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STUDIES ON PLUM (PRUNUS DOMESTICA) L. TREES AFFECTING THEIR RESISTANCE TO APHID *HYALOPTERUS ARUNDINIS* FABR.

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ABSTRACT

The chemcial analysis of spring and autumn leaves of plumes can give important information for the relation between chemical components and the susceptibility of plum leaves to be infested with aphid, so, spring and autumn leaves from the local plum trees were subjected to chemical analysis to isolate the flavonoid compound such as coumarin, hydroxy coumarin and Oxy. coumarin. Results revealed that spring and summer leaves contained either hydroxy or oxy-Coumarin. Whereas the autumn leaves contain coumarin when commercal coumarins were tested against adults of the Aphid Hyalopterus arundinis Fabr.

Through stretched membrane on synthetic diet, coumarin gave feeding stimulants at 25molar whil the other two compounds (HC and OC) changed the effect of the molecule aphid feeding from stimulatory to inhibitory. Hydroxy coumarin was very feeding inhibitor at 3 molars while Oxy-Coumarin was lethal at l molar that may, in part explain why aphid harboured abundantly plum trees in autumn, since the leaves are containing coumarin which used as an antifrost agent and protected them with their afids from severe cooling during winter the spring and summer leaves have been containing hydroxy and oxy-Coumarin. In Egypt aphids protect themselves against the low temperature of winter by feeding on Handaquoq plants and sweet clover in which they have coumarin.

Keywords: Plum (*Prunus domestica* L.) trees, resistance, aphid *hyalopterus arundinis* fabr.

INTRODUCTION

As it is known, Egypt, have favourable weather, and aphids live during those two seasons in which nymphs or adults infested plum trees in early autum and when leaves fell they migrated to eighter sweet clover or Handaquoq sweet clover and Handaquoq which have coumarin (Gorz *et al.,* 1972; Norris, 1977 and Hedin and Jenkins, 1977). This compound lowers the freezing points and is used as antifrost agent. This, it may be due to the need of aphids for coumarin to protect themselves from cold and weather so that the aphids left plum leaves in early spring to infest other host plants the extraction of coumarin derivatives from autumn, spring and summer leaves of plum trees and their aphicidal activity. In this study, we report on the extraction of coumarin and its derivatives found in plum leaves during autumn, spring summer together with aphicidal bioassay data.

Concerning the *Hyalopterus arundinis* Fabr. The wild weed Handaqoaq is grown on drainage canals and the fields of winter crops.

MATERIALS AND METHODS

1- **Insect:** the aphid *hyalopterus arundinis* fabor was reared in lab-on sweet clover deedlings at 21-23°C, 65-70 R.H.

2-Plant extraction: leaves grown during autumn, spring and summer from plum trees were analysed for their contents from coumarin according to Harborne (1973).

3-Commerical coumarin: was obtained from Hydroxy-and Oxy-coumarin were tested from their toxicity and deterrency effects. Adult ophids were fed with diet containing different concentrations of these chemical compounds. Survivals of *H. arundinis* recorded after 12 hours of feeding on coumarins compounds.

Applications: The collected extractes and commercial compounds were toxicological tests against the adultes of *Hyalopterus arundinis* by in corporating into an artificeal feeding diet through a parafilm streched membrane according to Erhardt (1968) and Salem (1983). For every concentration 3 repleates Cages were used, each containing lo apterous adults. Control received only diet. Mortality or deterrent effect was recorded at 12 and 24 hours after applications.

RESULTS AND DISCUSSION

1- Mortality percent of *H. arundtnis* as affected by plum summer, spring and autumn leaves extractes after 24 h feeding with synthetic diets:

Data in Table 1 show that autumn plum leaves have mainly coumarin hydroxy coumarin, while summer leaves mainly contain Oxy-coumarin. The biassay of these extracts on *Hyalopterus arundinis* shows that 84.1 and 90.3% mortality was obtained after 12, 24 hours by summer leaves extracts. Therefore, toxicity of summer leaves extracts may be due, in part, to those chemical contents of Oxy-and hydroxy-coumarin (Matsumoto, 1962) and that explains so, aphid migrated off from summer plum leaves.

Table 1. Mortality percent of *H. arundtnis* as affected by plum summer, spring and autumn leaves extraectes after 12, 24 h feeding with synthetic diets.

Extracted plum leaves	Molar concentrations 10^{-3} Molar	% Mortality	
		After 12 h	After24 h
	3	-	1.1
Autumy leaves	4	2.3	4.3
Coumarin	6	3.6	5.5
Spring leaves	3	14.7	18.6
Coumarin- Hydroxy-	4	23.8	28.4
coumarin (1 : 1)	6	39.1	49.71
	3	55.4	62.4
Summer leaves	4	66.6	77.2
Oxy-coumarin	6	84.1	90.3
Control	0.0	0.0	0.0

2- Effect of commerical coumarin, on H. *arundinis* survival fed with synthetic diets after 24 hours:

The highest mortality was observed at 3 Oxy-Coumarin, suggesting that this compound had feeding deterrent activity followed by insect death (Table 2). At lower and possibly, more compounds would be injested causing mortality, while high concentrations caused potent antifeedants and insect died due to starvation and the number of aphids feeding sharply decreased by Oxy-coumarin compared with control.

Table 2. Effect of commerical coumarin, on H. *arundinis* survival fed with synthetic diets after 24 hours.

Compounds	Concentrations 10^{-3} Molar	% Mortality	
		After 12h	After 24h
Coumarin	1	0.11	1.00
	2	0.23	2.21
	3	0.58	4.35
Hydroxy-coumarin	1	10.11	43.13
	2	22.13	60.2
	3	33.54	77.6
Oxy-coumarin	1	40.3	65.12
	2	61.9	83.7
	3	79.12	96.22
Control	0.0	0.0	5.2

Data in Table 3 represents the toxicity and feeding detrrency of coumarin compounds of *H. armdinis* after 24h. All tested compounds exept coumarin had feeding deterrent activity, while coumarin stimulated feeding

Results in this study proved that hydroxy and oxy-coumarin are toxic and coused feeding deterrency to *H.arundinis* suggesting a role of these compounds on aphid abundant from summer to host plants and from winter to summer host plants seasonal changes are affecting coumarin accumulation in plum trees during autumn and winter seasons, while in spring and summer seasons they accumulated hydroxy and oxy-coumarin in which they are affecting plant resistance to *H. arundinis* aphids (Hanson *et al*., 1983) and Zuniga and Corcuera (1987), and more were susceptible to cereal aphids than wheat barely cultivares.

Table 3: Toxicity and feeding deteverency of HC and OC on *H. armdinis* after 24h. feeding with synthetic diet.

Compounds	LD50 Molar- conc. 10^{-3}	Survival (%) with After 24
C	00	97.71
H.C	1.71	43.11
O.C	0.8	12.98
Control	00	97.99

Conclusively, the leaves are containing coumarin which used as an antifrost agent and protected them with their afids from severe cooling during winter the spring and summer leaves have been containing hydroxy and oxy-Coumarin. In Egypt aphids protect themselves against the low temperature of winter by feeding on Handaquoq plants and sweet clover in which they have coumarin.

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دراسات على أشجـار البرقوق وأثرها في مقاومة الإصابة بمن البرقوق الدقيقى

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إن التغيرات في الظروف الموسمية طوال العام تؤثر في أوراق البرقوق بما فيها من عصارة فقد استخلصت تلك العصارة خلال الفصول الأربعة (خريف – شتاء – ربيع – صيف) ووجد فيها مركب الكومارين في الخريف ثم يتحول إلى هيدروكسى كومارين ربيعاً ثم إلى أوكس كومارين صيفاً وباختبار المركبات الثلاثة بعد استخلاصها مع بيئة غذائية لحشرات المن فكانت كالتالى:

١- الكومارين منشط للتغذية – والهيدروكس كومارين مثبط للتغذية – والأوكس كومارين تأثيره سام على الحشرات.
٢- أن الكومارين مضاد للصقيع anti-forst agent ويقلل من تجميد العصارة النباتية لذلك يلجأ المن إلى أشجار البرقوق في الخريف ليحصل على هذه المادة لتحمى حشرات المن الكاملة والحوريات نفسها من برد الشتاء ثم تهاجر بعد ذلك لنباتات أخرى بها كومارين بعد سقوط أوراق أشجار البرقوق.
٣- وفي الربيع والصيف تهاجر الحشرات من على أشجار البرقوق إلى عوائل أخرى لاحتواء أوراق البروق على المواد السامة (أوكس كومارين) والمثبطة للتغذية (هيدروكسى كومارين) بهذا يتحول البرقوق إلى نبات مقاوم خلال فصلى الربيع والصيف.
٤- بذلك يستخدم مستخلص الأوكس وهيدروكسى كومارين وكذلك الكومارين التجارى فى صورة هيدروكسى وأوكس كومارين فى مكافحة المن بصفة عامة على محاصيل الخضر-الفاكهة الحقلية.