APPENDIX A

Calculation for the preparation of standard solutions

A-1 Preparation of dimethoate standard solution, 1000 mg/L (2 mL)

1000 mL of solution contains 1000 mg of dimethoate

2 mL of solution contains 2 mg of dimethoate

but, purity of dimethoate standard solution was 99.0% (w/w)

100 g of dimethoate contains 99.0 g

prepared 2 mg of dimethoate

thus, weight of dimethoate standard $= \frac{2mg \times 100g}{99.0g} = 2.02$ mg

A-2 Preparation of malathion standard solution, 1000 mg/L (2 mL)

1000 mL of solution contains 1000 mg of malathion

2 mL of solution contains 2 mg of malathion

but, purity of malathion standard solution was 99.5% (w/w)

100 g of malathion contains 99.5 g

prepared 2 mg of malathion

thus, weight of malathion standard $= \frac{2mg \times 100g}{99.5g} = 2.01$ mg

A-3 Preparation of parathion methyl standard solution, 1000 mg/L (2 mL)

1000 mL of solution contains 1000 mg of parathion methyl

2 mL of solution contains 2 mg of parathion methyl

but, purity of parathion methyl standard solution was 99.0% (w/w)

100 g of parathion methyl contains 99.0 g

prepared 2 mg of parathion methyl

thus, weight of parathion methyl standard $= \frac{2mg \times 100g}{99.0g} = 2.02$ mg

APPENDIX B

Calculation

The calculation of percentage recovery, standard deviation (S.D.) and relative standard deviation (R.S.D.) are described in below.

B-1 Percentage recoveries of extraction method

The percentage recovery can be calculated as follows

$$\%\,\text{Recovery} = \frac{(\text{Area ratio of standard added in sample} - \text{Area ratio of sample})}{\text{Area ratio of standard solution}} \text{x}\,100 \quad (1)$$

For example, the calculation for percent recoveries as shown in Table B-1 and B-2

B-2 Standard deviation [21, 32]

The most common measure of the error or a statistical measure of precision in an experimental quantity is S.D. of a set of data. S.D. defines a series of n measurements of the same measure and, the quantity is characterizing the dispersion of the results and given by the formula:

$$S.D. = \left[\sum (X_i - \overline{X})^2 / (n-1)\right]^{1/2} \quad (2)$$

Where X_i = the result of the i measurement

$\overline{X}$ = the arithmetic mean of the n results considered

n = the number of measurement

The definition is estimated the standard deviation for n values of a sample of a population and is always calculated using n-1. If the analysis was repeated several times to produce several sample sets of data, it would be expected that each set of measurements would have a different mean and a different estimate of the standard deviation.

B-3 Relative standard deviation

The most useful test parameter is the precision of replicate injections of the analytical reference solution, prepared as directed under the individual reagent. The precision of replicate injections is expressed in term of relative standard deviation as follows:

$$\%R.S.D. = (S.D./\overline{X}) \times 100 \quad (3)$$

Where S.D. = standard deviation

$\overline{X}$ = the mean of data

Calculation of percent recovery of extraction method

An example for calculation of the percent recovery of dimethoate in orange sample using SDME procedure.

Table B-1 Amount of dimethoate detected after spiking dimethoate standard in orange sample at 20 μg/L.

Trial No	Dimethoate found, X_i (μg/L)	$\left(X_i - \overline{X}\right)$	$\left(X_i - \overline{X}\right)^2$
1	0.5421	-0.0110	0.000121
2	0.5600	0.0069	0.000048
3	0.5573	0.0042	0.000018
	$\overline{X}$ = 0.5531		Σ = 0.000062
Area ratio of standard solution = 0.6060			

By using equation (1)

$$\% \text{ Recovery} = \frac{(0.5531 - 0)}{0.6060} \times 100$$

$$= 91$$

The statistic S.D. is calculated by

$$\text{S.D.} = \left[\sum (X_i - \overline{X})^2 / (n-1)\right]^{1/2}$$

$$\text{S.D.} = \left[(0.000062)/(3-1)\right]^{1/2}$$

S.D. = 0.0039

From equation (3)

$$\% \text{ R.S.D.} = (S.D./\overline{X}) \times 100$$

$$\% \text{ R.S.D.} = (0.0039/0.6060) \times 100$$

$$\% \text{ R.S.D.} = 0.60$$

Table B-2 Amount of dimethoate detected after spiking dimethoate standard in orange sample at 100 μg/L.

Trial No	Dimethoate found, X_i (μg/L)	$(X_i - \overline{X})$	$(X_i - \overline{X})^2$
1	3.6215	0.0013	0.0000020
2	3.6191	-0.0011	0.0000010
3	3.6199	-0.0003	0.0000001
	$\overline{X}$ = 3.6202		Σ = 0.000001
Area ratio of standard solution = 3.5029			

By using equation (1)

$$\% \text{ Recovery} = \frac{(3.6202 - 0)}{3.5029} \times 100$$

$$\% \text{ Recovery} = 103$$

The statistic S.D. is calculated by

$$\text{S.D.} = \left[\sum (X_i - \overline{X})^2 / (n-1)\right]^{1/2}$$

$$\text{S.D.} = \left[(0.000001)/(3-1)\right]^{1/2}$$

$$\text{S.D.} = 0.0005$$

From equation (3)

$$\%\ \text{R.S.D.} = (S.D./\overline{X}) \times 100$$

$$\%\ \text{R.S.D.} = (0.0005/3.6202) \times 100$$

$$\%\ \text{R.S.D.} = 0.01$$

As the results are given in Table B-1 and B-2, the percent recovery of dimethoate in orange sample (spiked at 20 and 100 μg/L) using SDME procedure was in the range 92-103%, 0.0039-0.0005 of S.D. and 0.60-0.01 of %R.S.D. For malathion, the calculations are the same as dimethoate (data not show).

VITA

Name	Mr. Yuttasak Chammui
Date of birth	May 24, 1983
Academic status	- High school certificate, Buddhachinarajphitaya School, Phitsanulok, 2001. - B.Sc. (Chemistry), Pibulsongkram Rajabhat University, Phitsanulok, 2004.
Scholarships	Center for Innovation in Chemistry: Postgraduate Education and Research Program in Chemistry (PERCH-CIC)
International presentation	Determination of Dimethoate and Malathion in Aqueous Solution by Single Drop Microextraction and Gas Chromatography-Flame Photometric Detection Methods, 1st Pure and Applied Chemistry International Conference (PACCON 2008), Sofitel Centara Grand Bangkok, Bangkok, Thailand, January 30-February 1, 2008.

National presentation

- Selection of Internal Standards for Ethanol Analysis in Wine by Gas Chromatography, 31st Congress on Science and Technology of Thailand at Suranaree University of Technology, October 18-20, 2005.

- Chromatographic Analysis for Detection of Constituents of Fiber Hemp, 32nd Congress on Science and Technology of Thailand at Queen Sirikit National Convention Center, October 10-12, 2006

- Optimization of Solid-Phase Microextraction for the Analysis of Some Phenolic Compounds in Aqueous Solutions, 5th PERCH-CIC Annual Scientific Congress, Jomtien Plam Beach Resort, Pattaya, Chonburi, Thailand, May 6-9, 2007.