REFERENCES

Abe, J., Mizowaki, N., Hizukuri, S., Koizumi, K., and Utamura, T. 1986. Synthesis of Branched Cyclomalto-oligosaccharides Using *Pseudomonas Isoamylase*. **Carbohydrate Research**. 154: 81-92.

Agricultural Regulatory Division, Department of Agriculturue. Thailand. 2000 (Mimeographed)

Agricultural Technology Publication Center.1990. **Pesticide**. Bangkok: Sahamitr.

Alisara Thanamiksakul. 1999. **Enhancing Dissolution of indomethacin Using β-Cyclodextrin and Sodium Lauryl Sulfate by Spray Drying Technique.** Master's thesis, Department of Industrial Pharmacy, Graduate school, Chulalongkorn University.

ARS pesticide properties .1995. [online] Available from: http://wizard.arsusda.gov /rsml/textfiles/carbaryl

Barboto, F., Rotonda, M.I., Miro, A., Morrica, P. and Quaglia, F. 2000. Inclusion Complexation of Carbaryl and β-Cyclodextrin in Solution and the Solid State. **J. of Inclus. Pheno.& Macro. Chem.** 38: 423-433.

Barrett, G.W. 1968. The Effects of an Acute Insecticide Stress on a Semi-enclosed Grassland Ecosystem. **Ecology.** 49:1019-1035.

Bavari, S. et al. 1991. Modulation of Interleukin-2 Driven Proliferation of Human Large Granular Lymphocytes by Carbaryl an Anticholinesterase insecticide. **Fund. Appl. Toxicol.** 17:61-74.

Baker, O., Uijtandaal, E.V., Boijnen, J.H., Butt, A. and Underberg, W.J.M. 1991. Cyclodextrins in Phamaceutical Field. **Drug Dev. Ind. Pharm.** 17(11): 1503-1549.

Buchanan, C., Dixon, D., Lamber, J., Offerman, R., Szejtli, J., Szente, L., and Wood, M. 2000. Preparation and Characterisation of Hydroxbutenyl Cyclodextrin for Drug Delivery, **10th International Cyclodextrin Symposium**. Michigan.USA: Ann Arbor.

Buckton, G. and Beezar, A.E. 1992. The Relationship between Particle Size and Solubility. **Int. J. Pharm.** 82: R7-R10.

Chang, R.1990. **Physical Chemistry with Application to Biological Systems**. NYC. USA:Macmillan Publishing Company.

Cranmer, M.F. 1986. Carbaryl: A Toxicological Review and Risk Analysis. **Neurotoxicology** 7(1):247-332.

Cremlyn. R.J. 1991. Agrochemicals. **Preparation and mode of action**, Chichester, U.K.: John Wiley and Sons.

Connors, K.A. 1987. **Binding Constants, The Measurement of Molecular Complex Stability.** USA: Wiley, John & Sons

Connors, K.A. 1996.Measurement of Cyclodextrin Complex Stability Constants, In: Comprehensive Supramolecular Chemistry. Vol. 3. **Cyclodextrins**. Oxford UK: Elsevier Science.

Connors, K.A. 1997. The Stability of Cyclodextrin Complex in Solution. **Chem. Rev.** 97: 1325-1357.

Dailey, O.D., Bland, J.M. and Eraskmorrell BJ. 1993. Preparation and Characterization of Cyclodextrin Complexes of the Insecticide Aldicarb and Sulprofos. **J. Agric. Food Chem.** 47:1767-1771.

Duchêne, D. and Wouessidjewe, D. 1996. Pharmaceutical and Medical Applications of Cyclodextrins. **Polysaccharides in medical Applications** ed. by Severian Dumitriu. 575 – 602.

Easton, C. and Lincoln, S. 1999. **Modified Cyclodextrin**. London, England: Imperial College Press.

Elamin, A.A., Ahlneck, C., Alderbom, G. and Nystrom, C. 1995. Increased Metastable Solubility of Milled Griseofulvin, Depending on the Formation of Disordered Surface Structure. **Int J. Pharm.** 111: 159-170.

EPA, 2000 [online] Office of pesticide programs. United States Environmental Protection Agency. Available from: http://www.epa.gov/opp00001/whatis.htm

Erden N. and Gelebi N. 1988. A Study of the Inclusion Complex of Naproxan with β-Cyclodextrin. **Internat. J. Pharmacol.** 48: 83-89.

EXTOXNET, 1996. [online] Extension Toxicology Network Pesticide Information Profiles. Available from: http://ace.orst.edu/cgi-bin/mfs/01/pips/ carbaryl. htm?8

EXTOXNET, 1996. [online] Extension Toxicology Network Pesticide Information Profiles. Available from: http://ace.orst.edu/cgi-bin/mfs/01/pips/carbendazim. htm?8

EXTOXNET, 1996. [online] Extension Toxicology Network Pesticide Information Profiles. Available from: http://ace.orst.edu/cgi-bin/mfs/01/pips/methidat. htm?8

Finney, D.J. 1971. **Probit Analysis**, 3rd edition, U.K., Cambridge Univ. Press.

Funk O., Schwabe. L. and Frömming F.H. 1993. Dissolution behaviour of Tablets with Freeze-Dried Complexes of Ketoprofen with β-cyclodextrin. **Pharmazie.** 48: 745-747.

Gay, L. and M. Ehrich. 1990. A Comparative Study of Drug Metabolizing Enzymes in Adrenal Glands and Livers of Rats and Chickens. **Int. J. Biochem**. 22 (1):15-18.

Guidance for the Reregistration of Pesticide Products containing Methidathion as the Active Ingredient. [online]. 1988. Office of Pesticides and Toxic Substances. Environmental Protection Agency. Washington, DC. Available from http://www.epa.gov

Hassan, M.A., Suleiman, MS and Najib, NM. 1990. Improvement of the In Vitro Dissolution Characteristics of Famotidine by Inclusion in β-cyclodextrin. **Int. J. Pharm.** 58: 19-24.

Higuchi T. and Connors KA. 1965. Phase Solubility Techniques. **Adv. Anal. Chem. Instrum.** 4: 117-212.

Hirayama F., Hirashima N., Abe, K., Uekama, K., Ljitsu, T. and Ueno, M. 1988. Utilization of Diethyl-β-Cyclodextrin as a Sustained-release Carrier for Isosorbride Dinitrate. **J. Pharm. Sci.** 77(3): 233-236.

http://www.carbendazim technical.html, 2000. [online]

http://www.sarawak.com, 2001. [online]

Integrated Risk Information System. 1993. **Methidathion**. National Library of Medicine. Medlars.

International Program on Chemical Safety, 2002. [online], Environmental Health Criteria 153, United Nations Environment Programme, the International Labour Organisation, and the World Health Organization. Available from: http:\\www.Carbaryl (EHC 153, 1994).htm

Jozwiakowski, M. and Connors, K. 1985. Aqueous Solubility Behaviour of Three Cyclodextrins. **Carbohydrate Research.** 143: 1067.

Jicsinszky, L. Hashimoto, H., Fenyvesi, ö., and Ueno, A. 1996. Cyclodextrin derivatives (Szejtli, J. and Osa, T. eds.) Comprehensive Supramolecular Chemistry, Vol. 3. **Cyclodextrins**. Oxford, UK: Elsevier Science

Juan M. Gines, Jose I., Perez-Martinez, Maria J. Arias, Jose R. Moyano., 1996. Inclusion of the Herbicide 2,4-Dichlorophenoxyacetic Acid (2,4-D) with β-Cyclodextrin by Different Processing Methods. **Chemophere**. 33(2): 321-334.

Kamiya M. and Nakamuru K. 1997. Cyclodextrin Inclusion Effects on Photodegradation Rates of Organophosphorus Pesticides. **Environ. Internat**. 21: 299-304.

Kidd, H. and James, D. R., Eds. **The Agrochemicals Handbook**, Third Edition. Royal Society of Chemistry Information Services, Cambridge, UK, 1991 (as updated).3-11

Larsen, K.L., Endo, T., Ueda, H. and Zimmermann, W. 1998 Inclusion Complex Formation Constant of a-, b-, g-, d-, e-, z-, h-, q-Cyclodextrin Determined with Capillary Electrophoresis. **Carbohydrate Research** 309: 153-159.

Lee, Y. and Lin, T. 1996. Capillary Electrophoretic Analysis of Cyclodextrins and Determination of Formation Constants for Inclusion Complexes. **Electrophoresis** . 17 : 333-340.

Li, S. and Purdy, W.C. 1992. **Chem. Rev.** 92:1457 cited in Szeijtli, J. 1988. **Cyclodextrin technology.** Kluwer Acadamic Publishers.

Lin, S-Y and Kao, Y-H. 1989. Solid Particulates of Drug-β-Cyclodextrin Inclusion Complexes Direct Prepared by a Spray-Drying Technique. **Int. J. Pharm.** 56: 249-259.

Lin, S.Z., Wouessidjewe, d., Poelman, M.C. and Duchene, D. 1991. Indomethacin and Cyclodextrin Complexes. **Int. J. Pharm.** 69:211-219.

Loftson, T. and Brewster, M.E. 1996. Pharmaceutical Applications of Cyclodextrins. 1. Drug Solubilization and Stabilization. **J. Pharm. Sci.** 85(10): 1017-1025.

Madsen. U. 2000. **Production and Characterisation of Modified Cyclodextrins.** Master's thesis, Department of engineering within biotechnology, University of Aalborg / University of Kansas,

Martin, A.N. 1993. **Physical Pharmacy 4th** *ed.* Lippincott Williams & Wilkins. 351 Maryland, USA: West Camden Street. Baltimore.

Morgan, D.P. 1989. **Recognition and management of pesticide poisonings.** Fourth edition.12-13. Washington, D.C.: U.S. EPA. Office of Pesticide Programs. Health Effects Division.

MSDS Reference for Crop Protection Chemicals. 1992. Fourth edition.. New York: Chemical and Pharmaceutical Press.

Murphy, C., Declune, C. and Derach, R. 1986. Effects of the Insecticidal Carbamate Derivitives (carbofuran, primicarb and aldicarb) on the Activity of Acetylcholinesterase in Tissue from Pregnant Rats and Fetuses. **Toxicol. Appl. Pharmacol.** 49: 203-208

Newsome, W.H. and Shields, J.B. 1981. A Radioimmunoassay for Benomyl and Methyl 2-benximidazolecarbarmate on Food Crops. **J. Agric. Food Chem.** 29: 220-222.

Nozawa, Y. and Yamamoto. 1989. Effects of Roll Mixing with β-Cyclodextrin on Enhancing Solubilites of Water Insoluble Drugs. **Pharm. Acta. Helv.** 64(1): 24-29.

PAN Pesticides Database: Chemical Classifications. 2001. [online] Available from: http://pesticideinfo.org/documentation3/ref_grneral3.html

Parafita, M.A. and P. Fernandez-Otero. 1984. The Interaction of Carbaryl with the Metabolism of Isolated Hepatocytes: II. Effect on Gluconeogenesis. **Gen. Pharm.** 15(4):333-337.

Pedersen, M. 2000. **Cyclodextrin Inclusion Complexes of Antimycotics.** Dr. pharm. thesis, Danish Royal School of Pharmacy, Copenhagen, Denmark.

Rajewski, R.A. and Stella, V.J. 1996. Pharmaceutical Application of CDs In Vivo Drug Delivery. **J. Pharm. Sci**. 85:1142.

Smalley, H.E. J.M. Curtis, and F.L. Earl. 1968. Teratogenic Action of Carbaryl in Beagle Dogs. **Toxicol. Appl. Pharm**. 13:392-403.

Smith, G.J. 1993. Toxicology and Pesticide Use in Relation to Wildlife: **Organophosphorous and Carbamate Compounds**. C.K. Smoley. Boca Raton, FL.

Smolkava, Y. 1980. Interaction of α- and β-CD with Several Non-Steroidal Anti-Inflammatory Drugs in Aqueous Solution. Chem. **Pharm. Bull**. 23(6): 1205-1211.

Solis, N.P., Wright, W.C., Anderson, M.M., and Phillipson, D.J. 1993. A Microwell Cytotoxicity Assay using *Artemia salina* (Brine Shrimp). **Planta med**. 59: 250-253.

Street, J.C. 1981. Pesticides and the Immune System. In Sharma, R.P. (ed.) **Immunologic considerations in toxicology**. (Volume 1). 45-66. Boca Raton, FL: CRC Press.

Szejli, J. 1982. **Cyclodextrin and their inclusion complexes.** Hungry: Akademiai Kiado, Budapest.

Szejtli, J. 1985. Cyclodextrins in Pesticides, **Starch**. 37: (11) 382-386.

Szejtli, J. 1988. Fungicidal Activity of Benomyl in Presence of β-Cyclodextrin. **In proceeding of the Fourth International Symposium on Cyclodextrins** (Huber, O. and Szejtli., J., eds.), 561-567.

Szejtli, J. 1994. Medical Application of Cyclodextrins. **Medical Research Reviews**. 14(3):353-386.

Szejtli, J. 1996. Chemistry, Physical and Biological Properties of Cyclodextrins. (Szejtli, J. and Osa, T. eds.) Comprehensive Supramolecular Chemistry. Vol. 3. **Cyclodextrins**. Oxford, UK: Elsevier Science

Szejtli, J. 1998. Introduction and General Overview of Cyclodextrin Chemistry. **Chem. Rev.** 98:1743-1753.

Szejtli, J. 2000. New Widely Applicable CD-Derivatives: The Hydroxybutenyl-CDs (Hben-α- and Hben-β-CD). **Cyclodextrin News.** 14(5): 91-95.

Szente, L. 1998. Stable, Controlled-Release Organophosphorous Pesticides Entrapped in β-Cyclodextrin: I. Solid State Characteristics. **J. Thermal. Anal.** 51: 957-963.

Szente, L. and Szejtli, J. 1999. Highly Soluble Cyclodextrin Derivatives: Chemistry, Properties, and Trends in Development. **Advanced Drug Delivery Reviews.** 36: 17-28.

Teijin Ltd. 1974. **Jpn. Kokai.** 50, 058, 226. cited in Szeijtli, J. 1988. **Cyclodextrin technology.** (351): Kluwer Acadamic Publishers.

Uekama, K., Udo, K., Irie, T., Yoshida, a. and Otagiri, M. 1987. Improvement of Dissolution and Absorption Characteristies of Idomethacin by Water-Soluble α-Cyclodextrin-Epichlorohydrin Polymer. **Acta. Pharm. Sci.** 24:27-36

U.S. Dept. of Health and Human Services. 1991. **Registry of toxic effects of chemical substances**. Public Health Service. National Institute for Occupational Safety and Health Microfiche edition. (January.)

Van Holde, K., Johnson, W.C., and Ho, P.S., 1998. **Principles of Physical Biochemistry**. New Jersey, USA: Prentice-Hall Inc., Upper Saddle River.

Wauchope, G., Gallo, M.A. and N.J. Lawryk. 1992. **The Agrochemicals Handbook.** Cambridge, England: The Royal Society of Chemistry.

Yamamoto, I., Usui, T., Suzuki, Y., and Katsuda, Y. 1976. Preparation, Stabilization and Insecticidal Activity of Cyclodextrin-inclusion Complexes of Pyrethroids, Nihon Noyaku Gakkaishi. **J. Pestic. Sci.** 1: 41-48

Yamamoto, I. and Katsuda, Y. 1980. **Pestic. Sci.** 11:134 cited in Szeijtli, J. 1988. **Cyclodextrin technology.** (351): Kluwer Acadamic Publishers.

Yamamoto, M., Yoshida, A., Hirayama, F., and Uekama, K. 1989. Some Physicochemical Properties of Branched β-CD and Their Inclusion Characteristics. **Int. J. Pharm.** 49: 163-171.

# APPENDICES

APPENDIX 1: The UV spectrum of pesticides and pesticide-βCD complexes
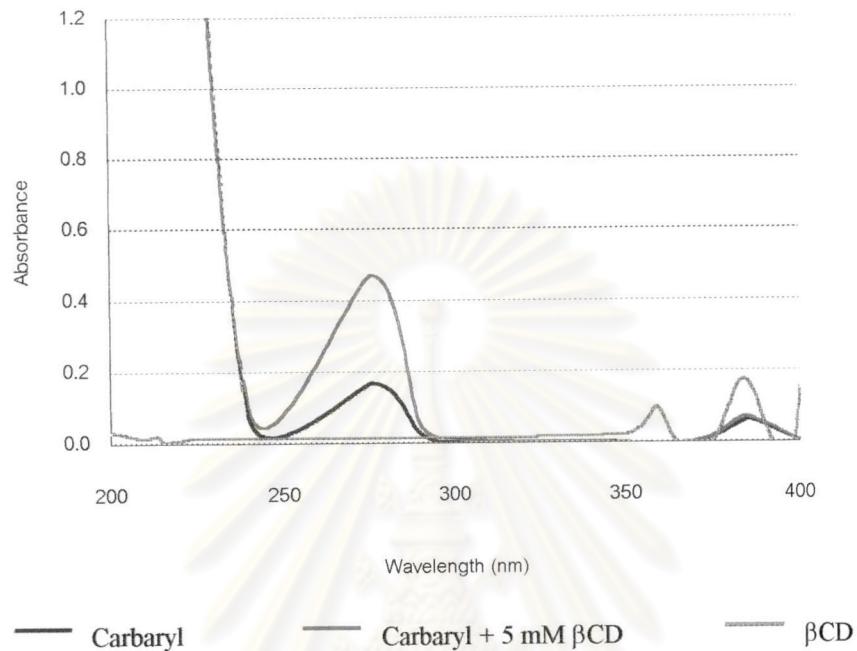
Figure 25. UV spectra of Carbaryl and Carbaryl in 5 mM βCD solution
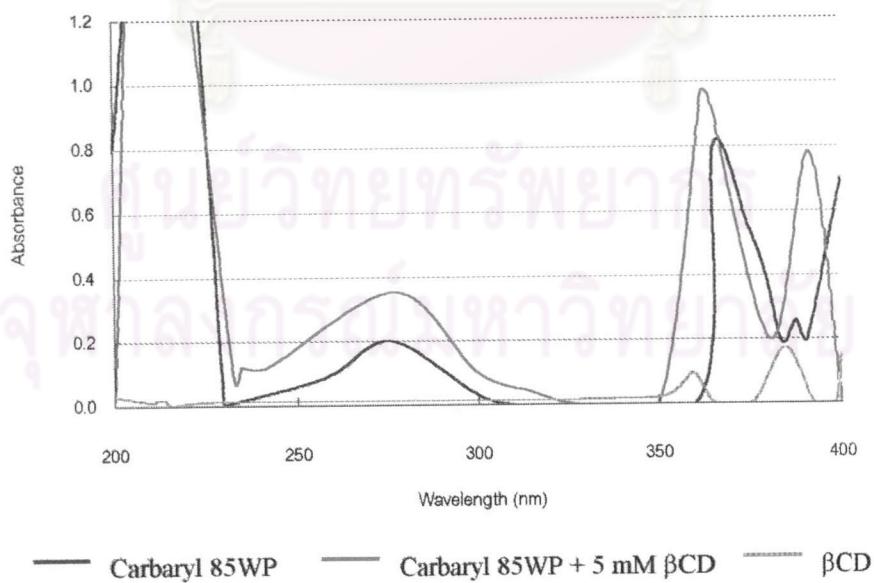
Figure 26. UV spectra of Carbaryl 85WP and Carbaryl 85WP in 5 mM βCD solution
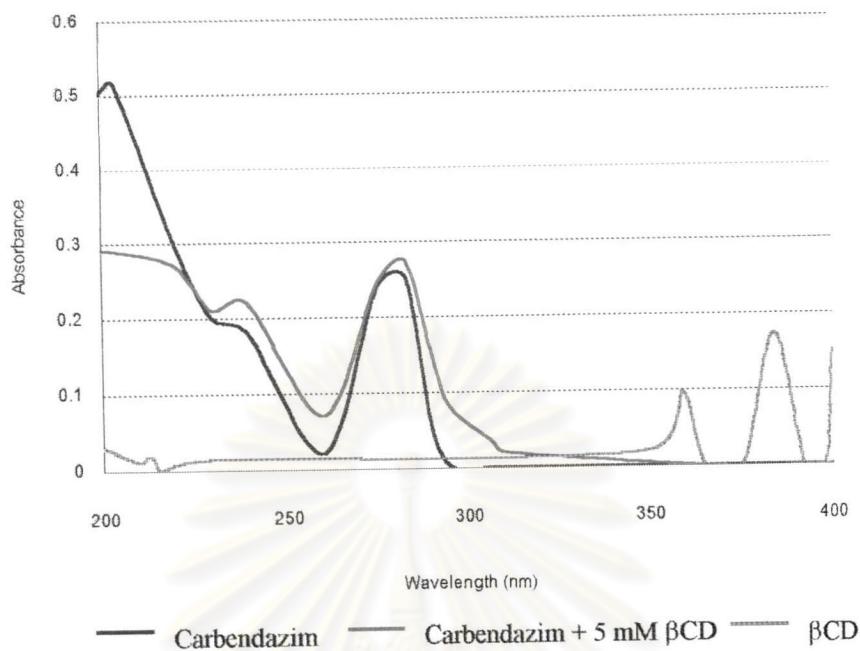
**Figure 27. UV spectra of Carbendazim and Carbendazim in 5 mM βCD solution**
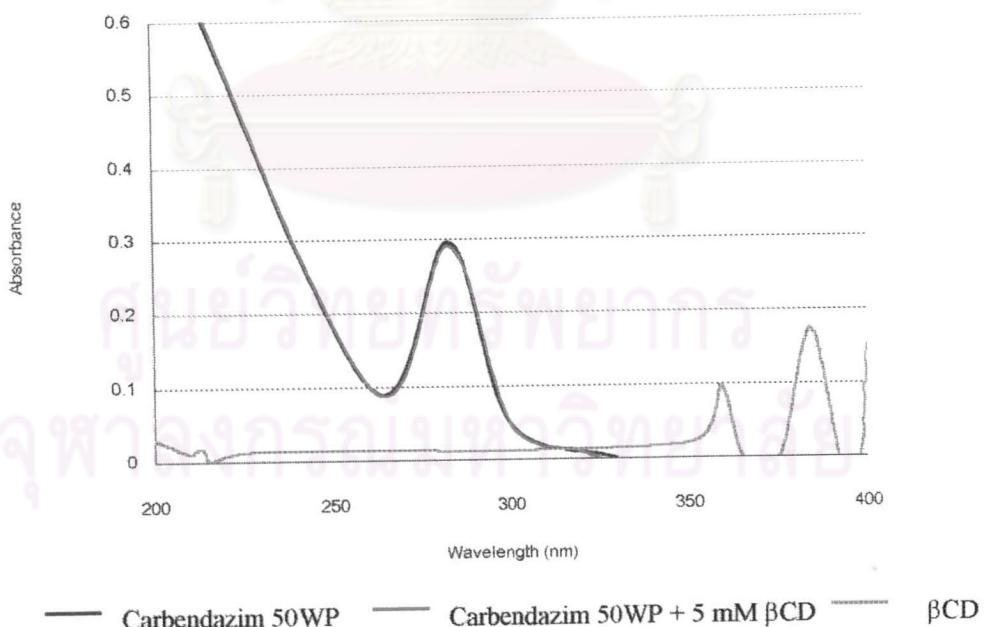
Figure 28. UV spectra of Carbendazim 50WP and Carbendazim 50WP in 5 mM βCD solution
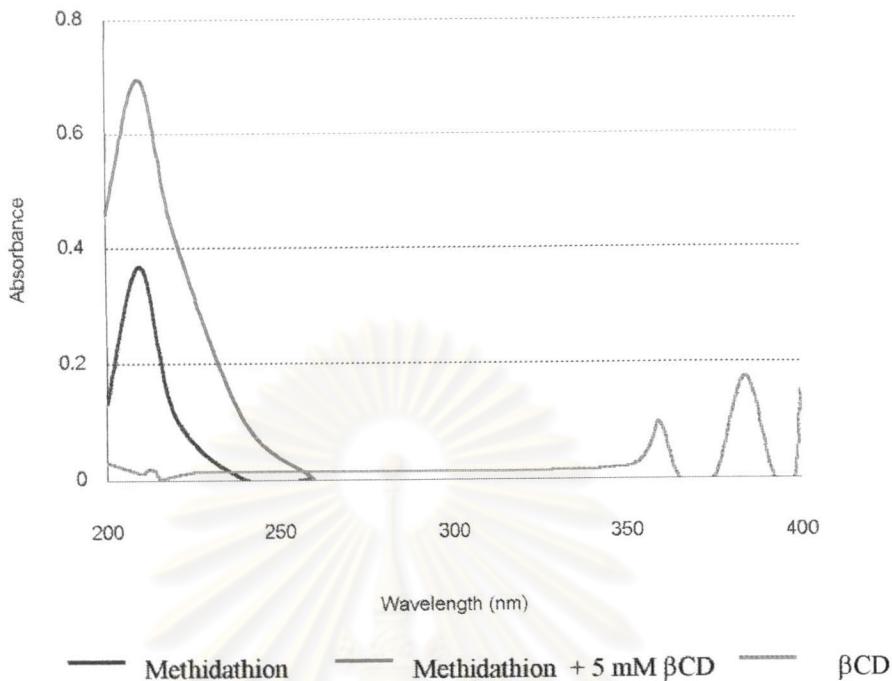
Figure 29. UV spectra of Methidathion and Methidathion in 5 mM βCD solution

APPENDIX 2 : Calibration curve of pesticides
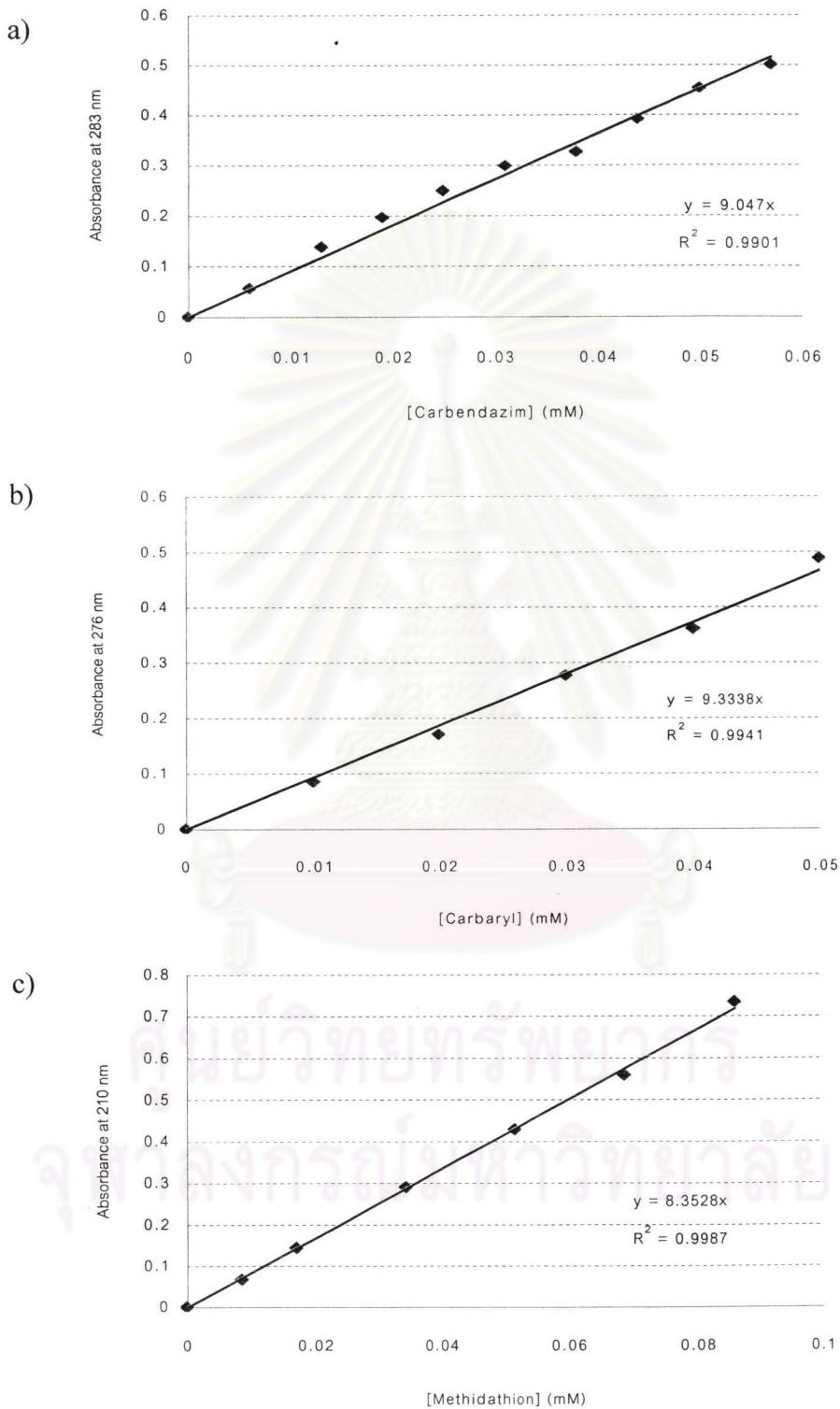
Figure 30. Standard curve: a) Carbendazim, b) Carbaryl, c) Methidathion

APPENDIX 3 : Carbaryl information profiles *(Extoxnet, 1996)*

Trade and Other Names : Product names include Adios, Bugmaster, Carbamec, Carbamine, Crunch, Denapon, Dicarbam, Hexavin, Karbaspray, Nac, Rayvon, Septene, Servin, Tercyl, Tornadao, Thinsec, Tricarnam and Union Carbide 7744.

Regulatory Status : Carbaryl is a General Use Pesticide (GUP). However, various formulations vary widely in toxicity. For example, it is categorized as toxicity class I-highly toxic for Tercyl; toxicity class II-moderately toxic for Servin 803; and toxicity class III-slightly toxic for some other products. Products containing carbaryl may bear the Signal Word DANGER-POISON, Warning, or CAUTION depending on the product formulation.

Chemical Class : Carbamate

Chemical Use : Insecticide

Formulation : It is available as bait, dusts, wettable powders, granules, dispersions and suspensions.

Acute oral LD50 : 255 mg/kg in rat.

Physical Properties : (Kidd and James, 1991)

- **Appearance** : Carbaryl is a solid that varies from colorless to white or grey, depending on the purity of the compound. The crystals are odorless. Carbaryl is stable to heat, light and acids. It is not stable under alkaline conditions. It is noncorrosive to metals, packaging materials and application equipment.

- **Chemical name** : 1-napthyl methyl carbamate

- **CAS Number** : 63-25-2

- **Molecular weight** : 201.23

- **Melting point** : 142°C

- **Water solubility** : 40 mg/L at 30°C

- **Solubility in Other Solvents**: very soluble in dimethylformaldehyde and dimethyl sulfoxide ; soluble in acetone and cyclohexanone

- **Relative density (water = 1)** : 1.2

- **Vapor Pressure** : <5.3 mPa at 25°C

- **Octanol/water partition coefficient as log Pow** : 2.34

- **Adsorption Coefficient**: 300

APPENDIX 4 : Carbendazim information profiles (Extoxnet, 1996)

Trade and Other Names : Commercial names for products containing carbendazim include Agrocit, Benex, Benlate, Benosan, Fundazol, Fungidice 1991, and Tersan 1991. Carbendazim is compatible with many other pesticides.

Regulatory Status : Carbendazim is a General Use Pesticide (GUP). The EPA categorizes it as toxicity class IV - practically nontoxic. Carbendazim-containing products carry the Signal Word CAUTION.

Chemical Class : benzimidazole

Chemical Use : Fungicide

Formulation : Formulations include wettable powder, dry flowable powder, and dispersible granules.

Acute oral LD50 : 10,000 mg/kg in rat.

Physical Properties : (http://www.inchem.org/documents/hsg/hsg/hsg82_e.htm)

- **Appearance** : Colorless crystals or gray to white powder with little or no odor.

- **Chemical name** : Methyl (1H-benzimidazol-2-yl)carbamate

- **CAS Number** : 10605-21-7

- **Molecular weight** : 191.2

- **Melting point** : 250°C

- **Water solubility** : 8.0 mg/L at 25°C

- **Solubility in Other Solvents**: soluble in chloroform, heptane, ethanol and acetone.

- **Relative density (water = 1)** : 0.27

- **Vapor Pressure** : <1 x 10^{-7} Pa at 20°C

- **Octanol/water partition coefficient as log Pow** : 1.49

APPENDIX 5 : Methidathion information profiles *(Extoxnet, 1996)*

Trade and Other Names : Trade names for products containing methidathion include Somonic, Somonil, Supracide, Suprathion and Ultracide. The compound may be found in formulations with many other pesticides.

Regulatory Status : Mehidathion is highly toxic compound in EPA toxicity class I. Labels for products containing it must bear the Signal Word DANGER.

Chemical Class : Organophosphate

Formulation : It is available in emulsifiable concentrate, wettable powder, and ultra-low volume (ULV) liquid formulations.

Oral LD50 : between 25 mg/kg and 54 mg/kg in rat.

Physical Properties : (Kidd and James, 1991 and Wauchope *et. al.*, 1992)

- **Appearance** : Methidathion is a colorless crystalline compound at room temperature.

- **Chemical name** : S-2,3-dihydro-5-methoxy-2-oxo-1,3,4-thiadiazol-3-ylmethyl O,O-dimethylphosphorodithioate

- **Molecular Formula**: $C_6H_{11}N_2O_4PS_3$

- **CAS Number** : 950-37-8

- **Chemical class**: Organophosphate, thiadiazole

- **Chemical Use**: Insecticide and acaricide

- **Molecular weight** : 302.23

- **Melting point** : 39-40°C

- **Water solubility** : 240 mg/L at 20°C

- **Solubility in Other Solvents** : 53 g/kg (octanol), 260 g/kg (ethanol), 600 g/kg (xylene), 690 g/kg (acetone), 850 g/kg (cyclohexane)

- **Vapor Pressure : 186 mPa at 20°C**

- **Partition Coefficient** : 4.7243

- **Adsorption Coefficient** : 400 (estimated)

APPENDIX 6: HPLC chromatogram and standard curve of carbaryl
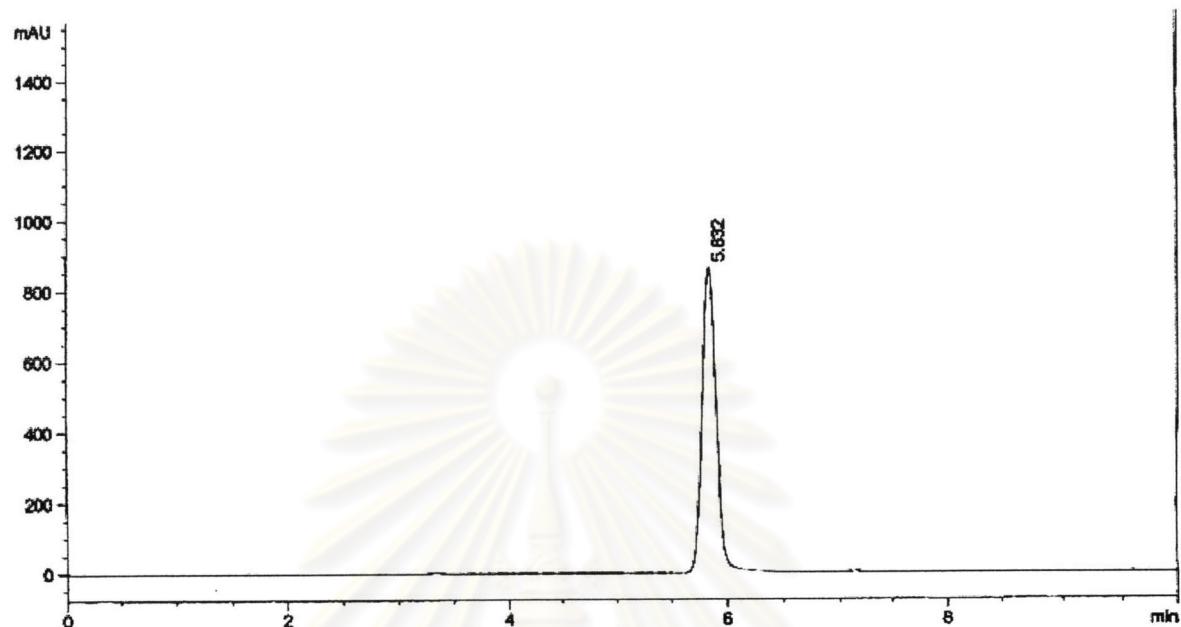
Figure 31. HPLC chromatogram of standard carbaryl at 28 mg/ml

Wavelength = 278 nm

peak	RT [min]	Area [mAU*S]	Height [mAU]	Area %
1	5.832	7568.28	866.29	100.00
Total :		7568.28	866.29	
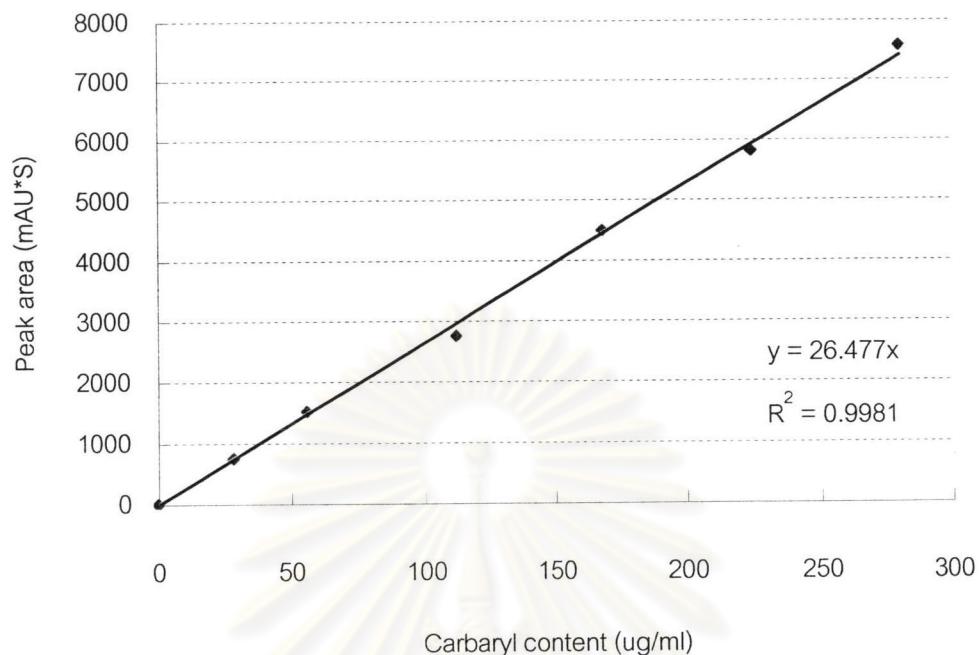
Figure 32. Standard curve of carbaryl

Standard carbaryl equation: Y̶   = 26.477X

Slope   = 26.477

When Y represents peak area (mAU*S) and

X represents carbaryl concentration (µg/ml)

APPENDIX 7: Calculation of carbaryl content in carbaryl 85WP
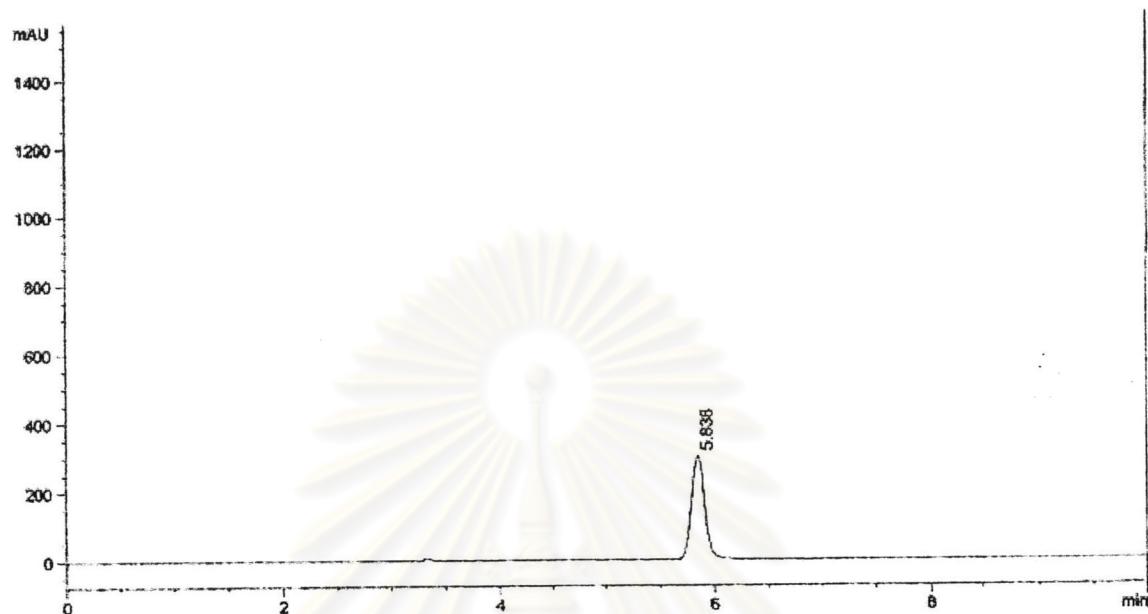
Figure 33. HPLC chromatogram of carbaryl 85WP at 23 mg/ml

Wavelength = 276 nm

peak	RT [min]	Area [mAU*S]	Height [mAU]	Area %
1	5.838	2557.90	300.99	100.00
Total :		28.513	300.99	

From standard carbaryl equation   Y   = 26.477 X

      Carbaryl concentration   X   = 2557.90/26.477

                                            = 96.61 μg/ml

Carbaryl 85WP was prepared from carbaryl 85WP 0.0023 g dissolved in 10 ml acetonitrile which was equal to 230 μg/ml

Thus carbaryl 85WP 230 μg had carbaryl content   = 96.61 μg

Finally, Percent carbaryl content in carbaryl 85WP = $\dfrac{96.61 \times 100}{230}$

                                                      = 42 %

APPENDIX 8: Amount of carbaryl 85WP dissolved from the free or complex form after 15 minutes of dissolution.

Method of preparation	Amount of carbaryl 85WP dissolved (mg/l)				
	Free carbaryl	Carbaryl 85WP-methyl-βCD			(carbaryl 85WP-dextrin)
		1:1	1:2	2:1	
kneaded	66.17	88.3 (7.84)	85.80 (5.27)	94.2 (6.08)	79.59 (11.88)
Freeze-dried, prepared at					
20°C*	66.17	89.96 (5.24)	75.39 (5.68)	92.81 (4.32)	75.22 (4.25)
30°C*	66.17	78.11 (7.56)	67.27 (1.22)	83.82 (2.58)	82.25 (1.71)
40°C*	66.17	134.06 (1.91)	100.70 (5.64)	149.56 (0.73)	95.94 (3.15)
50°C*	66.17	118.28 (1.57)	132.93 (2.49)	140.49 (0.68)	103.60 (2.14)
60°C*	66.17	154.11 (0.49)	130.20 (0.54)	100.10 (0.67)	112.99 (0.62)

* = Temperature used to prepare complex before freeze-dried process.

( ) = standard deviation, Each figure represents the average value from three determinations at given sampling time.

APPENDIX 9 : Probit analysis of LC_{50} of free carbaryl 85WP

DATA Information

    4 unweighted cases accepted.

    0 cases rejected because of missing data.

    1 case is in the control group.

MODEL Information

    ONLY Normal Sigmoid is requested.

Parameter estimates converged after 12 iterations. Optimal solution found.

Parameter Estimates (PROBIT model: (PROBIT(p)) = Intercept + BX):

Regression Coeff.	Standard Error	Coeff./S.E.
0.36257	0.03737	9.70194
Intercept	Standard Error	Intercept/S.E.
-1.62612	0.17399	-9.34621

Pearson Goodness-of-Fit Chi Square =   .387 DF = 2 P = .824

    Since Goodness-of-Fit Chi square is NOT significant, no heterogeneity factor is used in the calculation of confidence limits.

Dose	Total	Killed			probit
(mg/l)	treated	observed	expected	residual	
10	62.0	61.0	60.588	.412	.97723
5	60.0	33.0	34.444	-1.444	.57406
1	60.0	7.0	6.192	.808	.10320
0	60.0	3.0	3.118	-.118	.05196

* * * * * * * * * * * * P R O B I T   A N A L Y S I S * * * * * * * * * * * *

Confidence Limits for Effective VAR00001

	95% Confidence Limits		
Probit	LC value	Lower	Upper
.01	-1.93129	-3.47869	-.85271
.02	-1.17944	-2.55725	-.20646
.03	-.70241	-1.97554	.20648
.04	-.34356	-1.53985	.51903
.05	-.05166	-1.18690	.77471
.06	.19679	-.88766	.99352
.07	.41463	-.62631	1.18639
.08	.60968	-.39321	1.35998
.09	.78707	-.18203	1.51868
.10	.95036	.01161	1.66552
.15	1.62642	.80411	2.28267
.20	2.16373	1.42069	2.78643
.25	2.62469	1.93768	3.23060
.30	3.03866	2.39081	3.64062
.35	3.42225	2.80026	4.03100
.40	3.78625	3.17905	4.41118
.45	4.13842	3.53653	4.78801
.50*	**4.48500**	**3.88009**	**5.16712**
.55	4.83159	4.21610	5.55377
.60	5.18376	4.55066	5.95352
.65	5.54775	4.89012	6.37302
.70	5.93135	5.24199	6.82099
.75	6.34531	5.61610	7.31003
.80	6.80628	6.02715	7.86013
.85	7.34359	6.50049	8.50714
.90	8.01965	7.08935	9.32793
.91	8.18293	7.23069	9.52706
.92	8.36033	7.38390	9.74373
.93	8.55538	7.55199	9.98234
.94	8.77322	7.73930	10.24925
.95	9.02167	7.95245	10.55415
.96	9.31356	8.20227	10.91296
.97	9.67241	8.50861	11.35486
.98	10.14944	8.91469	11.94343
.99	10.90130	9.55256	12.87325

APPENDIX 10 : Probit analysis of 2:1 molar ratio of carbaryl 85WP-methyl-βCD complex

DATA Information

4 unweighted cases accepted.

0 cases rejected because of missing data.

1 case is in the control group.

MODEL Information

ONLY Normal Sigmoid is requested.

Parameter estimates converged after 12 iterations. Optimal solution found.

Parameter Estimates (PROBIT model: (PROBIT(p)) = Intercept + BX):

Regression Coeff.	Standard Error	Coeff./S.E.
0.34908	0.03437	10.15602
Intercept	Standard Error	Intercept/S.E.
-1.76532	0.18161	-9.72011

Pearson Goodness-of-Fit Chi Square = .157 DF = 2 P = .925

Since Goodness-of-Fit Chi square is NOT significant, no heterogeneity factor is used in the calculation of confidence limits.

Dose	Total	Killed			probit
(mg/l)	treated	observed	expected	residual	
10	10.00	63.0	60.340	-.340	.95778
5	57.0	29.0	28.047	.953	.49206
1	64.0	5.0	5.015	-.015	.07835
0	60.0	2.0	2.325	-0.325	.03876

* * * * * * * * * * * P R O B I T   A N A L Y S I S * * * * * * * * * * * *

Confidence Limits for Effective VAR00001

	95% Confidence Limits		
Probit	LC value	Lower	Upper
.01	-1.60717	-3.15130	-.50863
.02	-.82626	-2.20586	.16816
.03	-.33080	-1.60905	.60060
.04	.04191	-1.16205	.92787
.05	.34509	-.79993	1.19556
.06	.60314	-.49292	1.42461
.07	.82939	-.22475	1.62647
.08	1.03198	.01445	1.80811
.09	1.21623	.23118	1.97413
.10	1.38583	.42992	2.12770
.15	2.08801	1.24375	2.77258
.20	2.64608	1.87770	3.29795
.25	3.12486	2.41018	3.76006
.30	3.55481	2.87789	4.18553
.35	3.95323	3.30154	4.58954
.40	4.33129	3.69446	4.98200
.45	4.69707	4.06617	5.37014
.50 *	**5.05705**	**4.42418**	**5.75993**
.55	5.41702	4.77498	6.15694
.60	5.78280	5.12477	6.56701
.65	6.16086	5.48009	6.99706
.70	6.55928	5.84866	7.45615
.75	6.98924	6.24074	7.95725
.80	7.46801	6.67164	8.52095
.85	8.02608	7.16788	9.18403
.90	8.72827	7.78519	10.02541
.91	8.89786	7.93334	10.22958
.92	9.08211	8.09393	10.45173
.93	9.28470	8.27011	10.69640
.94	9.51096	8.46643	10.97011
.95	9.76901	8.68980	11.28280
.96	10.07218	8.95159	11.65082
.97	10.44490	9.27258	12.10410
.98	10.94035	9.69804	12.70789
.99	11.72126	10.36626	13.66190

BIOGRAPHY

Miss Ruedeekan Saikosin was born on August 12, 1977, at Bangkok province. In 1998, she graduated with the Bachelor degree of Science (Biotechnology) from King Mongkut's Institute of Technology Ladkrabang with GPAX 2.98. She continued to study the master degree in Biotechnology Program at Chulalongkorn University in 1999.