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Use of the Agricultural Tractor Exhaust for Controlling the Nile Grass Rat *Arvicanthis niloticus*

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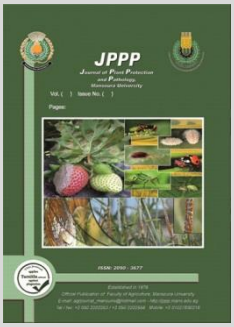

ABSTRACT

This study was carried out on two types of soil: heavy clay soil and light soil that planted with wheat in Minia Governorate - Egypt. The experiment was conducted at the time of wheat harvest to evaluate the effect of tractor exhaust fumes on the Nile grass rats, *Arvicanthis niloticus* in its burrows. The effect of tractor exhaust was studied in the morning with the start of the tractor operation and at noon after time from the work of the tractor. The exposure periods were 20,15,10 and 5minutes, after which the hose that connected the tractor pipe with the hole of the burrow is removed, the holes of the burrows are closed with mud. after a week, the burrows of rats were observed to calculate the percentages of burrows that did not open. In heavy lands that treated in the morning, these percentages were 100,100,83.3, and66.7% at exposure periods of 20,15,10 and 5minutes, respectively. In heavy lands that treated in the noon, the percentages of non-working burrows were 100, 83.3, 66.7, and 33.3% at exposure periods of 20, 15, 10 and 5 minutes, respectively. On the other hand, the effect of treatments on the Nile grass rats in the light lands declined. In the morning treatment, the percentages of non-working burrows were 83.3, 66.7, 50.0, and 16.7% at exposure periods of 20, 15, 10 and 5 minutes, respectively. While, in the noon treatment, the percentages of non-working burrows were 50.0,33.3,16.7 and 0.0%at exposure periods of 20,15,10 and 5minutes, respectively.

Keywords: Harvest, heavy soil, light soil, rate burrows, wheat

INTRODUCTION

The traditional control of rats in their burrows in the field depends on different techniques such as burning, drowning or destroying burrows. Abdel-Gawad (2001) evaluated laser land leveling, deep irrigation and destroying burrows for rodent control in maize fields. El-Eraky *et al.* (2000) in Assiut Governorate of Egypt, found that mechanical control by laser-land operation has given great success. Destruction of rodent active burrows may make rodents to escape for other locations. Searching for other less expensive techniques and somewhat euthanasia become required. Carbon monoxide and dioxide as well as other gases of the exhaust consider the control agents of rats in their shelters and they easily arrived to their target through the vestibules of the rat burrows (Zhi and Chang, 1986). On the other hand, Turner *et al.* (2020) reported that there has been increased concern about the suitability of CO_2 as a method for euthanasia of laboratory mice and rats. Other researchers used carbon monoxide and dioxide as euthanasia materials (Conen *et al*., 1995; Danneman *et al*., 1997;Conlee *et al*., 2005; Niel and Weary, 2006; Moher *et al*., 2009; Ziemann *et al*., 2009; Hawkins *et al*., 2016; Tuner *et al*., 2017 and Axiak *et al*., 2019). Therefore, this research aims to evaluate the efficiency of agricultural tractor exhaust during the threshing operation of wheat against the Nile grass rat that frequently appeared in this time.

MATERIALS AND METHODS

This study was conducted to evaluate the efficiency of the tractor exhaust against the Nile rat *Arvicanthis niloticus* after the harvest of wheat that planted in two types of soils: one at heavy clay soil and the second in sandy soil. These two farms located in Minia Governorate. Two experiments were conducted by inserting the agricultural tractor exhaust into the rat burrows by a hose fixed in exhaust pipe with sealing tightly the burrows openings by mud around the house. Six burrows for each test were treated. One experiment was carried out in the morning when the engine started from cold and the other experiment was conducted at noon, after time from the engine work. The tested periods of inserting the exhaust into burrows were 20, 15, 10 and 5 minutes. Directly after draw the hose from rat tunnels, these tunnels closed by mud. The openings of the Nile rat *A. niloticus* tunnels were observed after one week in both types of soils, for estimating the unopened tunnels percentage.

RESULTS AND DISCUSSION

Data in Table (1) show the effect of using tractor exhaust against *A. niloticus* in the heavy clay soil at the morning when the engine is started, at different periods of exposure. After one week from exposure the rat burrows to tractor exhaust, the exposure periods of 20 and 15 minutes caused complete unopened of rat burrows that previously closed by mud. This means complete death of rat individuals in their burrows. The exposure period of 10 minute gave 83.3 % unopened tunnels after one week. The unopened tunnels that exposed to 5 minutes of the exhaust represented 66.7% from the total tunnels. This effect of exhaust fumes may be because their containment of carbon monoxide and carbon dioxide. Zhi and Chang (1986) reported that fumigants specially those containing CO or CO_2 can be very effective for killing rodents and their ectoparasites living in burrows in the field. Adequate fumigation of field burrows is a quick way of controlling wild rodents. It is a useful technique for preventing zoonosis outbreaks. Other fumigants commonly used include calcium cyanide, methyl bromide, chloropicrin and aluminum phosphide. Unfortunately, these chemicals can

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be extremely dangerous to the practitioners and so expensive. Conlee *et al*. (2005) mentioned that Carbon dioxide (CO_2) is the most commonly used compound for euthanasia of laboratory rodents. Yet there is a growing body of evidence indicating that exposure to CO2 causes more than momentary pain and distress in these and other animals

The exposure of the exhaust at noon after remarkable time of the engine working in the heavy clay soil that planted with wheat gave different results. The percentages of unopened tunnels were less at different periods of exposure than other results obtained when the exhaust used at the morning. Unopened tunnel percentages were 100, 83.3, 66.7 and 33.3 % at 20, 15, 10 and 5 minutes of exhaust exposure periods (Table 1). It could be concluded that the control procedure in morning when engine is started from cold gave best results. Although, the levels of CO_2 in exhaust fumes are higher when the engine is started from cold, this level declines when the engine starts to warm up (deRoux, 2006).

In the light soil, the obtained data with the implementation in morning showed that the percentages of unopened burrows of *A. niloticus* were 83.3, 66.7, 50.0 and 16.7% with the exposure periods of 20, 15, 10 and 5 minutes, respectively (Table 1).

The application at noon as shown in Table (1) gave slight effects, since the percentages of unopened burrows were 50.0, 33.3, 16.7 and 0.0 % at 20, 15, 10 and 5 minutes of the exposure to exhaust inside rat burrows.

Table 1. Effect of tractor exhaust, in the start of engine operation in the morning or after time from the engine work at noon, on percentages of the unopened burrows of the Nile grass rat at wheat harvest time in two types of soils

Exposure time (minutes)	Percentage of the unopened burrows			
	Heavy soil		Light soil	
	Morning	Noon	Morning	Noon
20	100	100	83.3	50.0
15	100	83.3	66.7	33.3
10	83.3	66.7	50.0	16.7
5	66.7	33.3	16.7	0.00

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إستخدام عادم الجرار الزراعى لمكافحة فأر العشب النيلى *Arvicanthis niloticus*

حسن محمد حسن

قسم وقاية النبات ـكلية الزراعة ـجامعة المنيا

هذه الدراسة تمت فى نوعين من التربة وهى التربة الطينية الثقيلة والتربة الخفيفة المزروعة بالقمح فى محافظة المنيا- مصر وتم إجراء التجربة وقت حصاد القمح لتقييم تأثير أبخرة عادم الجرار على فأر العشب النيلى داخل جحورها وتم دراسة تأثير عادم الجرار صباحاً مع بداية تشغيل الجرار وظهراً بعد فترة من عمل الجرار وكانت فترات التعرض ٢٠ ، ١٥ ، ١٠ ، ٥ دقائق وبعدها كان ينزع الخرطوم الواصل من شكمان الجرار والمدخل فى فتحة الجحر ثم يتم قفل فتحات الجحور بالطين وبملاحظة جحور الفئران بعد اسبوع لحساب النسب المئوية للجحور التى لم تفتح كانت هذه النسب فى الأراضى الثقيلة والمعرضه لعادم الجرار صباحاً كالتالى ١٠٠ ، ١٠٠ ، ٨٣,٣ ، ٦٦.٧ % عند فترات التعرض ٢٠ ،١٥ ، ١٠ ، ٥ دقائق على التوالى. أما عند إجراء هذه التجربة فى الأراضى الثقيلة وقت الظهيرة فكانت نسب الجحور الغير عاملة كالتالى ١٠٠ ، ٣.٨٣ ، ٦٦,٧ ، ٣٣,٣ % عند فترات التعرض ٢٠ ،١٥ ، ١٠ ، ٥ دقائق على التوالى . تم إجراء هذه المعاملات أيضا فى الأراضى الخفيفة وإتضح إنخفاض التأثير فعند إجراء المعاملة صباحاً كانت نسب الجحور الغير عاملة كالتالى ٨٣,٣ ، ٦٦,٧ ، ٥٠,٠ ، ١٦,٧% عند فترات التعرض ٢٠ ،١٥ ، ١٠ ، ٥ دقائق على التوالى. أما عند إجراء هذه المعاملة ظهراً فى نفس التربة فكانت نسب الجحور الغير عاملة كالتالى ٥٠,٠، ٣٣,٣، ١٦,٧ ، ٠,٠ % عند فترات التعرض ٢٠ ،١٥ ، ١٠ ، ٥ دقائق على التوالى.