Formosan Entomologist
Journal Homepage: entsocjournal.yabee.com.tw

【Scientific note】

番茄素對小菜蛾Plutella xylostella L.卵之殺卵效應【科學短訊】

朱耀沂、呂鳳鳴

*通訊作者E-mail :

Received: Accepted: 1992/09/02 Available online: 1992/09/01

Abstract

摘要

分別以50μl、100μl、150μl劑量之0.1 % 、0.2 % 及0.4 % 番茄赤液處理小菜蛾產下之卵，結果顯示未加處理之小菜蛾卵之孵化率高達90 % 以上，而經150μl之0.1 % 番茄素溶液處理後的卵，孵化率卻降至20 % 以下。可見番茄素對小菜蛾所產之卵有強度的殺卵效應。

Key words:
關鍵詞: 番茄素、小菜蛾、殺卵效應。

Full Text: PDF(0.18 MB)

下載其它卷期全文 Browse all articles in archive: http://entsocjournal.yabee.com.tw

中華昆蟲 12: 213-216(1992)
Chinese J. Entomol. 12: 213-216(1992)

The Ovicidal Effect of Tomatine against Deposited Eggs of the Diamondback Moth, *Plutella xylostella* L.

Yau-I Chu Department of Plant Pathology and Entomology, National Taiwan University, 1 Roosevelt Road, Sec. IV, Taipei, Taiwan, R.O.C.
Feng-Ming Lu Fengshan Tropical Horticutural Experiment Station, P. O. Box. 16, Fengshan, Kaohsiung, Taiwan, R.O.C.

ABSTRACT

The ovicidal effect of tomatine was tested on the deposited eggs of *Plutella xylostella* L. using 50 μl, 100 μl and 150 μl of 0.1%, 0.2% and 0.4% tomatine solutions. While the hatching rate of untreated eggs was normally greater than 90%, less than 20% hatched after treatment with 150 μl of a 0.1% tomatine solution. From our result, it is apparent that tomatine is highly toxic to the deposited eggs of the diamondback moth.
Key words: Tomatine, diamondback moth, *Plutella xylostella*, ovicidal effect.

番茄素對小菜蛾 *Plutella xylostella* L. 卵之殺卵效應

朱耀沂 國立台灣大學植物病蟲害學系 台北市羅斯福路四段 1 號
呂鳳鳴 鳳山熱帶園藝試驗分所 鳳山郵政 16 號信箱

摘　要

分別以50 μl、100 μl、150 μl 劑量之 0.1 %、0.2 % 及 0.4 % 番茄素液處理小菜蛾產

下之卵，結果顯示未加處理之小菜蛾卵之孵化率高達 90 %以上，而經 150 μl 之 0.1 %番茄素溶液處理後的卵，孵化率卻降至 20 %以下。可見番茄素對小菜蛾所產之卵有強度的殺卵效應。
關鍵詞：番茄素、小菜蛾、殺卵效應。

Introduction

Formerly, protection of cruciferous vegetables against the diamondback moth (DBM), *Plutella xylostella* (L.), was mainly dependent on intense insecticidal treatment, which in the long term, often resulted in resistant DBM populations (Miyata *et al.*, 1986), as well as a contaminated environment that poses a threat to human health. In order to reduce the damage of this pest, other methods were developed such as intercropping (Buranday and Raros, 1975; Talekar *et al.*, 1984), deterrence of oviposition by plant compounds (Tabashnik, 1985), repellents (Sinchaisri *et al.*, 1988), and antifeedants. Extensive research has been carried out on the antifeedant actions of α-tomatine against insects: *Empoasca fabae* (Dahlman and Hibbs, 1967), *Melanoplus bivittatus* (Harley and Thorsteinson, 1967), *Aedes aegypti* (Harley, 1967), *Leptinotarsa decemlineata* (Sinden *et al.*, 1978), *Heliothis zea* (Juvik *et al.*, 1982), *Myzus persicae* (Qin and Ke, 1984), *Ceratitis capitata* (Chan and Tam, 1985), *Spodoptera littoralis* (Dhillon, 1986), *Earias insulana* (Weissenberg *et al.*, 1986), *Spodoptera exigua* (Bloem *et al.*, 1989). In addition, Roddick's review (1974) on α-tomatine included its inhibiting effect on the larval growth of several insects.

The antifeedant action of tomatine against DBM larvae, has been studied by Lu and Chu (1992). According to them, the application of 0.1～0.4 % tomatine solution on cabbage is sufficient to reduce DBM feeding anywhere from 1/6 to 1/41 of that of the control. The ovicidal effect of tomatine on DBM deposited eggs is studied in this paper.

Newly deposited DBM eggs were collected in groups of 10, placed on seperated pieces of filter paper. The pieces of filter paper were inserted into a small petri-dish (ϕ 3 cm) and treated with either 50 μl, 100 μl, or 150 μl of either 0.1 %, 0.2 % or 0.4 % tomatine solution from a micropipette. The control involved leaving the eggs untreated or treating them with either 50% EtOH, or water. After the solvent evaporated, the small petri-dish was placed in a large tapper (ϕ 16 cm) and wrapped with aluminum foil. The eggs were observed daily during the hatching process. The experiment was repeated 10 times.

While the untreated eggs showed high hatching rates (around 90%), those treated with 150 μl of 50% EtOH solution or water had their development slightly influenced with their hatching rate being reduced to under 80 % (Fig. 1). Note, however, that there is no statistical difference among these treatments (Fig. 1).

Treatment with 50 μl or 100 μl of a 0.1% tomatine solution or 50 μl of 0.2% solution were not toxic to DBM eggs (Fig. 1). On the other hand, eggs treated with 150 μl of any concentration of tomatine solution resulted in more than 80% of the eggs failing to hatch (Fig. 1). It is concluded that tomatine had significant ovicidal effect against the deposited DBM eggs, with the LC_{50} being 0.33% tomatin solution.

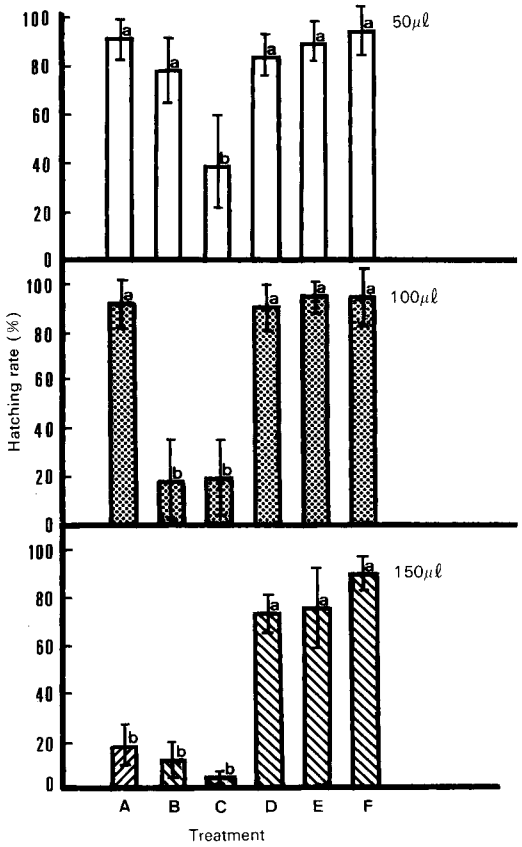

Fig. 1. Ovicidal effect of tomatine solution against deposited eggs of diamondback moth. A: 0.1% tomatine solution; B: 0.2% tomatine solution; C: 0.4% tomatine solution; D: 50% ethyl alcohol; E: Control (water); F: Dry. Columns ($\bar{x} \pm SE$) marked by the same letter are not significantly different at the DMRT 5% level.

References

Bloem, K. A., K. C. Kelley, and S. S. Duffey. 1989. Differential effect of tomatine and its alleviation by cholesterol on larval growth and efficiency of food utilization in *Heliothis zea* and *Spodoptera exigua*. J. Chem. Ecol. 15: 387–398.

Buranday, R. P., and R. S. Raros. 1975. Effects of cabbage tomato intercropping on the incidence and oviposition of the diamondback moth, *Plutella xylostella* (L.). Philipp. Ent. 2: 369–374.

Chan, H. T., and S. Y. T. Tam. 1985. Toxicity of α–tomatine to larvae of the Mediterranean fruit fly. (Diptera: Tephritidae). J. Econ. Ent. 78: 305–307.

Dahlman, D. L.,and E. T. Hibbs. 1967. Responsesof *Empoasca fabae* (Cicadellidae: Homoptera) to tomatine, solanine, leptine I; tomatidine, solanidine, & demissidine. Ann. Entomol. Soc. Amer. 60: 732–740.

Dhillon, N. P. S. 1986. Growth of the army worm (*Spodoptera littoralis* Boisd.) on three selections of *Lycopersicon* and on various concentrations of α–tomatinein artificial diets. Crop Res. (Hort. Res.) 26: 79–82.

Harley, K. L. S., and A. J. Thorsteinson. 1967. The influence of plantchemicals on the feeding, behavior, development, and survival of the two–striped grasshopper, *Melanoplus bivittatus* (Say), Acrididae: Orthoptera. Can. J. Zool. 45: 315–319.

Harley, K. L. S. 1967. A note on the influence of a range of plant chemicals on the growth and survival of *Aedes aegypti* L. larvae. Can. J. Zool. 45: 1297–1300.

Juvik, J. A., M. A. Stevens, and C. M. Rick. 1982. Survey of the genus Lycopersicon for variability in α–tomatine content. Hortsci. 17: 764–766.

Lu, F. M., and Y. I. Chu. 1992. The antifeeding effects of α–tomatine to the larvae of diamondback moth (*Plutella xylostella* L.). Chinese J. Entomol. 12: 318–323.

Miyata, T., T. Saito, and V. Noppun. 1986. Studies on the mechanism of diamondback moth resistance to insecticides. pp. 347–357 *in* N. S. Talekar and T. D. Griggs, eds. Diamondback Moth Management AVDRC, Taiwan.

Qin, J., and L. Ke. 1984. The influence

of secondary plant substances on the growth and development of *Myzus persicae* of Beijing. Entomol. Exp. Appl. 35: 17–20.

Roddick, J. G. 1974. Review article: The steroidal glycoalkaloid α-tomatine. Phytochemistry 13: 9–25.

Sinchaisri, N., D. Roongsook, and S. Areekul. 1988. Botanical repellent against the diamondback moth, *Plutella xylostella* L. Kasetsart J. (Nat. Sci. Suppl.) 22: 71–74.

Sinden, S. L., J. M. Schalk, and A. K. Stoner. 1978. Effects of daylength and maturity of tomato plants on tomatine content and resistance to the colorado potato beetle. J. Amer. Soc. Hort. Sci. 103: 596–600.

Tabashnik B. E. 1985. Deterrence of diamondback moth (Lepidoptera: Plutellidae) oviposition by plant compounds. Environ. Entomol. 14: 575–578.

Talekar, N. S., S. T. Lee, and S. W. Huang. 1984. Intercropping and modification of irrigation method for the control of diamondback moth. AVRDC 1984 Progress Report. pp.145–154.

Weissenberg, M., M. Klein, J. Meisner, and K. R. S. Ascher. 1986. Larval growth inhibition of the spiny bollworm, *Earias insulana*, by some steroidal secondary plant compounds. Entomol. Exp. Appl. 42: 213–217.

Received for publication February 13, 1992; revised manuscript accepted September 2, 1992.