SHORT COMMUNICATIONS

Toxicity of Five Systemic Insecticides to *Myzus persicae* SULZER and Its Predator *Coccinella septempunctata bruckii* MULSANT (Coleoptera : Coccinellidae)[1]

The use of nonselective insecticides commonly leads to pest levels exceeding those of the original population, as a result of the destruction of the natural enemy (RIPPER, 1956, 1957; BARTLETT, 1964). The estimation of selective toxicities of insecticides between insect pests and their natural enemies is one of the important research problems in the integrated control of insect pests.

Systemic insecticides are absorbed and translocated in the plant tissues and since only phytophagous insects consume them directly, they may reduce the insect pests population without poisoning natural enemies (RIPPER et al., 1948, 1951; SAITO, 1969).

In this paper, the selective toxicities of five systemic insecticides to the green peach aphid, *Myzus persicae* SULZER and its predator *Coccinella septempunctata bruckii* MULSANT are described.

Green peach aphids, *Myzus persicae* SULZER were reared on cabbage leaves (NAGAOKA KOUHAI SHIKITORI) and the coccinellid predator *Coccinella septempunctata bruckii* MULSANT were then fed on these aphids. These insects were reared in the laboratory at 25°C and 16 hr illumination per day.

Systemic insecticides, PSP-204 (*O,O*-diisopropyl S-ethylsulfinyl methylphosphorodithioate), phorate, dimethoate, disulfotone and vamidothion, were used. Chemical purities were more than 95%. 10% insecticide solutions in a mixture of acetone: benzene : Newcol 863, 1 : 1 : 1(w/w) were diluted

Table 1. CONTACT TOXICITY OF FIVE SYSTEMIC INSECTICIDES ON THE ADULTS OF *Coccinella septempunctata bruckii* MULSANT

Insecticide	Concersration[a] (ppm)	No. of test insect	Mortality (%)	
			after 24 hr	after 48 hr
PSP-204	4000	30	36.7	63.3
	2000	30	23.3	26.3
	1000	30	16.7	20.0
	500	30	6.7	6.7
	125	30	6.7	6.7
Phorate	500	30	86.7	96.7
	250	30	80.0	93.3
	62.5	30	76.7	76.7
	31.3	30	70.0	70.0
	15.6	30	30.0	30.0
Dimethoate	1000	24	54.7	87.5
	500	24	45.8	83.3
	125	24	29.2	54.2
	62.5	24	8.3	25.0
Disulfotone	100	24	20.0	66.7
	25	24	0.0	37.5
	12.5	24	0.0	16.7
	6.3	24	0.0	8.3
Vamidothion	400	24	33.3	66.7
	200	24	20.8	33.3
	100	24	20.8	37.5
	25	24	8.3	16.7
Control		30	0.0	0.0

[a] Concentration of spray solution.

[1] Appl. Ent. Zool. **9** (2): 95—97 (1974)

Table 2. Systemic Insecticidal Toxicity of Five Systemic Insecticides to *Myzus persicae* Sulzer

Insecticide	Mortality (%) at concentrations (ppm) of:								Control
	200	100	50	25	10	5	1	0.5	
PSP-204	—	98.3	96.7	66.7	58.3	40.0	18.8	1.7	0.0
Phorate	70.0	60.0	55.0	36.7	33.3	38.3	5.0	—	0.0
Dimethoate	—	98.3	90.0	68.3	70.0	36.7	11.7	15.0	0.0
Disulfotone	—	61.7	58.3	36.7	15.0	13.3	3.3	—	0.0
Vamidothion	—	98.3	83.3	38.3	11.7	6.7	0.0	—	0.0

Table 3. Toxicity of Five Systemic Insecticides to the Adult of *Coccinella septempunctata bruckii* Mulsant

Insecticide	Time (hr)	Dosage-mortality regressioon equation $Y=5+b\ (X-\bar{x})$	Pr	LC50[a] (ppm)
PSP-204	24	$Y=5+0.835(X-3.105)$	$Pr>0.99$	(12700)
	48	$Y=5+1.258(X-2.369)$	$0.75<Pr<0.90$	2340
Phorate	24	$Y=5+0.879(X-0.879)$	$0.95<Pr<0.98$	20
	48	$Y=5+1.454(X-0.358)$	$0.98<Pr<0.99$	20
Dimethoate	24	$Y=5+1.162(X-1.782)$	$0.98<Pr<0.99$	600
	48	$Y=5+1.329(X-1.120)$	$0.95<Pr<0.98$	130
Disulfotone	24	—	—	—
	48	$Y=5+1.505(X-2.687)$	$0.98<Pr<0.99$	50
Vamidothion	24	$Y=5+0.782(X-2.190)$	$Pr>0.99$	(1500)
	48	$Y=5+1.258(X-1.371)$	$0.95<Pr<0.98$	240

[a] Values in parentheses were obtained by extrapolation.

Table 4. Toxicity of Five Systemic Insecticides to *Myzus persicae* Sulzer

Insecticide	Dosage-mortality regression equation. $Y=5+b(X-\bar{x})$	Pr	LC50[a] (ppm)
PSP-204	$Y=5+1.191(X-1.814)$	$Pr>0.99$	6.5
Phorate	$Y=5+1.111(X-2.618)$	$Pr>0.99$	41.5
Dimethoate	$Y=5+1.150(X-1.813)$	$Pr>0.99$	6.5
Disulfotone	$Y=5+1.172(X-2.734)$	$Pr>0.99$	8.5
Vamidothion	$Y=5+1.902(X-2.585)$	$Pr>0.99$	38.5

[a] Expressed by the concentration of culture solution.

to a suitable concentration with water.

Eight or ten adults *C. septempunctata bruckii* were anesthetized with carbon dioxide, and 5 ml of the insecticide solution was applied with a rotary spray tower at 280 mmHg. Treated insects were transferred to a petri dish 9 cm in diameter, and were offered the green peach aphid as food. Mortality was observed at 24 and 48 hr after treatment. Control insects were treated with 5 ml of an aqueous solution of an emulsifier, equivalent to the insecticide solution used to prepare the highest concentration of the insecticide.

Individual cabbage plant with 4 to 5 leaves were cultured with 100 ml of a culture solution containing the insecticide in a brownish glass pot, 9 cm in diameter and 6 cm in depth, for 24 hr. Single cabbage leaf was excised, and ten apterous viviparous females of *M. persicae* were placed on the leaf within the aphid chamber. Mortality was observed and recorded after a 24 hr exposure period. Insects treated with the insecticide were kept at 25°C. Each experiment was repeated at least three times.

Results of contact and systemic insecticidal toxicity are shown in Table 1 and 2. From these results, LC50 values were calculated (BLISS, 1934) and are shown in Table 3 and 4. PSP-204 was remarkably low in toxicity to the coccinellid predator, whereas the other insecticides were highly toxic. Phorate and disulfotone were especially toxic, and their LC50 values after 48 hr were 20 and 50 ppm, respectively. All systemic insecticides used were markedly effective against the green peach aphid. LC50 values after 24 hr for dimethoate, PSP-204 and disulfotone were 6.5, 6.5 and 8.5 ppm, respectively.

BARTLETT (1963) studied the contact toxicities of sixty-one pesticides to hymenopterous parasites and coccinellid predators, and found that virtually none of the materials tested were toxic to coccinellid adults while no toxicity to parasitic Hymenoptera was seen.

In order to compare the toxicities of the insecticides to the green peach aphid and the coccinellid, the "selective factor" was calculated by the following equation, using the LC50 values of the time indicated stable mortality:

$$\text{Selective factor} = \frac{\text{LC50 value to the coccinellid after 48 hr}}{\text{LC50 value to the green peach aphid after 24 hr}}$$

Values for PSP-204, phorate, dimethoate, disulfotone and vamidothion were 375, 0.48, 20, 5.85 and 6.23, respectively. According to the nomenclature proposed by O'BRIEN (1960), PSP-204 might be defined as a selective aphidicide and phorate as a nonselective chemical, although the index value may differ from the experimental condition.

REFERENCES

BARTLETT, B. R. (1963) *J. Econ. Entomol.* **56** : 694–698.

BARTLETT, B. R. (1964) *Biological Control of Insect Pests and Weeds.* (P. DEBACH ed.) Reinhold, New York, p. 489–511.

BLISS, C. I. (1934) *Science* **79** : 409.

O'BRIEN, R. D. (1960) *Toxic Phosphorus Esters.* (1st ed.) Academic Press, New York and London, 434 pp.

RIPPER, W. E., R. M. GREENSLADE, J. HEATH and K. BARKER (1948) *Nature* **196** : 484.

RIPPER, W. E., R. M. GREENSLADE and G. S. HARTLEY (1951) *J. Econ. Entomol.* **44** : 448–459.

RIPPER, W. E. (1956) *Ann. Rev. Entomol.* **1** : 403–438.

RIPPER, W. E. (1957) *Advance in Pest Control Research* **1** : 305–352.

SAITO, T. (1969) *Residue Rev.* **25** : 175–186.

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Some Biological Aspects of the Artificial Rearing of the Cucumber Looper, *Anadevidia peponis* (FABRICIUS) (Lepidoptera : Noctuidae[1,2])

An artificial method of rearing the cucumber looper, *Anadevidia peponis* (FABRICIUS), a well-known cucurbitaceous pest, was successfully established. It appears impossible for the looper to hibernate in the central and northern parts of Japan because of its non-diapausing nature throughout the developmental period. In Tokyo, eggs and pupae killed by frost are found in the field

[1] Appl. Ent. Zool. **9** (2): 97—99 (1974).

[2] The author proposes a new English name "the cucumber looper" for this species, *Anadevidia peponis* (FABRICIUS), to supersede the old one, the cucurbita plusia, which is considered inadequate.