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INSECTICIDAL EFFECT OF CARROT (*DAUCUS CAROTA*) AND LOVAGE (*LEVISTICUM OFFICINALE*) (APIACEAE) EXTRACTS AGAINST *TRIBOLIUM CONFUSUM* JACQUELIN DU DUVAL, 1868 (COLEOPTERA, TENEBRIONIDAE)

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Abstract

HRUDOVÁ, E., KOCOURKOVÁ, B., ZELENÁ, V.: *Insecticidal effect of carrot (Daucus carota) and lovage (Levisticum officinale) (Apiaceae) extracts against Tribolium confusum Jacquelin du Duval, 1868 (Coleoptera, Tenebrionidae).* Acta univ. agric. et silvic. Mendel. Brun., 2006, LIV, No. 1, pp. 165–168

Extracts from *Daucus carota* and *Levisticum officinale* in different concentrations were tested for insecticidal effect against *Tribolium confusum* (Coleoptera, Tenebrionidae). The efficacy of treatment was evaluated after 24, 48 and 72 h. The required data were statistically analysed using the Henderson-Tilton method. The *Daucus carota* IPM extract in a dose of 1ml, *D. carota* IPM extract diluted with water in a ratio of 1:1 (dose 1 ml) and *Levisticum officinale* extract in a dose of 2 ml were highly efficient.

aromatic plant extract, insecticidal effect, *Daucus carota*, *Levisticum officinale*, *Tribolium confusum*

The scope of plant extracts and essential oils for on-pharmaceutical use is increasing. Many authors have observed the antimicrobial activity of essential oils and have discovered the high inhibitory effect to selected bacteria and fungi (ELGAYYAR et al., 2001). Many authors use these substances as insecticides. According to KIM et al. (2003a) good results have been achieved with extracts of fruits of fennel (*Foeniculum vulgare*) and mustard (*Brassica juncea*) against the anobid beetle. KIM et al. (2003b) tested insecticidal activities of methanol extracts from 30 aromatic plants including fruit of *Foeniculum vulgare* against adults of *Sitophilus oryzae* and *Callosobruchus chinensis* using direct contact application; they found the high effect of *F. vulgare* extract against both of these species. HUANG & HO (1998) stated that the methylene chlorid cinnamon (*Cinnamomum aromaticum*) extract had contact toxicity for *Tribolium castaneum* and *Sitophilus zeamays*, both species showed the similar susceptibility for this extract. Hexane extracts from *Daucus carota* (trans-asarone) incorporated into artificial diet caused a significant weight reduction of caterpillars *Helicoverpa zea* and *Heliothis virescens* (Lep., Noctuidae) (MOMIN & NAIR, 2002). The antifeedant and insecticide effect of ethanolic extracts from pine needles of *Pinus banksiana*, *P. retinosa*, *P. sylvestris* and *P. strobus* against caterpillars of *Lymantria dispar* were tested by BENINGER & ABOU-ZAID (1997) with a significant reduction of weight and increasing mortality of the 2nd instar caterpillars. LAMIRI et al. (2001) discovered the insecticidal effect of essential oils from *Mentha pullegium*, *Origanum compactum*, *O. majorana* against the adults of *Mayetio-*

la destructor (Diptera, Cecidomyiidae), essential oils from *Ammi-Visnaga*, *Pistacia lentiscus* had an ovicidal effect, *O. compactum* and *M. pullegium* were toxic for both eggs and adults. Essential oils and extracts from aromatic plants may provide alternatives and supplements to conventional preparations as antibiotics and pesticides.

MATERIALS AND METHODS

The insecticidal effect of extracts from plants of the family Apiaceae were tested on *Tribolium confusum* (Coleoptera, Tenebrionidae), which is generally used as a model organism for testing the insecticidal effects of preparations.

The beetles were placed into Petri dishes (3 repetitions), 33 specimens each, and in Potters sedimentation tower exposed to the impact of extracts from carrot and lovage. The dose of 1 ml, and/or 2 ml were used for spraying under a pressure of 3 Mpa were used for spraying.

The insecticidal effect of extracts was observed for 24, 48 and 72 hours. The ratio of survival beetles was observed. The beetles were divided into three categories: live, tremor (the beetles with some indication of life) and dead. From view of insecticidal effect the dead beetles and tremor beetles were counted together. The problem is catalepsy and thanatosis, when the beetles appeared to be dead and could have been categorized incorrectly. The insecticidal effect of 70–80% is commonly regarded as adequate. The control groups of beetles were exposed to effects of water in doses of 1 and 2 ml, neither showing mortality.

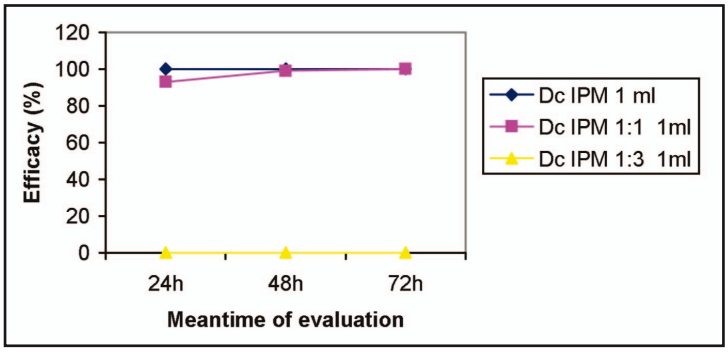
For statistical evaluation of the efficacy of extracts and their dilution we used the method after Henderson – Tilton, commonly used for these types of analyses and software UPAV PLUS (by the State Phytosanitary Administration).

I: *Used extracts and their dilution*

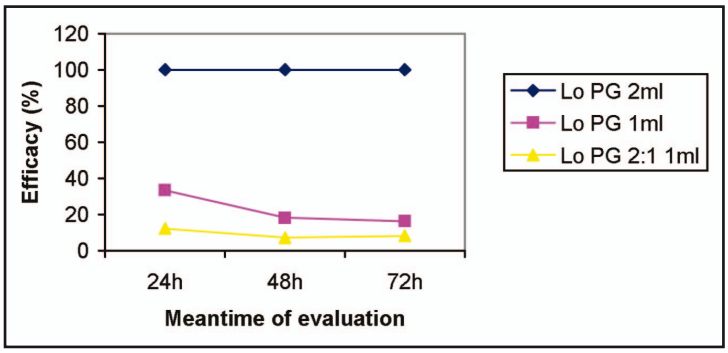
lovage (*Levisticum officinale*) Propylenglycol extract (Lo PG)	1 ml concentrate	
	2 ml concentrate	
	2:1	1 ml
carrot (*Daucus carota*) Isopropylmyristat extract (Dc IPM)	1 ml concentrate	
	1:1	1 ml
	1:3	1 ml
Untreated control (C)		

II: *The effect of extracts from Levisticum officinale and Daucus carota examined 24, 48 and 72 h after application*

Variation	Alive after treatment (%)			Efficacy (%)			Level of significance 99%		
	24 h	**48 h**	**72 h**	**24 h**	**48 h**	**72 h**	**24 h**	**48 h**	**72 h**
Untreated control	33.00	33.00	33.00	0.00	0.00	0.00	. . C	. B	. . C
Dc 1 ml concentrate	0.00	0.00	0.00	100.00	100.00	100.00	A	A	A
Dc 1:1	2.33	0.33	0.00	92.93	98.99	100.00	A	A	A
Dc 1:3	33.00	33.00	33.00	0.00	0.00	0.00	. . C	. B	. . C
Lo 1 ml concentrate	22.00	27.00	22.00	33.33	18.18	33.33	. B	. B	. B
Lo 2:1 1 ml	29.00	30.67	30.33	12.2	7.07	8.08	. B	. B	. B C



1: *Efficacy of Daucus carota IPM extracts in different dilutions*



2: *Efficacy of Levisticum officinale PG extracts in different dilutions*

RESULTS

We achieved good insecticidal effects with the IPM extract from carrot (*Daucus carota*) and PG extract from lovage (*Levisticum officinale*) in our experiments. The undiluted IPM extract from carrot in a dose of 1 ml showed the best insecticidal effect, and the same extract diluted with water in a ratio of 1:1 in a dose of 1 ml. The effect of an undiluted PG extract from lovage also achieved a 100% effect, but in a dose of 2 ml and dose of 1 ml the efficacy was only 22.56%, which is not satisfactory.

The experiments showed that extracts from carrot and lovage are perspective for their insecticidal effect.

We can conclude in saying that extracts from aromatic plants may provide alternatives and supplements to conventional preparations as antibiotics and pesticides.

DISCUSSION

Many authors have dealt with aromatic plant extracts and essential oils from different plants as insecticides and/or antifeedants. According to KIM et al. (2003a) good results were achieved with extracts of fruits of fennel (*Foeniculum vulgare*) and mustard (*Brassica juncea*) against the anobid beetle. BENINGER & ABOU-ZAID (1997) showed the antifeedant and insecticide effect of ethanolic extract from pine needles of *Pinus banksiana*, *P. retinosa*, *P. sylvestris* and *P. strobus*. HUANG & HO (1998) discovered that the methylene chlorid cinnamon (*Cinnamomum aromaticum*) extract showed contact toxicity for *Tribolium castaneum* and *Sitophilus zeamays*. SHARMA et al. (1990) screened the antifeedant activity of *Daucus carota*, *Apium graveolens*, *Angelica glauca*, *Valeriana walichii*, *Saussurea lappa* and *Acorus callamus* against *Spodoptera litura* but they did not find this effect of carrot. LAMIRI et al. (2001) mentioned the insecticidal effect of essential oils from *Mentha pullegium*, *Origanum compactum*, *O. majorana*, *Ammi-Visnaga*, *Pistacia lentiscus*, *O. compactum* and *M. pullegium* against the *Mayetiola destructor*.

SOUHRN

Insekticidní účinky výtažků z mrkve (*Daucus carota*) a libečku (*Levisticum officinale*) (Apiaceae) proti *Tribolium confusum* Jacquelin du Duval, 1868 (Coleoptera, Tenebrionidae)

V laboratorních podmínkách byly zkoušeny insekticidní účinky extraktů z mrkve (*Daucus carota*) a libečku (*Levisticum officinale*) proti potemníku *Tribolium confusum* (Coleoptera, Tenebrionidae). Byly zkoušeny různé koncentrace extraktů.

Účinnost ošetření byla hodnocena po 24, 48 a 72 hodinách. Získané výsledky byly vyhodnoceny metodou Hendersona-Tiltona. Nejlepší účinnost vykazoval izopropylmyristatový (IPM) extrakt z mrkve v dávce 1 ml a IPM extrakt z mrkve ředěný s vodou v poměru 1:1 v dávce 1 ml a propylenglykolový (PG) extrakt z libečku v dávce 2 ml.

extrakty z aromatických rostlin, insekticidní účinek effect, *Daucus carota*, *Levisticum officinale*, *Tribolium confusum*

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