Searching for alternative methods for a sustainable population management of the common vole (*Microtus arvalis*) in Saxony-Anhalt

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Abstract

High crop damage can occur due to gradations by *Microtus arvalis*. After the gradation years 2004/2005 and 2007 the Ministry of Agriculture and Environment Saxony-Anhalt initiated a research project to find new ways of managing *Microtus arvalis* on farmland. At the moment, the conclusion of this project is that deep tillage is the most effective method to minimize the *Microtus* populations. The impact of weather conditions such as rain and ground frost without snow is also significant. Because of their non-selective toxicity against other vertebrates rodenticides should only be used as a last option.

Keywords: common vole, gradation, *Microtus arvalis*, Sachsen-Anhalt, Saxony-Anhalt, tillage, weather

Introduction

In times of high population density the common vole (*Microtus arvalis*) causes high crop damage on agricultural land. The damage caused by common vole gradation can in some areas reach 70% or even 80% of the harvest (Jacob and Tkadlec, 2010; Plant protection Department Saxony-Anhalt pers. comm., 2008). After the last gradations in 2004/2005 and 2007 the Ministry of Agriculture and Environment Saxony-Anhalt initiated in 2008 the research project on the common vole in Saxony-Anhalt. Part of the project is to develop methods for a sustainable management of *Microtus arvalis*. Establishing monitoring systems for the risk prediction of common vole gradations is another part of the project.

Materials and methods

Areas with a high density of common vole were monitored regularly. On infested fields two areas of 250 m^2 each were selected. On these fields the *Microtus arvalis* activity was controlled using the common method of closing all tunnel entrances. After 24 and 48 hours the number of reopened tunnel entrances was counted.

Another field of research was exploring the effect of different land management systems on the development of the *Microtus arvalis* abundance. For this purpose a tillage experiment with five tillage types was used, each one with a width of 24 m and two replicates. Plot one was ploughing to a depth of 21 cm, plot two grubbing with a cultivator to a depth of 18 cm, plot three shallow grubbing with a cultivator to a depth of 10 cm, plot four disking with a disk harrow to a depth of 6 cm and plot five was no-till/direct drilling.

Results

During the past three years the regional development of the *Microtus arvalis* abundance and its state of gradation was monitored. With this regional data farmers are enabled protect their crops in time.

It could clearly be shown that the type of tillage has great influence on the progression of a possible gradation. However, also weather was an important factor. The results of the tillage experiment showed that a deep tillage, whether through ploughing or deep cultivating, has the greatest influence on the *Microtus arvalis* population and decreases the rate of activity to nearly zero. The shallow tillage variants showed a decrease of vole activity, however, a measurable activity remained. On the no-tillage plots a rather high population of *Microtus* survived and started spreading after the abundance ascended.

However, the spring population is not only affected by the type of tillage but also depends on previous weather conditions as stated by Herold (1954). Not being an objective of this study, a simple comparison of spring populations with the climate of the previous winter shows that even no-till/direct drilling fields show no/nearly no activity under certain conditions: Whether there has been any tillage or not, in years

following winters with heavy frost (and only slight snow) followed by rainy conditions (on frozen soil) no gradation has to be expected and no measures are necessary to protect the harvest.

Discussion

Forecast models will be useful to predict the regional infestation risk, but they never acquit the farmer from monitoring his fields. It is also important to establish a monitoring system through the whole state to gather information. Basic research about the mechanisms which cause gradations of the common vole is still needed to discover prevention methods.

If there is high population density, deep tillage is the best way to control the population at the affected site. Therefore, it is necessary to start the tillage as soon as possible post-harvest. It might be necessary to repeat the treatment before sowing. The key factor is the depth of the tillage.

If there is a large population of *Microtus arvalis* post-harvest, no-till should not be the sowing method. The use of rodenticides should be only the last option because of their non-selective toxicity against other vertebrates. It is also important to keep refuges of *Microtus* managed. This includes mowing ditches and soft shoulders of roads, which makes them accessible for predators such as kestrels, buzzards, red- and black-kite, herons as well as foxes and mustelids.

The massive influence caused by weather conditions needs more research to allow better predictions.

References

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