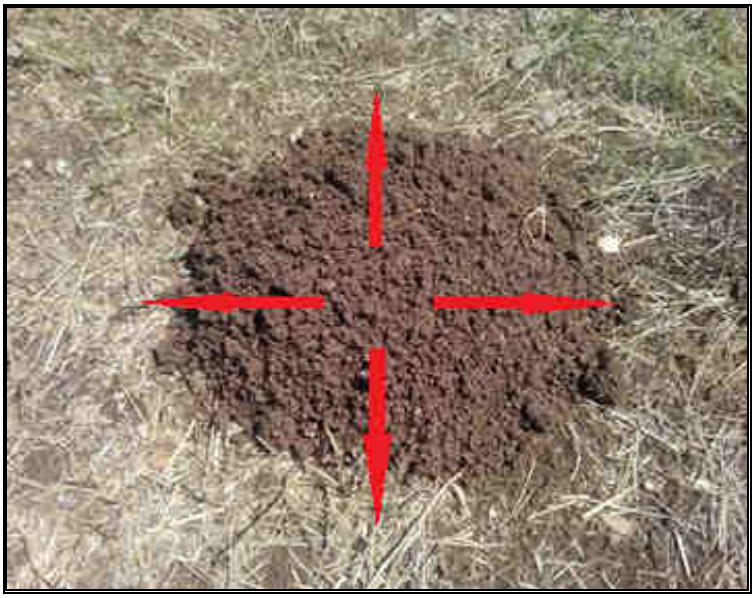

Figure 4. Mole rats mound showing direction of the burrow and where soil was pushed out of the hole (arrows in a fan pattern)

The humane trap developed in this study is very simple. It is comprised of a stick, a thorn and a 7 cm width and 40 cm long wooden board(s). To arrange this trap, a fresh mole rat mound is found in the field or land. The main tunnel of the mound is determined and then the tunnel is opened using a shovel or a garden trowel wide enough to set traps in pairs facing opposite directions. A stick is used to make sure that each burrow opening is going off in a straight line for at least 25 cm, that it does

not fork immediately, and that there are no major impediments to the trap's smooth operation. It is best to locate burrow openings going off in roughly opposite directions and prepare and set traps in each direction. Placing traps with their openings facing in opposite directions means you will be able to intercept a mole rat coming from either end of the burrow.

After excavating a burrow, thorns are inserted into tunnel entrances to follow the mole rats activities and wooden boards are placed over the tunnels vertically from 40-50 cm behind the openings (**Figure 5 and 6)**. These types of traps are also prepared for other tunnels. Mole rats will push soil into the entrance of tunnel if they detect air movement or light. When the animal approaches the entrance openings of tunnels by soil, the thorn is pushed by soil and shaked. After the detection of this movement, the wooden board is pushed into the soil by a shovel. The animal is captured alive between the gallery opening and the wooden board. This process is repeated in other traps to catch more animals (**Figure 7 A and B**).

Figure 5. Establishment of a humane trap.

Figure 6. Setting two humane traps.

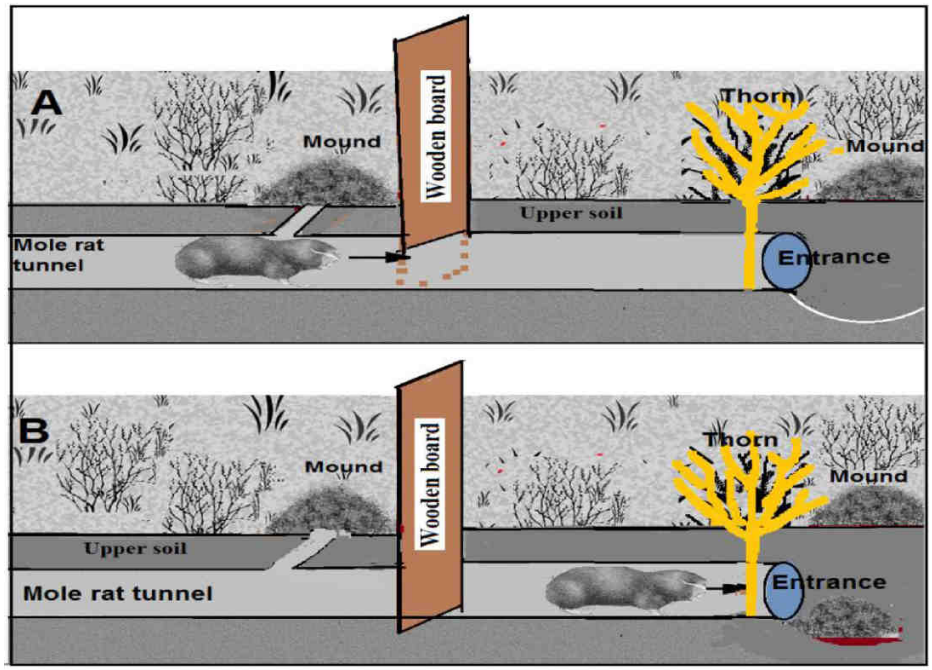

Figure 7. Establishment of a humane trap and trapping of an animal.

The traps are checked continually and reset if they are not successful. If you catch one mole rat per burrow system, you have probably taken care of the problem for that localized area. Because, the mole rats are solitary animals except for the time when they are breeding or nursing the young. It is best to continue excavating the area, because several of the tunnels will usually either dead end or double back to one of the other openings. If a tunnel forks and only one trap is available, set the trap in the downward sloping fork as it will more often lead to the main runway.

The microclimate conditions in the burrow systems of mole rats are surprisingly very stable. When the burrow systems are opened, the mole rats are disturbed by microclimate conditions. When this condition is detected by a mole rat, it attempts to close the tunnel opening (Jarvis and Sale, 1971; Gervais *et al.*, 2010). Interestingly, the tunnels are closed faster by the animals in cold and windy weather conditions. Probably perception of vibrations and sound caused by the wind in the mouth of the tunnel stimulate the animals to close the opening faster. According to some experiences, the best time for trapping the mole rats is early morning and late afternoon.

Trapping can be conducted during any snow free, nonfrozen soil period. In the northern region, however, the traps are often prepared in spring and early summer or in the fall when there is adequate soil moisture to make probing and digging easier and mole rats are actively excavating new burrows.

A live trap designed before works as the animal getting in the trap pulls the trigger out and the door connected to the trigger frees and closes the trap downward (Bennett *et al.*, 1994). But, this trap can be perceived by the mole rats. Also, live traps proposed before are similar to other traps; the metal or plastics tubes used in these traps are more complicated and have triggers, and these traps can also be perceived by the mole rats (Yagci and Asan, 2007; Arslan, 2013). Because of perception by the mole rats, the

animals cannot be captured, and they can be time consuming apparatus.

Conclusion

Most of the methods are abandoned, because they are frequently perceived by the mole rats and filled with soil to prevent activation of the mechanism. This trap is presented as an alternative to other traps. This is a humane method which has been used in moist and hard soils of the Central Anatolia and the Mediterranean regions of Turkey. A lot of mole rats were captured by this type of trap and used in labs for some experiments. The working principle of this trap is simpler than those of other traps. Also, it cannot be perceived by mole rats.

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