Nat. Volatiles & Essent. Oils, 2021; 8(4): 12564-12573

NVEO
Natural Volatiles &
Essential Oils

Investigation Of The Attractive Properties Of Compounds In Anacanthotermes Turkestanicus

[1,2]Togaev U.R. , [1]Kh. Khitbaev , [1]Z. Tilyabaev , [2]Kh.S.Toshov , [2]A.Kh.Khaitbaev

[1]Acad. A. S. Sadykov Institute of the Bioorganic Chemistry, Academy of Sciences of Republic of Uzbekistan, Tashkent 100125, MirzoUlugbek str. 83

[2.]National University of Uzbekistan, Uzbekistan, 700174, Tashkent, VUZ Gorodok

ABSTRACT

The well-known and very tangible harm caused by termites to the national economy makes it urgent to study the issues of their distribution and to develop effective radical control measures. This paper reports on the development of poisonous baits for termites based on numerous laboratory and field experiments. We have carried out a study using 2-naphthalenemethanol, 2-phenoxyethanol, triphenyl phosphate, sodium salt of N-hydroxynaphtholimide, sodium salt of naphthol-5-sulfonic acid, ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, and phenol. Each trap containing bait, and substances were buried in the soil for a period of 3, 7, 10, and 30 days to combat termites effectively.

Keywords: Anacanthotermes turkestanicus,2-naphthalenemethanol, 2-phenoxyethanol, phagostimulant.

INTRODUCTION

Despite the considerable work carried out in various countries, there are currently no simple and reliable criteria for resistance to termite damage.[1] With all the complexity of combatting termites and significant financial costs, the main attention is paid by scientists to biological testing[2].

In this regard, at present, the need for the development of highly effective preparations for combating termites has increased. Termite poison baits are being developed on the basis of numerous laboratory, field experiments and observations[3]. The nutrient matrix of these baits is made up of plants that attract termites to eat them[4].

Our research has shown that poplar sawdust (Poplus spp) is an attractive and acceptable local dietary supplement that has been incorporated into the termite control bait matrices. It should be noted that this type of poplar is used by villagers as timber frames in the construction of residential buildings and

is the most affordable and cheapest building material.Thus, we have selected a more improved and cost-effective bait formulation[5].

MATERIAL AND METHODS

The traps were made of pressed cardboard of a cylindrical shape with two open ends with a diameter of 50 mm and a length of 150 mm (Fig. 1, 2, 3), which had additional holes on the cylinder wall with a diameter of 5 mm for free entry and exit of termites.

Fig. 1. Pressed cylindrical cardboard for making bait traps.

Fig. 2. Ready-made termite traps

Fig. 3. Required ingredients for making a bait mixture for traps

Under natural conditions, the effectiveness of drugs identified in laboratory experiments was studied by burying baits into the soil. The tests were carried out in private houses in a number of villages in the Navoi region, where the infestation by termites was evident.

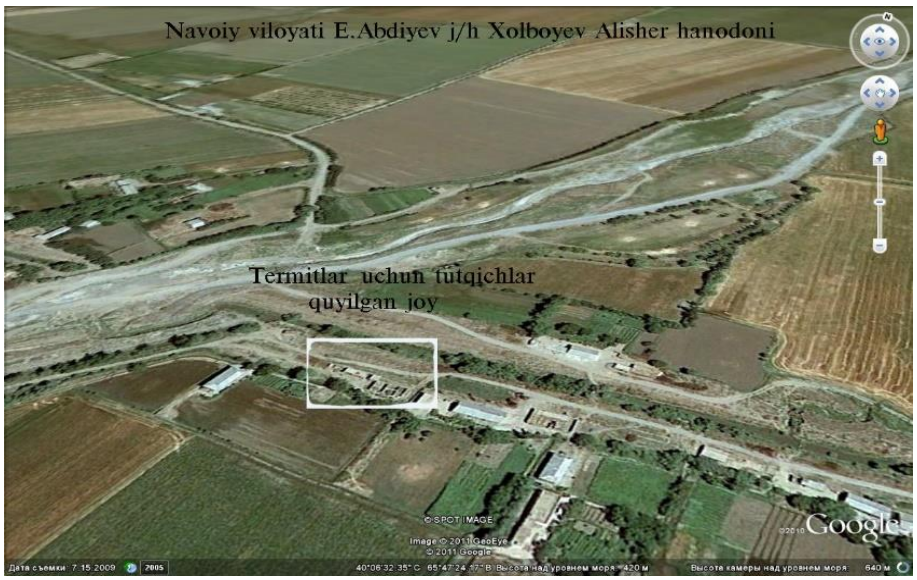

Fig. 4.1-test area

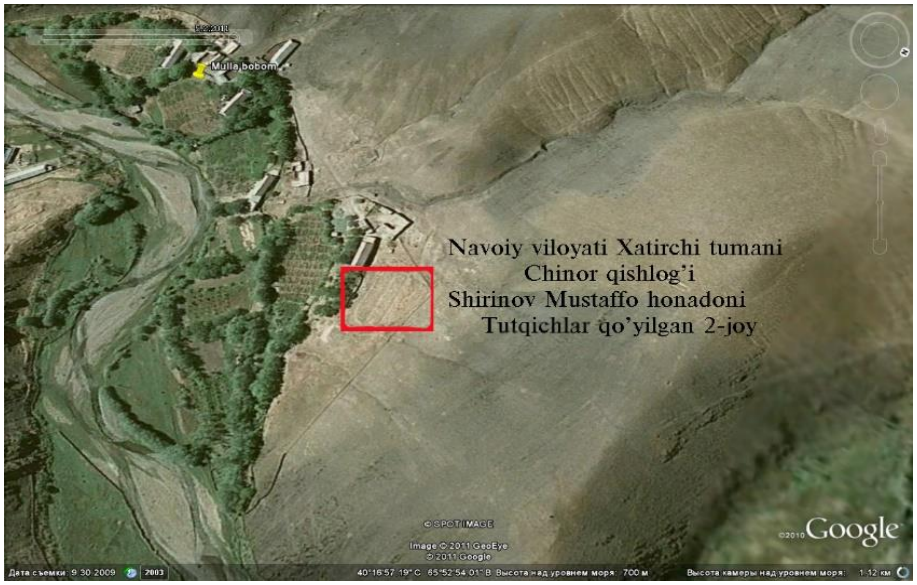

Fig. 5.2-area of testing

Fig. 6. Types of wood damage by termites in rural houses.

The traps were placed along the perimeter of the building to a depth of 30 cm, 25-30 cm from the outside of the house from the base of the building (see Fig. 7).

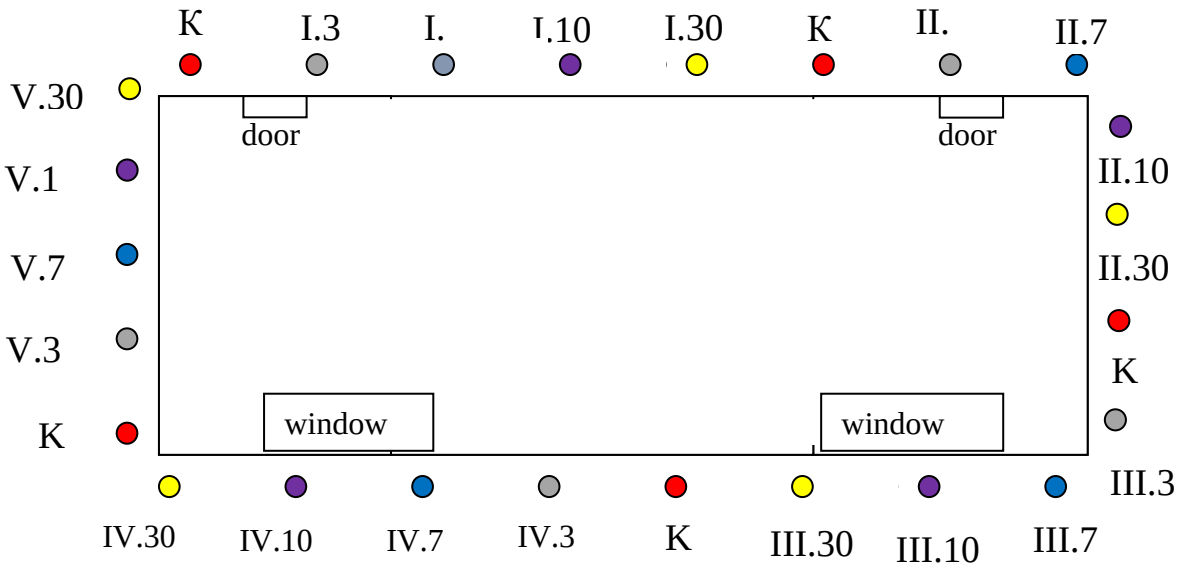

Fig. 7. Layout of traps () around building infested with termites:

() control experiment, without test compound

(), a trap containing a test substance that has been in the ground for 3 days;

() a trap containing a test substance that has been in the ground for 7 days;

() a trap containing a test substance that has been in the ground for 10 days;

() a trap containing a test substance that has been in the ground for 30 days.

The serial numbers of the compounds are indicated in Roman numerals.

Fig. 8. Making trap holes

The baits were monitored after all the experiments have been launched. After this time, the traps were dug up. Special attention was paid to the formation of moldings on traps.

RESULTS AND DISCUSSION

The effectiveness of the compounds used was evaluated by the size of the eaten area in percent relative to the length of the traps. These indicators are used to determine the effectiveness of the compounds and are shown in the form of diagrams (Fig. 9-12). Statistical processing and correlation analysis of the obtained data were performed using the GraphPadPrism 8.0.1 software.

To establish the biological activity, 0.2% of the concentration of the following substances were selected: 2-naphthalenemethanol, 2-phenoxyethanol, triphenyl phosphate, sodium salt of N-hydroxynaphtholimide, sodium salt of naphthol-5-sulfonic acid, ethylene glycol monobutyl ether, diethylene glycol monobutyl ether and phenol. Each trap containing bait, substances were buried in the soil for a period of 3, 7, 10, 30 days.

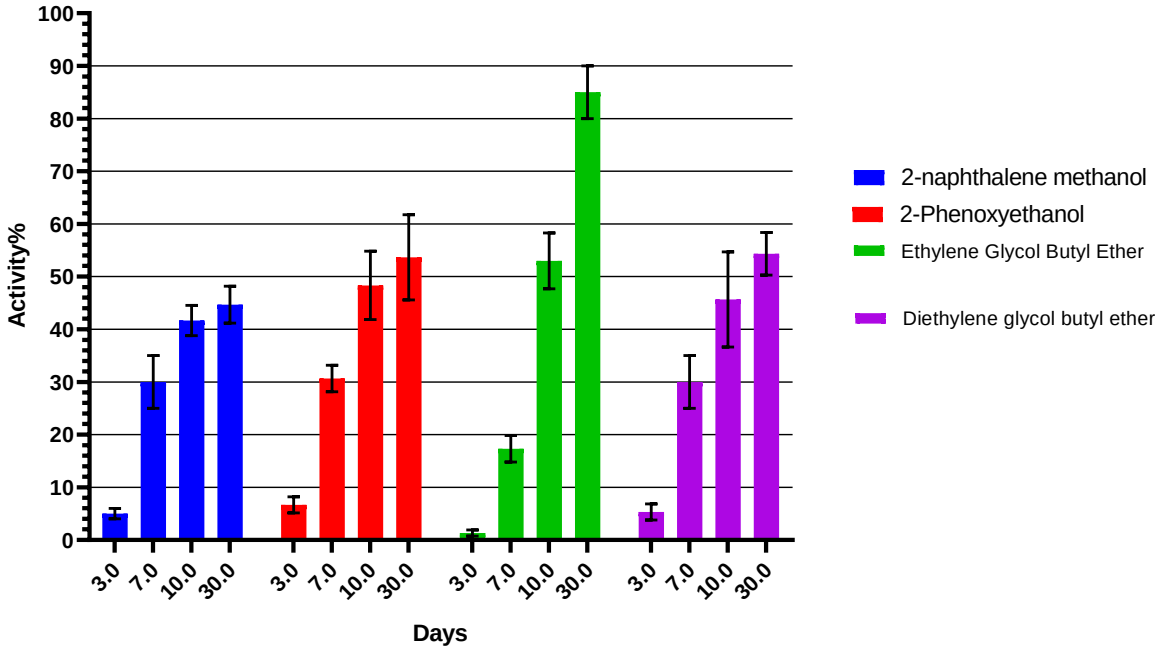

Fig. 9. Phago-stimulating effect of compounds by day of registration

Considering the activity of the first group of compounds shown in Fig. 9, one can notice that their phago-stimulating effect on the third day has almost the same attractive effect, with the exception of ethylene glycol butyl ether.

After the seventh day, the activity of all the selected compounds had the same activity, which increased dramatically (5 times) compared to the third day of testing for the compounds: 2-naphthalenemethanol, 2-phenoxyethanol and diethylene glycol butyl ether.

Ethylene glycol butyl ether was 1.7 less weaker than these three indicators. A high activity index on the 10th day of testing is inherent for ethylene glycol butyl ether. The activity of the remaining compounds decreased on going from 2-phenoxyethanol to butyl ether of diethylene glycol and 2-naphthalenemethanol. The 30th day of research was the highest for the traps containing ethylene glycol butyl ether, the phago-stimulating effect of which was almost 2 times higher than that of 2-

naphthalenemethanol, and 1.5 times higher than that of 2-phenoxyethanol and diethylene glycol butyl ether, respectively.

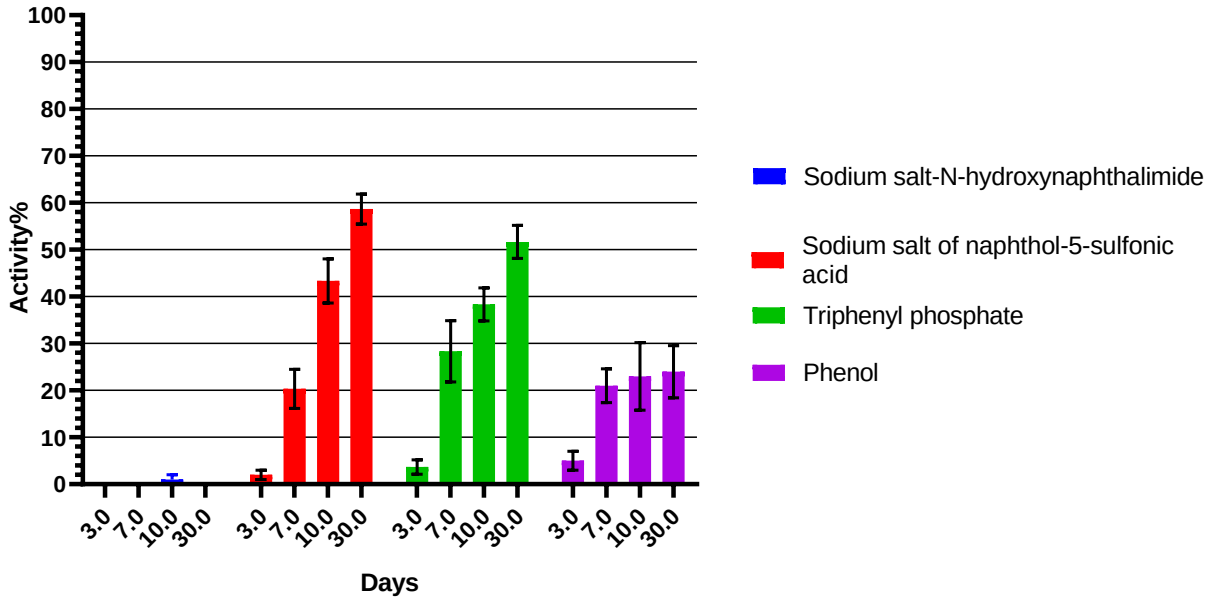

Fig. 10. Phago-stimulating effect of compounds by day of registration

The connections shown in Fig. 10 also exhibited a phago-stimulating effect. The activity of the sodium salt of N-hydroxynaphtholimide was very weak only on the 10th day of the study.

The third day of testing was the most noticeable for phenol in comparison with the action of triphenyl phosphate and sodium salt of naphthol-5-sulfonic acid. All these drugs are characterized by an increase in their activity from the third to the 30th day.

The same effect was observed for the sodium salt of naphthol-5-sulfonic acid and phenol on the 7th day of the experiment. Phenol as a phagostimulant showed almost the same activity after the 10th and 30th days of the investigation.

The maximum effect among these substances was shown by the sodium salt of naphthol-5-sulfonic acid on the 30th day of the survey. The activity of naphthol-5-sulfonic acid is also higher than that of triphenyl phosphate on the 7th and 10th day of testing.Summing up the study of the phagostimulating activity of all the selected compounds, it can be stated that ethylene glycol butyl ether has the highest activity in relation to working termites. The sodium salt of naphthol-5-sulfonic acid is 1.5 times weaker than ethylene glycol ether.

Therefore, these compounds can be recommended for use as effective phage stimulants in traps for controlling termites.

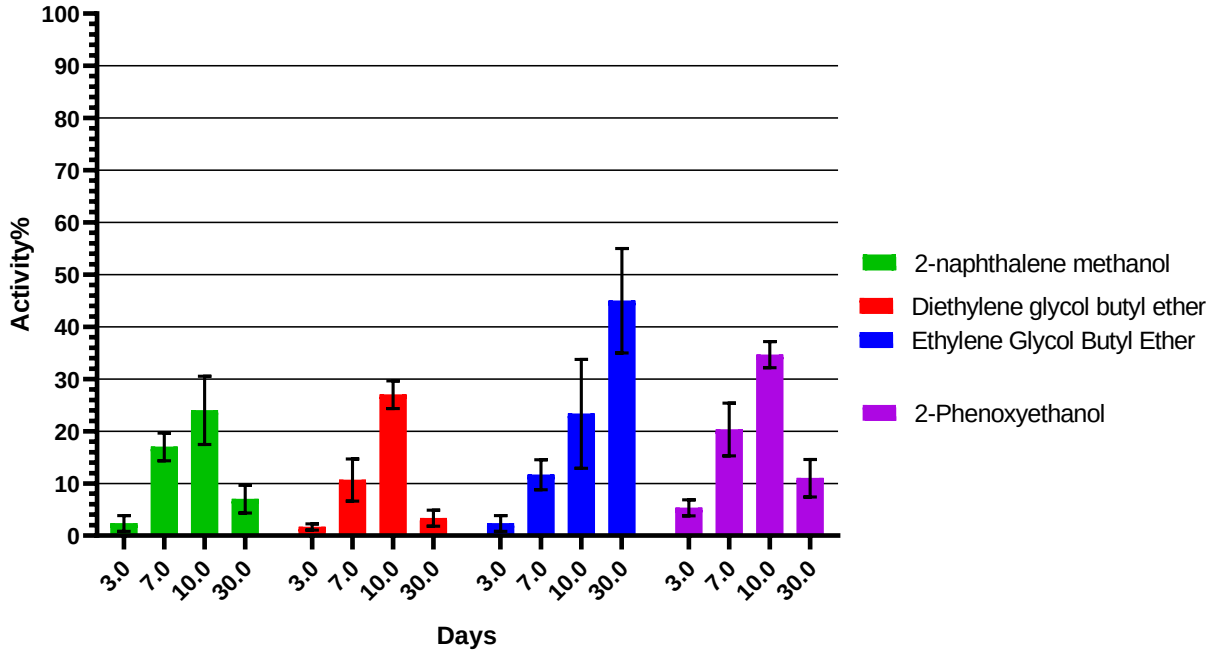

Fig. 11. The daily thermicidal effect of compounds

The results of the biological effectiveness of the insecticidal action of the above compounds are shown in Fig. 11 and 12. The rapid death of termites in these experiments is undesirable, since infected termites will be blocked or removed from the nest by termites, in addition, the termites will bypass the treated areas of the nest and their role as the insecticide spreading agents inside the mound will get minor.Poisoning will affect a small number of termites in the family.

2-naphthalenemethanol, diethylene glycol butyl ether, ethylene glycol butyl ether and 2-phenoxyethanol showed toxic properties, i.e. are insecticides against termites.

In this series of studies, ethylene glycol butyl ether showed the highest insecticidal effect after 30 days than all other compounds. Next, in terms of activity, 2-phenoxyethanol and 2-naphthalenemethanol, which are 4 and 3.75 times inferior in activity to ethylene glycol butyl ether, respectively.

Based on the data on effectiveness, established on day 10, the activity of 2-phenoxyethanol and 2-naphthalenemethanol is 1.5 times higher than that of ethylene glycol butyl ether, and only 1.25 times of diethylene glycol butyl ether's.

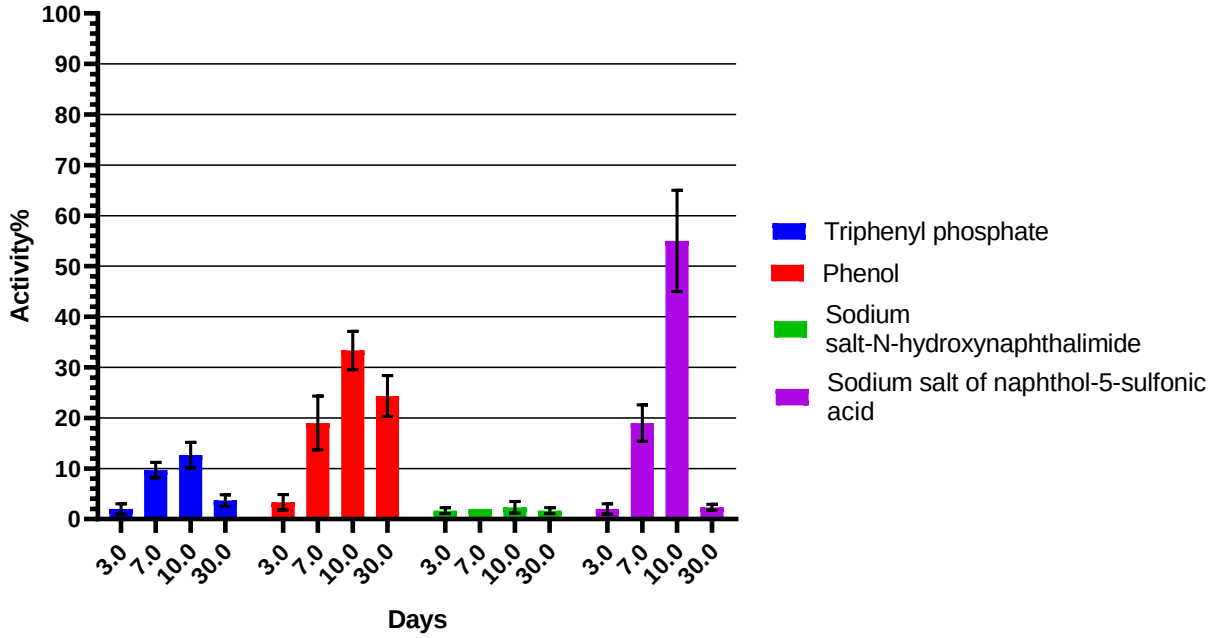

Fig. 12.Thermicidal effect of compounds by day of accounting

The study of the insecticidal action of the compounds shown in Fig. 12 show that the sodium salt of naphthol-5-sulfonic acid in this series of compounds exhibits the highest activity on the 10th day of counting.

The second most effective activity is phenol activity, which, however, is 1.5 times weaker than the activity of the sodium salt of naphthol-5-sulfonic acid. The rest of the preparations have significantly lower insecticidal activity than the sodium salt of naphthol-5-sulfonic acid and phenol.

CONCLUSION

Fig. 13. Eatability of nutrient matrices of bait traps after 3, 7, 10 and 30 days after setting the experiments

Thus, the study of the biological properties of eight compounds of different chemical structures made it possible to identify two highly specific phago-stimulants of termites: sodium salt of naphthol-5-sulfonic acid and butyl ether of ethylene glycol, as well as two compounds: sodium salt of naphthol-5-sulfonic acid and phenol, which can be used as effective insecticidal media against worker termites - Anacanthotermes turkestanicus.

After 3 months, no fresh moldings were found on traps containing no chemical additives, which indicated a sharp decrease in the number of individuals in houses infested with termites.

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