

Antifeedant effect of NeemAzal-T/S on the caterpillars of *Lymantria dispar* L..

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Key words: antifeedant effect, *Lymantria dispar*, NeemAzal-T/S

Abstract: The objective of laboratory trial presented in this paper were to establish in what measure the NeemAzal-T/S (1% azadirachtin A) insecticide has effect on feeding of *Lymantria dispar* caterpillars, when it is applied as emulsion of 5%, 10%, 20% and 20% emulsion mixed with 0.1% raps oil or with 1% *Bacillus thuringiensis* var. *aizawai*. Antifeedant effect was evident after 72 hours of feeding with treated leaves, moment which marked by entering of many caterpillars in lethargic state. The antifeedant index (AFI) increased (0.59-0.98) in the same time with increasing concentration of NeemAzal emulsion, and being accentuated by raps oil and *Bta* added in emulsion. If the application of these emulsions contributes at decreasing of leaf feeding with 74.3-99.3%, we can affirm that the azadirachtin, the active complex of the insecticide, can be utilized in the aim of deciduous forests protection against the gypsy moth.

INTRODUCTION

The most damaging defoliator of deciduous forests in Romania is *Lymantria dispar* L.. It is a polyphagous defoliator which attacks oaks, hornbeam, willow, elm, acacia, fruit trees (Simionescu *et al.*, 2000), maples, linden, beech, hawthorn, poplar, filbert, sometimes larch (Ene, 1971). The insect makes periodical mass multiplication and defoliations which induce wood growth and fructification decreasing and causes the forest biocenosis disruptions (Zabel *et al.*, 1999). If the affected trees do not have sufficient water after a prolonged period of dryness can appear trees drying. When the density of the eggs masses is very high (over 5 eggs masses/tree) the larva had made high defoliations even it has been applied treatments with *Bacillus thuringiensis* var. *kurstaki* and viruses (Turcani, 2001). From that reasons permanently is trying to find some efficient means and procedures to control this pest. Because of the pest prolificacy are preferred that means of protection which can make drastic reduction of population level in larva stage without affected useful insects and forest environment. Many products will not be accepted to be utilized, in this condition we have to look at alternatives which put the accent on natural extracts, selective and without impact on environment. This kind of product can be considered the insecticide NeemAzal-T/S, which has as active substance the complex azadirachtin.

Antifeedant effect of this product against the insects is known well (Singh, 1993), but not all insects respond in the same mode at treatment (Schmutterer & Huber, 2004). In this paper we try to establish in what measure the insecticide in different concentration influenced the feeding process of *Lymantria dispar* L. caterpillars, using single or mixed with raps oil or *Bacillus thuringiensis* var. *aizawai*, when the caterpillars consume permanently treated leaves. Also, it is measured the quantity of excrements produced by caterpillars.

MATERIAL AND METHOD

The researches were made in 2007, in the laboratory conditions (temperature 18-24°C, natural light regime).

In the month April were harvest eggs masses from Paniova forest, Timiș County, where the pest was in progradation (ICAS Timișoara) and putted in glass pot bounded at muzzle with plastic texture to do not permit the caterpillars to get out and permit normal ventilation. Immediately after the caterpillars gated out from eggs they was putted in growth boxes and feeding with fresh leafs of common oak, obtain on all trial at the same three. For the trial have been used caterpillars in 2nd age.

In each growth box has introduced one leaf of common oak which preliminary was measured at surface and treated through pulverization with water on control, with NeemAzal-T/S emulsion in concentration of 5%, with NeemAzal-T/S emulsion in concentration of 10%, with NeemAzal-T/S emulsion in concentration of 20%, with NeemAzal-T/S emulsion in concentration of 20% and 0.1% raps oil for more adherent proprieties, with NeemAzal-T/S emulsion in concentration of 20% and 1% *Bacillus thuringiensis* var. *aizawai*. The maximum quantity of water respectively emulsion pulverized was 2 ml/leaf. For each variant were used 40 caterpillars (as 10/replication). At 24 hours, the remnant of leafs were measured as surface and introduced other fresh leafs from 48 in 48 hours, and preceding same. The length of all trials was of 7-11 days.

To evaluate the insecticide effect on feeding process of caterpillars has been estimate periodically the percentage of reduction of consumed surface of leaf in comparison with control, and antifeedant index (AFI) used in other trials beginning at formula used of Klepzing & Schlyter (1999) to estimate the index in the case of pest *Hylobius abietis* L.. The index is calculated with formula: $AFI = (C-T)/(C+T)$, where: C is the area of removed leafs on control leafs and T is the area of removed leafs on treated leafs. If AFI is -1 is indicative of the best feeding stimulant; if AFI is 0 means no effect; if AFI is 1 is indicative of the best possible antifeedant.

RESULTS AND DISCUSIONS

The efficacy of treatment with NeemAzal depends in high measure of the moment of application, emulsion concentration, sensitivity of target insect and mode action of the product (Kleeberg, Hummel, 2001). It is considered that the application of product NeemAzal in the moment in which the caterpillars are in 2nd age it found them, in natural condition, enough sensible and in majority get out of eggs.

The total surface of consumed leafs by caterpillars (Table 1) in the period of observation was significantly lower in comparison with surface recorded in the case of control caterpillars and represented 0.7-25.7% from that, most antifeedant effect being observed after 72 hours of feeding. The caterpillars presented evident signs of lethargy.

Table 1 Leaf area consumed by caterpillars in the period of observation (mean \pm standard deviation, cm²)

Feeding time (hours)	Treatment					
	Control	5% NeemAzal	10% NeemAzal	20% NeemAzal	20% NeemAzal+ Raps oil	20% NeemAzal+ 1% Bta
24	39.96 \pm 3.49	31.72 \pm 6.95	30.03 \pm 6.06	27.72 \pm 9.04	22.95 \pm 5.69	1.41 \pm 0.79
72	46.19 \pm 1.68	22.21 \pm 12.25	12.95 \pm 6.06	6.03 \pm 5.74	4.72 \pm 3.48	0.45 \pm 0.38
120	49.22 \pm 5.46	6.07 \pm 5.56	5.17 \pm 7.08	1.53 \pm 1.97	1.06 \pm 1.35	0
168	40.92 \pm 4.00	2.04 \pm 1.43	1.46 \pm 1.57	0.53 \pm 0.38	0	-
216	40.41 \pm 4.46	1.78 \pm 1.67	0.19 \pm 0.22	0.08 \pm 0.17	0	-
264	32.66 \pm 3.63	0.35 \pm 0.17	-	-	-	-
Total	249.36 \pm 5.72	64.17 \pm 13.09	49.80 \pm 11.70	36.16 \pm 10.88	28.73 \pm 9.08	1.86 \pm 0.56

Adding in emulsion of 20% NeemAzal of the raps oil make it better adherent on leaf, in this case the caterpillars consumed more active substance, fact confirmed of decreased feeding process of caterpillars in comparison with variant 20% NeemAzal.

After 24 hours of feeding, did not recorded significant differences between the quantity of eliminated excrement by caterpillars from treated variants (NeemAzal 5%, 10%, 20%, 20% and raps oil), in comparison with control variant. In the case of mixed emulsion of 20% NeemAzal 20% and 1% *Bta*, the quantity of eliminated excrement was significant lower and represented just 8.5% from quantity eliminated by control caterpillars. The quantity of excrements begins to be significant lower after 72 hours of feeding. To the end of trial, the caterpillars which has fed with treated leaf has eliminated a lower quantity of excrements, quantity which represent 1.2-19.3% from quantity of excrements eliminated of control caterpillars (Table 2).

Table 2 Excrements quantity in feeding process (mean \pm standard deviation, g)

Feeding time (hours)	Variants					
	Control	5% NeemAzal	10% NeemAzal	20% NeemAzal	20% NeemAzal+ Raps oil	20% NeemAzal+ 1% <i>Bta</i>
24	0.1244 \pm 0.0270	0.0993 \pm 0.0332	0.1235 \pm 0.0253	0.1186 \pm 0.0269	0.0995 \pm 0.0422	0.0106 \pm 0.0065
72	0.1624 \pm 0.0173	0.0675 \pm 0.0315	0.0448 \pm 0.0103	0.0242 \pm 0.0170	0.0139 \pm 0.0089	0.0020 \pm 0.0009
120	0.1853 \pm 0.0152	0.0201 \pm 0.0158	0.0108 \pm 0.0114	0.0062 \pm 0.0049	0.0027 \pm 0.0032	0
168	0.1941 \pm 0.0356	0.0083 \pm 0.0076	0.0077 \pm 0.0068	0.0030 \pm 0.0022	0.0001 \pm 0.0002	-
216	0.1954 \pm 0.0344	0.0036 \pm 0.0078	0.0009 \pm 0.0019	0	0	-
264	0.1661 \pm 0.0314	0	-	-	-	-
Total	1.0277 \pm 0.0268	0.1988 \pm 0.0407	0.1877 \pm 0.0480	0.1520 \pm 0.0465	0.1162 \pm 0.0396	0.0126 \pm 0.0042

Between the surface of consumed leaf and the quantity of eliminated excrement is close positive correlation (Fig. 1), and confirm the antifeedant effect of the insecticide.

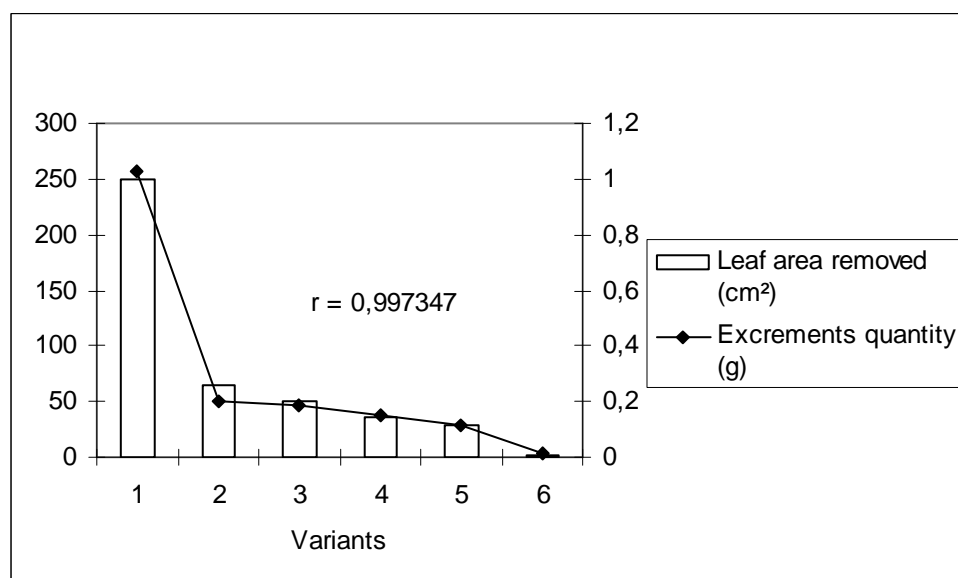


Fig. 1 Correlation between leaf area removed by caterpillars and excrements quantity

Decreasing of removed surface made by caterpillars which consumed treated leaves with insecticide in comparison with the surface removed by control caterpillars were visible higher since first measurements (Table 3).

Antifeedant index (AFI) increased in the same time with emulsion of NeemAzal concentration growth and being increased of adding in emulsion of raps oil and *Bta*.

Table 3 Percentage reduction of leaf area consumed by caterpillars in comparison with control and antifeedant index (AFI) for the period of observation

Feeding time (hours)	Treatment				
	5% NeemAzal	10% NeemAzal	20% NeemAzal	20% NeemAzal+ Raps oil	20% NeemAzal+ 1% <i>Bta</i>
24	11.2	15.7	36.2	39.5	94.5
72	44.5	67.2	84.2	88.7	98.7
120	87.5	89.8	96.3	97.7	100
168	94.2	96.3	98.2	100	-
216	95.5	99.5	99.8	100	-
264	98.2	-	-	-	-
AFI	0.59	0.66	0.74	0.79	0.98

CONCLUSIONS

The emulsion of NeemAzal-T/S in concentration of 5%, 10% and 20%, 20% and 0.1% raps oil, 20% and 1% *Bacillus thuringiensis* var. *aizawai* reduce the feeding process of *Lymantria dispar* caterpillars. The proportion of antifeedant effect depends of emulsion concentration. Adding in emulsion of raps oil can increase the insecticide efficacy, also adding of *Bta*.

The trials results recommend using of NeemAzal-T/S insecticide in deciduous forest stands protection against this defoliator, but it is necessarily to be completed with field trials.

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