

EFFICACY OF SOME INSECTICIDES FOR CONTROL OF APHID *CHAITOPHORUS POPULETI* PANZER ON WHITE POPLAR

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Abstract

Aphid *Chaitophorus populeti* Panzer is a significant pest in poplar nurseries and young poplar plantations in Serbia. Harmful impact is very expressed on white poplars due to their hairy abaxial leaf side which accumulates honeydew what creates conditions for development of sooty molds. Application of insecticides is inevitable measure in the period of high population levels of these aphids. The aim of this research was to test insecticide efficacy in control of *C. populeti*. The experiment was established in the nursery on one-year old seedlings of white poplars with one date application on 20th May 2013. Tested insecticides were bifenthrin (conc. 0.05%), thiacloprid (conc. 0.015%) and thiamethoxam (conc. 0.02%). Efficacy of insecticides was calculated by Henderson-Tilton's formula. Results showed that tested insecticides has high efficacy in suppression of *C. populeti*, what presents recommendation for application against this insect.

Key words: *Chaitophorus populeti*, poplar, insecticides, efficacy

INTRODUCTION

Aphid *Chaitophorus populeti* (Panzer) (Hemiptera, Aphididae) is frequently reported in outbreaks in nurseries and white poplar plantations in Serbia. This species occurs on *Populus alba* L., *Populus x euramericana* (Dode) Guinier, *Populus tremula* L. and *Populus nigra* L. (Tanasijević, Eastop, 1963; Petrović-Obradović, 2003, 2010; Poljaković-Pajnik, 2005, Toper Kaygin et al., 2008; Poljaković-Pajnik et al., 2011). Plant sap feeding causes physiological weakening of plants and reduction of its growth. Harmfulness is specially expressed on white poplar due to its hairy abaxial leaf side which accumulates honeydew what creates conditions for development of sooty molds which further reduces the intensity of photosynthesis. Noxiousness and importance of this aphid is best shown by example when heavy infested seedlings of *P. alba* at the end of the growing season had a lower height increment with high number of died plants (Poljaković, 2005). Application of insecticide presents necessity during outbreaks of this insect. A large number of insecticides that previously was advised and used for the control aphids on poplar satch as phosphamidon, diazinon and dimethoate are on the list of banned pesticides for use in FSC

Certified forests (Anonymus, 2007) and we needed to find an adequate replacement. Almost all forests and nurseries in Serbia are FSC certified and users are required to comply to guidelines of the FSC on the application of pesticides. For this reason, the research is conducted on biological efficacy of two new generation insecticides from the neonicotinoid group and one pyrethroid whose application is allowed to FSC standards.

MATERIAL AND METHOD

In the poplar nursery was determined efficacy of insecticides in controlling of *C. populeti* and its residuality. The experiment was carried out in the nursery at the experimental estate of the Institute of Lowland Forestry and Environment on annual seedlings of white poplar. Treatment was carried out on May 20th 2013, with hand sprayer type Hipol 6 with water consumption of 1000 L per ha. During treatment meteorological conditions were favourable for the application of insecticides. Products and their concentration used are given in Table 1.

Table 1. Examined insecticides

Active ingredient	Insecticide	Applied insecticide concentration
Bifenthrin	Fobos EC	0.05%
Thiacloprid	Calypso SC 480	0.015%
Thiamethoxam	Actara 25 WG	0.02%

The experimental design was a randomized complete block, with four replications. The main plot size was 15 plants. Before treatment five shoots with aphids were marked per experimental plot (5 plants). Determining the number of wingless aphids on five selected shoots was performed four times: immediately before treatment (BT), 3 days after treatment (3 DAT), 7 days after treatment (7 DAT) and 14 days after treatment (14 DAT). The effectiveness of insecticides was calculated by the Henderson-Tilton's formula.

RESULTS

The results of field experiment for examination of tested insecticides effect are shown in Tables 2 and 3. Infestation of poplar shoots before treatment was high and the average number of aphids per shoot in control was 77.2, and 14 days after treatment 98.2 aphids. The results presented in Table 2 indicate a major reduction or absence of aphids on treated shoots after the application of insecticides.

Table 2. Number of living aphids before and after treatment

Treatments	Time of assessment	Number of living aphids				Ms ± Sd
		I	II	III	IV	
Bifenthrin	BT	391	303	376	359	357.25 ± 33.30
	3 DAT	0	1	0	3	1.0 ± 1,22
	7 DAT	0	0	0	0	0 ± 0
	14 DAT	23	22	0	1	11.5 ± 11.02
Thiacloprid	BT	353	330	444	316	360.75 ± 49.85
	3 DAT	0	0	1	1	0.5 ± 0.5
	7 DAT	0	0	0	0	0 ± 0
	14 DAT	0	0	0	0	0 ± 0
Thiamethoxam	BT	499	571	515	346	482.75 ± 83.36
	3 DAT	4	0	19	4	6.75 ± 7.26
	7 DAT	0	0	1	0	0.25 ± 0.43
	14 DAT	0	0	3	33	9.0 ± 13.91
Control	BT	301	309	543	390	385.75 ± 97.24
	3 DAT	474	530	688	314	501.5 ± 133.70
	7 DAT	381	489	624	401	473.75 ± 83.92
	14 DAT	410	448	615	490	490.75 ± 77.11

Table 3. Efficacy of thiamethoxam, bifenthrin and thiacloprid in control of *C. populeti*

Treatments	Time of assessment	Total number of living aphids	Efficacy (%)
Bifenthrin	BT	1429	-
	3 DAT	4	99.8
	7 DAT	0	100
	14 DAT	46	97.5
Thiacloprid	BT	1443	-
	3 DAT	2	99.9
	7 DAT	0	100
	14 DAT	0	100

Thiamethoxam	BT	1931	-
	3 DAT	27	98.9
	7 DAT	1	99.9
	14 DAT	36	98.5
Control	BT	1543	-
	3 DAT	2006	-
	7 DAT	1895	-
	14 DAT	1963	-

Results emphasized high initial effect of insecticide application after 3 days with efficacy of 98.9 % for thiamethoxam, 99.8% for bifenthrin and 99.9% for thiacloprid. Seven days after the treatment, the efficacy of bifenthrin and thiacloprid was 100%, while thiamethoxam had 99.9% of efficacy. After 14 days thiacloprid showed 100%, thiamethoxam showed 98.5% while bifenthrin had efficacy of 97.5%. Highest efficacy and residual effect was recorded in thiacloprid. Amongst the tested insecticides highest efficacy and residual effect was recorded with application of thiacloprid. Studies have shown that all tested insecticides have high efficacy against *C. populeti*.

DISCUSSION

Although the importance of *C. populeti* as poplar pest in Serbia is very significant, still there are no registered insecticides for suppression of this aphid. As preparations which can be successfully used for control of aphids on poplars Jodal (1967) mentioned malathion, phosphamidon, diazinon, dimethoate and fenthion, but the application of these insecticides, except malathion, is now prohibited in forests and nurseries certified by FSC scheme (Anonymus, 2007). Therefore, we tested the efficacy of the insecticides Phobos EC, Actara, 25 WG and Calypso SC 480 which are not registered in Serbia for use in forestry, but registered and applied to control aphids on agricultural crops (Sekulic, Jelcic, 2013). The aim of this study was to highlight the potentially successful application of the tested insecticides for control of *C. populeti* which would encourage the producers and distributors for registration that would allow legal use.

The high efficacy of the tested insecticides in controlling *C. populeti* indicates that they can be recommended for the suppression of these harmful insects. Applied concentration tested insecticides shown high toxicity, so the future work should be directed to study their efficacy at lower concentrations in order to determine their optimal concentration for practical use.

CONCLUSIONS

The results of field experiment showed high efficacy of tested insecticides in controlling of *C. populeti*. Among the tested insecticides, greatest efficacy and residual effect showed thiacloprid. Considering the very high efficacy of the applied insecticides manifested, further research should check their efficacy at low concentration to determine their optimal concentration for the practical application. Tested insecticides can be recommended for the control of pest.

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