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Efficacy of Neem Azal T/S formulation on *Philoscia muscorum* (Scopoli, 1763) (Isopoda; Philosciidae)

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ABSTRACT

A study to determine the side effect of Neem Azal T/S (%1 Azadirachtin) formulation on the terrestrial isopod *Philoscia muscorum* (Scopoli, 1763) (Isopoda; Philosciidae) was conducted under laboratory conditions. Neem Azal is recommended as a biopesticide. Different doses of Neem Azal formulation (50, 100, 250, 500, 750 and 1000 mL/100 L water) were tested. Obtained results showed that none of these doses had toxic effect on *P. muscorum*. Therefore, it is recommended to be used in integrated pest management programs, especially in organic agriculture.

Key words: Biopesticide, Azadirachtin, Terrestrial isopod, Neem Azal, *Philoscia muscorum*.

INTRODUCTION

Soil organisms are an integral part of the ecologic environment and contribute greatly to the disintegration of the plant and animal-based wastes, especially in agricultural areas. Moreover, they have important effects on plant nutrition and soil fertility because they are actively involved in the biological processes and sometimes they direct these processes (Bardgett, 2005). The terrestrial isopods have an important role in these soil organisms. They are involved in the basic soil fertility processes such as degradation of the organic materials within the soil, and making the degradated organic compounds to become ready for microbiological decomposition (Coleman *et al.,* 2004). These terrestrial isopods are used as indicators for environmental pollution, and as means of assessment for the living species in the fields. Therefore, heat, rainfall and similar environmental factors affect the activity of the terrestrial isopods in agricultural fields greatly as well as some practices used to increase the fertility. Among these, the widespread use of pesticides is important (Lavelle and Spain, 2003).

The pesticides used against the pests in agricultural areas cause death of terrestrial isopods in a great deal (Eijsackers, 1981and Paoletti and Hassall, 1999).

Today, excessive and unconscious use of synthetic insecticides gives rise to resistance in the pests, and also gives rise to negative effects on human health and environment. So, biological control or using other organic insecticides are recommended, and are a modern inclination for pest management (Gupta and Dikshit, 2010; Mazid *et al.,* 2011 and Bajwa and Ahmad, 2012). Biopesticides are classified into three major categories: microbial pesticides, botanical pesticides and biochemical pesticides (Gupta and Dikshit, 2010 and Leng *et al.,* 2011).

Botanical pesticides are an important group of biopesticides that has been recommended as a suitable alternative for plant protection with minimum negative risks (Naumann and Isman, 1996; Copping and Menn 2000; Isman, 2006 and Gupta and Dikshit, 2010). Botanical insecticides have been used against more than 400 insect species (Isman, 1997 and Saber *et al.,* 2004).

Today, although it is well-known that many plants have insecticidal properties; very few pesticide products have been produced from plants, and these products are generally used in developed countries (Isman, 1997). One of the most important and widely used as natural insecticide is the Azadirachtin which is obtained from fruits of *Azadirachta indica* Juss, also known as Neem tree (Raizada *et al.,* 2001). It is known that Azadirachtin has many effects as well as anti-feedant, anti-oviposition, repellent, regulation of growth and development etc. (Ascher, 1993; Awad *et al.,* 1998 and Mordue *et al.,* 2005). In the past decades, Azadirachtin has been used against many pests as a botanical pesticide (Gnanamani and Dhanasekan, 2013 and Saruhan *et al.,* 2014). Many studies dealt with its effects on natural enemies and non-target organisms (Akca *et al.,* 2005 and 2009). The studies on the effect of the Azadirachtin on the terrestrial isopods, used frequently in soil fertility and land assessments, have been rare so far, and are mainly focused on earthworms. However, no studies have focused on the effects on *Philoscia muscorum* (Scopoli, 1763) (Isopoda; Philosciidae), which is one of the terrestrial isopods commonly found in nature.

The present study was conducted to determine the side effects of Neem Azal T/S formulation

(1% Azadirachtin) on *P. muscorum* under laboratory conditions.

MATERIALS AND METHODS

Philoscia muscorum was collected from Ondokuz Mayis University campus area in Samsun, Turkey. Neem Azal T/S, the commercial formulation produced by the German company Trifolio-M GmbH, was used. It consists of 1% azadirachtin. As the recommended dosage of the Neem Azal formulation against many insect pests is 250-500 mL /100 L water, six different concentrations (1000, 750, 500, 250, 100 and 50 ml/100 L water) were tested. All tests were conducted under the laboratory conditions of (25±2 ^{0}C, 70±5 RH and 14L: 10D).

Insects were placed in Petri dishes (9-cm diameter), having filter paper on their bottom (10 insects/ Petri dish). Each dose was applied by 2 ml per Petri dish, using a potter spray tower (Burkard, Rickmansworth, Hertz UK). Control dishes were treated with sterile distilled water (2-ml). Four replicates were used for each dose. In each Petri dish, a tiny apple piece (approximately 0,5g) was provided as food. Daily monitoring was performed for all the dishes. Died insects were counted and mortality percentage at each Petri dish was calculated.

Obtained data were analyzed by SPSS 11.0 (Statistical Package for Social Science).

RESULTS AND DISCUSSION

Toxicity of Neem Azal T/S tested on *P. muscorum* was presented in table (1). Mortality was 7.5% for 1000 mL dose; 2.5% for 750, 500, 250 and 50 mL doses 96 hours post the application. However, no significant differences were calculated in all doses and the control was in the same group (Table 1). Higher doses had not a negative effect on the terrestrial isopod *P. muscorum*.

Neem Azal is a biopesticide that has been recommended against many pests in agricultural production and its use and other similar biopesticides in pest management have become widespread. It is crucial that as well as the effect of these biopesticides on the insect pests, their effects on environment and non target organisms should also be examined. Nouman and Isman (1996) and Akça *et al.* (2009) determined that azadiractin had a negative effect on the honeybees. Akca *et al.* (2005) found that azadirachtin had a positive effect on the microbial biomass and on the respiration in the soil. Pandey (1994) stated that low azadirachtin concentrations had fertilizing characteristics because azadirachtin has many nutrient elements such as; N, P, K. It also contains organic compounds at a significant level. Many researchers studied the effect of azadirachtin on natural enemies of pests, and determined that this biopesticide had no effect on such natural enemies. However, there are no previous studies on its effect on *P. muscorum*, which is a terrestrial isopod that plays an important role in disintegrating organic matters in soil. Present results determined that Azadirachtin had no negative effect on *P. muscorum*.

In conclusion, azadirachtin can be used with great ease in agricultural areas, especially in organic farming areas for pest management

Table (1): Side effect of Neem Azal T/S on the terrestrial Isopod, *Philoscia muscorum* under laboratory conditions

Doses, mL/100 L water	Mortality percentage at intervals after application				
	1 hour	24 hour	48 hour	72 hour	96 hour
1000	0,00 ± 0,00a	0,00 ± 0,00a	2,50 ± 2,50a	5,00 ± 2,88a	7,50 ± 4,78a
750	0,00 ± 0,00a	0,00 ± 0,00a	0,00 ± 0,00a	2,50 ± 2,50a	2,50 ± 2,50a
500	0,00 ± 0,00a	0,00 ± 0,00a	2,50 ± 2,50a	2,50 ± 2,50a	2,50 ± 2,50a
250	0,00 ± 0,00a	0,00 ± 0,00a	0,00 ± 0,00a	0,00 ± 0,00a	2,50 ± 2,50a
100	00,0 ± 0,00a	00,0 ± 0,00a	00,0 ± 0,00a	00,0 ± 0,00a	00,0 ± 0,00a
50	00,0 ± 0,00a	00,0 ± 0,00a	00,0 ± 0,00a	00,0 ± 0,00a	2,50 ± 2,50a
Control	0,00 ± 0,00a	0,00 ± 0,00a	0,00 ± 0,00a	0,00 ± 0,00a	0,00 ± 0,00a

At the same column, the values with the same letters are not significantly different at P<0,05.

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