REFERENCES

Abreu Jr A., Zanetti S.M., Oliveira M.A.S., Thim G.P. 2005. Effect of urea on lead zirconatetitanate – Pb (Zr_{0.52}Ti_{0.48})O₃ Nanopowders synthesized by the Pechini method. J. of the Euro. Ceram Soc. 25:743-748.

Abreu MT, Sparrow MP. 2007. The role of translation and research in inflammatory bowel disease. Rev Gastroenteral Mex 72: 146-53.

Advantages of niosomes. 2010.[Online]. Available http://www.pharmainfo.net/Reviews/niosome-unique-drug-delivery-system; Surender, V. et al., 2010 [2010, September 1].

Akiyama, D., M.Okazaki ., K .Hirabayashi. 1993. Sericin protein. J. Seric Sci Jpn. 62: 392-396

Alicia Ortiz Moreno, Dorantes L., Galíndez J., Guzmán R.I. 2003. Effect of different extraction method on fatty acid, volatile compounds and physical and chemical properties of avocado (Persea Americana Mill.) oil. J. Of Agric. and Food chem.51:2216-2221.

Anti-cellulite cream gel O-001 4 2006. [Online]. Available. www.noveon.com [2006, December.17]

Aparicio R., Roda L., Albi M A., Gutierrez F. 1999. Effect of various compounds on virgin olive oil stability measured by Rancimat. J. Agric Food Chem.47:4150 -4155.

Ashawat, M.S., Saraf, S., Saraf, S. 2006. Sunscreen properties of natural skin care lotion. Plant Arch. 6,253–256.

Aramwit P., Damrongsakkul S., Kanokpanont S., Srichana T. 2010. Properties and antityrosinase activity of sericin from various extraction methods. Biotechnology and Applied Biochemistry 55:91-98.

Arouri A., Dathe M., Blume A. 2009. Peptide induced demixing in PG/PE lipid mixtures: A mechanism for the specificity of antimicrobial peptides towards bacterial membranes. BBA - Biomembranes, 1788(3): 650-659.

Autthum T., Kunhasut, W., Areekul, S. 1996. Different kinds of feed plant for feeding wild silkworms. Research and Development Center, Kasetsart University, Bangkok. 15-25.

Axtell B. L. 1992. *Jatropha curcas*, Minor oil crops. The Chief Editor, FAO Agricultural Services Bulletin No.94, Italy.

Azmin, M.N., Florence, A.T., Handjani-Vila, R.-M., Stuart, J.F.B., Vanlerberghe, G. Whittaker, J.S. 1985. The effect of non-ionic surfactant vesicle (niosome) entrapment on the absorption and distribution of methotrexate in mice. J. Pharm. Pharmacol. 37, 237–242

AOCS. 1983. Official and Tentative Method; Link, W.F., Ed.; American Oil Chemist's Society: Champaign, IL.Vol.1 and 2.

AOCS. 1995. Official Methods and Recommended Practices of the American Oil Chemists' Society, 4th Ed., (D. Firestone, ed.) American Oil Chemists'

Bangham A.D., Standish M.M., Walkins J.C. 1965. Diffusion of univalent ions across the lamellar of swollen phospholipids. J Mol Biol. 13: 238-252.

Barriocanal L., Taylor K.M., Buckton G.A. 2004. Study of liposome formation using a solution (isoperibol) calorimeter. Int J Pharm. 287(1-2):113-21.

Barbosa-Barros L., Barba C., Cócera M., Coderch L., López-Iglesias C., de la Maza A.,López O. 2008. Effect of bicellar systems on skin properties. Int J Pharm. 52(1-2): 263-272.

Baillie A.J., Florence A.T., Hume L.R, Rogerson A., Muirhead G.T. 1985. The preparation and properties of niosomes-non-ionic surfactant vesicles. J. Pharm Pharmacol 37(12):863–868.

Bazin R., Fanchon C. 2006. Equivalence of face and volar forearm for the testing of moisturizing and firming effect of cosmetics in hydration and biomechanical studies. Int J Cosmet Sci. 28: 453-460.

Banks W., Muir D.D., 1985. Effect of alcohol content on emulsion stability of cream liqueurs. Food Chem. 18:139-141.

Barton S.P, Black D.R. 1998. Surface contour: Variability, significance and measurements. In: Marks R, Barton SP, Edwards C, eds. The physical nature of skin. Lancaster, England: MTP Press, 23-30.

Beauty without cruelty. 2006. Silk [Online]. September, 2006. Available from: URL: http://www.bwcindia.org/learn_about/learn_about.htm.

Berardesca, E., Borroni, G. 1995. Instrumental evaluation of cutaneous hydration. Clin in Dermatol.13: 323-327.

Becker MA, Willman P, Tuross NC. 1995. The US first ladies gowns: A biochemical study of silk preservation. J. of the Amer Inst for Conser. 34: 141–152.

Boonlerd D. 1994. Applying the silk chrysalis as protein source to replace the fish meal in cockerel and layer foods. Master's Degree Thesis. Kasetsart University.

Borror, D.J., C.A. Triplehorn, Johnson N.F. 1989. An introduction to the study of Insects. Sixth edition. Saunders College Publishing, Philadelphia.

Boontawan A, 1994. Special problem report: consumable silk worm oil. Department of Food Sciences and Technologies, Faculty of Agricultural Industry, Chiang Mai University.

Boonman, S. 2000. Thai silk worm varieties. *In* Proceeding of the workshop on polyvoltine sericulture and postharvest technology., by Tsubouchi, K., Ragsang, V., and Chaosattakul,P. (eds). 21st November 2000, Nakhon Ratchasima Sericultural Research Center, Nakhon Ratchasima, Thailand.

Breimer D.D.,Speiser R. Topics in pharmaceutical Sciences. 5 Elsevier Science Publishers, New York, USA. 1985.

Bredeson D. 1983. Mechanical oil extraction. J. of the Amer Oil Chem Soc. 60:211-213.

Brown S, Diffey BL, 1986. The effect of applied thickness on sunscreen protection: In vivo and in vitro studies. Photochem Photobiol. 44: 509-513.

Cable C. 1989. An examination of the effects of surface modifications on the physicochemical and biological properties of non-ionic surfactant vesicles PhD thesis. Glasgow: University of Strathclyde,

Cao G., Alessio H.M., Cutler R.G. 1993. Oxygen-radical absorbance capacity assay for antioxidants. Free Radic Biol Med. 14: 303-311.

Casper P.J., Lucassen G.W., Puppels G.J. 2003. Combined *in vivo* confocal raman spectroscopy and confocal microscopy of human skin. Biophys J. 85: 572-580.

Chauhan S., Luorence M.J. 1989. The preparation of polyoxyethylene containing non-ionic surfactant. vesicles. J. Pharm. Pharmacol.41-46.

Chaiya Ui-soongnern, 1996. Department of Agriculture, Ministry of Agriculture and Cooperatives, Bangkok.

Chandraprakash K.S., Udupa N., Umadevi P. and Pillai G.K. 1990. Pharmacokinetic evaluation of surfactant vesicles containing methotrexate in tumor bearing mice. Int. J. Pharma.R1-R3: 61.

Chattopadhyay P., Gupta R.B. 2002. Protein nanoparticles formation by supercritical antisolvent with enhanced mass transfer. AIChE J. 48: 235-244.

Chen, X., Chen X, Knight DP, Shao Z, Vollrath F. 2001. Regenerated *Bombyx* silk solutions studied with rheometry and FTIR. Polymer. 42, 9969-9974

Chen W.Q., Priewalder H., Pradeep John J.P., Lubec G. 2010. Silk cocoon of *Bombyx mori*: proteins and posttranslational modifications heavy phosphorylation and evidence for lysine-mediated cross links. Proteomics. 10:369-379.

Chen, Hua., Zhu, Liang-Jun., Min, Si-Jia., Hu, Guo-Liang. 2001. Structure, properties and utilization of silk sericin. protein. Peop. Rep. China. 14(3):344-348 pp. (Abstract).

Cholesterol.2010. [Online]. Available. http://www.serva.de. [2010, Frbruary 12].

Chrit L., Bastien P., Biatry B., Simonnet J.T., Potter A., Minondo A.M., Flament F., Bazin R., Sockalingum G.D., Leroy F., Manfait M., Hadjur C. 2007. *In vitro* and *in vivo* confocal raman study of human skin hydration: assessment of a new moisturizing agent, pMPC. Biopolymers. 85(4): 359-369.

Composition of fibroin.2009. [Online]. Available http://www.smiss.com.cn/smissenglish/silk%20derivatives/silkraw.asp [2009, October 28].

Chompreeda P. and Rimkhiri H., 2002. Consumer test and sensory evaluation test. deparmement of product development Faculty of agro industry Kasetsart university

Cooper D.R., Schindler P.S. 1998. Business Research Methods. 6th ed., Irwin McGraw-Hill, Singapore.

Crommelin D.J.A., Schreier H. 1994. Liposomes in colloidal drug delivery systems. In: Kreuter J., eds. Marcel Dekker Inc, New York. . 66: 119.

David W.L. Ma, Antoni A. Wierzbicki, Catherine J. Field., Michael T. Clandinin. 1999. Preparation of conjugated linoleic acid from safflower oil. J. of the Amer Oil Chem Society 76:729-730.

3D Structure of β-form of fibroin in silk. 2007 [Online]. Available http://www.biochem.usyd.edu.au [2007, October 2].

Department of Agriculture. 2000. Documents to the meeting of research result presentations of the sericulture institute Vol. 2, Department of Agriculture, Ministry of Agriculture and Cooperatives; p. 114-134.

Dobrev H. 2005. Application of cutometer area parameters for the study of human skin fatigue. Skin Research and Technology 11:120-122.

Di Lullo, Gloria A.; Sweeney, Shawn M.; Körkkö, Jarmo; Ala-Kokko, Leena; San Antonio, James D. 2002. Mapping the ligand-binding sites and disease-associated mutations on the most abundant Protein in the human, Type I Collagen. J. Biol. Chem. 277 (6): 4223–4231.

Doneanu, C., V., Radulescu, D.M., Efstatiade, V. Rusu., A.Covaci. 1997. Capillary GC/MS/ characterization of fatty acid from indigenous silkworm oil. J. Microcolumn.Sep. 9 (1); 37-41.

Don A. Van H., Joke A.B., Hans E.1997. Non ionic surfactant vesicles containing estradiol for topical application. Ph.D. thesis. Centre for drug research. 330-339.

Draize J.H. 1959. Dermal toxicity in appraisal of the safety of chemicals in food, drugs and cosmetics. The Association of Food and Drug Officials of the United States, Bureau of Food and Drugs, Austin, TX. 46-59.

El Maghraby G.M., Williams A.C., Barry B.W. 2000b. Skin delivery of oestradiol from lipid vesicles: importance of liposome structure. Int J Pharm. 204: 159-69.

Engel W, Hoppe U. 1987. Aqueous hair preparations containing sericin and pelargonic acids. Ger Offen DE 3603595 A1. p. 4.

Eiichi, K 2002. Lipid profiles and oxidative stability of silkworm pupal oil. J. Oleo Science. 51(11): 681-690.

Elmahjoubi E., Frum Y., Eccleston G.M., Wilkinson S.C., Meidan V.M. 2009. Transepidermal water loss for probing full-thickness skin barrier function: Correlation with titrated water flux, sensitivity to punctures and diverse surfactant exposures. Toxicol. In Vitro. 23: 1429-1435.

Elizabeth H, Monica G, Joel S, Michael V. .2004. Ultrasound enhancement of drug release across non ionic surfactant vesicle membranes. Proceedings of the 26th. September 1-5, Annual International Conference of the IEEE EMBS San Francisco, CA, USA

Elias P.M. 1983. Epidermal lipids, barrier function, and desquamation. J Invest Dermatol. 80: 44S-49S.

Epler S., Iv E.C., Kemp K.E. 1998. Hedonic scales are a better redictor than just-about right scales of optimal sweetness in lemonade1.J.of Sensor Stud 13:191-197.

Eyres L, Sherpa N., Hendriks G. 2010. Avocado oil: a new edible oil from Australasia.

European Union Commission. Off. 1992. J. Commission Eur.Communities. Regulation no.1429/92.

Ezure T., Hosoi J., Amano S., Tsuchiya T. 2009. Sagging of the cheek is related to skin elasticity, fat mass and mimetic muscle function. Skin Research and Technology 15:299-305

Fan JB, Wu LP, Chen LS, Mao XY, Ren FZ. 2009. Antioxidant activity of silk sericin from silkworm *Bombyx mori*. J Food Biochem 33: 74–78.

Farhoosh R. 2007. The effect of operational parameters of the rancimat method on the determination of the oxidative stability measures and shelf-life prediction of soybean oil. JAOCS, Journal of the American Oil Chemists' Society 84:205-209.

Feitosa E., Barreleiro P.C.A., Olofsson G. 2000. Phase transition in dioctadecyldi methyl-ammonium bromide and chloride vesicles prepared by different methods. Chem Phys Lipids. 105(2): 201-213.

Freddi G., Bianchi Svilokos A., Ishikawa H., Tsukada M. 1993. Chemical composition and physical properties of *Gonometa rufobrunnae* silk. J. of App Polym Sci. 48:99-106

Firming cream gel. 2006. [Online]. Available.www.arch.com.[2006, December.15]

Firm up firming cream ST-50. 2005. [Online]. Available. www.arch.com. [2005, December.12]

Firming and moisturizing care. 2006. [Online]. Available. www.seppic.com, [2006, December.12]

Fiedler M, Meier W-D, Hoppe U. 1999. Texture analysis of the surface of the human skin. Skin Pharmacol. 8: 252-265.

Fong S, Hung L, Cheng J. 1997. The cutometer and ultrasonography in the assessment of postburn hypertrophic scar: a preliminary study. Burns. 23(1):S12–18

Grit M., Crommelin D.J.A. 1993. The effect of surface charge on the hydrolysis kinetics of partially hydrogenated egg phosphatidyl choline and egg phosphatidyl glycerol in aqueous liposome dispersion. Biochem Biophys Acta. 1167: 49-55.

Gulrajani, ML. Arora, S., Aggarwal, S. 1997. Degummase treatment of spun silk fabric. India J. of Fiber and Text Res. Vol.22 (2), 119 -123.

Gayatri D.S., Venkatesh P., Udupa N. 2000. Niosomal sumatriptan succinate for nasal administration. Int. J. Pharm. Sci. 62(6), 479-481.

Groskery P., Iype, C. 1999. Yarn production; theoretical Aspects. The Textile Institute International: South Carolina. 205.

Garthright W.E., Blodgett R.J. 2003. FDA's preferred MPN methods for standard, large or unusual tests, with a spreadsheet. Food Microbiol. 20: 439-445.

Gacula M.C., Washam R.W., Beard S.A., Heinze J.E. 1986. Estimates of carry-over effects in two-product home usage consumer test. J. of Sens Stud.1:47-53.

Gil E.S., Frankowski D.J., Bowman M.K., Gozen A.O., Hudson S.M., Spontak R.J. 2006. Mixed protein blends composed of gelatin and *Bombyx mori* silk fibroin: effects of solvent-induced crystallization and composition. Biomacromolecules 7:728-735.

Hamada Y, Yamashita O, Suzuki Y. 1982. Haemolymph control of sericin gene expression studied by organ transplantion. Cell Differentiation. 20: 65–76.

Handjani V.R.M., Ribier A., Rondot B., Vanlerberghe G. 1979. Dispersions of lamellar phases of non-ionic lipids in cosmetic products. Int. J. Cosmetic Sci. 1:303–314.

Hashmi F., Malone-Lee J. 2007. Measurement of skin elasticity on the foot. Skin Research and Technology 13:252-258.

Hadimani V.V., Vijayeendra, M.K., Prabhuswamy, N. 1998. Standards for degumming of silk. Indian. Tex. J. 108(10): 62-66.

Hata.O. 1987.Cosmetics containing sericin hydrolysates. Jpn Kokai Tokkyo Koho Jap 62036308 A2. p. 7.

Hemachantorn, K. 1987. Silk technology I. Department of Industrial Promotion, Bangkok.

Hedrick J.L., Smith A.J. 1968. Size and charge isomer separation and estimation of molecular weights of proteins by disc gel electrophoresis. Archi of Biochemis and Bioph. 126:155-164.

Henne W, Hoppe U. Light and screening composition. Ger Offen DE.3408406 A1. 1985.

Hisao A. 1994. Principles of sericulture. Translated from Japanese.

Helena A., Veronika A. 2005. Physico-chemical properties, composition and oxidative stability of *Camelina sativa* Oil. Food Technol. Biotechnol. *43* (1) 63–70

High W.A., Pandya A.G. 2006. Pilot trial of 1% pimecrolimus cream in the treatment of seborrheic dermatitis in African American adults with associated hypopigmentation. J Am Acad Dermatol. 54(6): 1082-1088.

Huang J., Valluzzi R., Bini E., Vernaglia B., Kaplan D.L. 2003 Cloning, expression, and assembly of sericin-like protein. J. of Biolo Chem. 278:46117-46123.

Hoppe U, Koerbaecher K, Roeckl M. 1984. Hair and bath preparations containing sericin. Ger Offen DE 3233388 A1.

Hao Y., Zhao F., Li N., Yang Y., Li K.a., 2002. Studies on a high encapsulation of colchicine by a niosome system. International Journal of Pharmaceutics 244:73-80.

Hu C., Rhodes D.G. 1999. Proniosomes: A novel drug carrier preparation. Intern J. of Pharma. 185:23-35

Hua, C., Zhu, L., Min, S., Hu, G. 2002. Progress of study on the utilization of silk sericin protein. Peop. Rep. China.28(3):132-136 pp. (Abstract).

Hyogo S., Yoshiko A. 1967. Carbohydrate content of fibroin and sericin of the silkworm, *Bombyx mori.* J. Biochemistry, Vol.62. No. 1. 129-130.

IUPAC. 1992. Standard methods for analysis of oils, fats, andderivatives, 1st supplement to the 7th Ed., international union for pure and applied chemistry, commission on oils, fats and derivatives, Blackwell Scientific Publications, Osney Mead, Oxford, UK.Society Press, Champaign, IL.

Ishay J.S., Kirshboim S. 2000. Grid formation in hornet cuticle induced by silk spun during pupation. Biomacromolecules 1:224-231. DOI: 10.1021/bm000290b.

Industrial Standards Institute. 1996. Cosmetics: general specification. TISI 152-1996

Industrial Standards Institute. 1994. Coconut oil: general specification. TISI 670-1994

International Organization for Standardization.2003.Determination of ash. ISO 6245:2001

Iva J., Patrick B., Ilse S. 2003. Determination of trace elements in pumpkin seed oils and pumpkin seeds by ICP-AES. J. Anal. At. Spectrom., 2003, 18, 54–58

Joachim, W.H.,. Pascual, F.P. 2000. Handbooks on ingredients for aquaculture feeds. Kluwer Academic Publishers, Dordrecht.

Jolly, M.S., Sen, S.K., Sonwalkar, T.N., Prasad, G.K. 1979. Non-mulberry silks. FAO agricultural services bulletin 29. food and agriculture organization of the united nations rome. V.4. 5-6.

Jin, H.J., J. Park, R. Valluzzi, P. Cebe and D.L. Kaplan, 2007. Biomaterial films of *Bombyx mori* silk fibroin with poly (ethylene oxide). Biomacromolecules, 3: 1233-1239.

Jung, H. A., B. H. Su, W. J. Keller, R. G. Mehta.,Kinghorn A. D. 2006. Antioxidant xanthones from the pericarp of *Garcinia mangostana* (Mangosteen). J. Agric. Food. Chem. 54: 2077-2082.

Khazaka R ., Min M. 2005. Nonlinear macromodeling using model order reduction, electrical performance of electronic packaging. IEEE 14th Topical Meeting on.131-134.

Khan M.M.R., Tsukada M., Gotoh Y., Morikawa H., Freddi G., Shiozaki H. 2010. Physical properties and dyeability of silk fibers degummed with citric acid. Bioreso Techno 101:8439-8445.

Kato, N., Sato, S., Yamanaka, A., Yamada, H., Fuwa, N., Nomura, M. 1998. Silk protein sericin inhibits lipid peroxidation and tyrosinase activity. Biosci. Biotechno. Biochem. 62: 145-147.

Kim J.B., Cho K.J., Kŏnig G.M., Wright A.D. 2006. Antioxidant activity of 3,4,5-trihydroxybenzaldehyde isolated from *geum japonicum*. J. of Food and Drug Analysis 14:190-193.

Kim W.S., Park B.S., Park S.H., Kim H.K., Sung J.H. 2009. Antiwrinkle effect of adipose-derived stem cell: activation of dermal fibroblast by secretary factors. J of Dermatol Sci. 53: 96-102.

Kaewruang W. 1997. Mulberry and silk, multi-useful pant and insect. sericultural research institute, department of agroculture, ministry of agriculture and co-operation, 21.

Kotake N.E., Yamamoto K., Nozawa M., Miyashita K., Murakami T. 2002. Lipid profiles and oxidative stability of silkworm pupae oil. J. of Oleo Scie. 51:681-690.

Kobkol S., Yaowapa S., Supreeya S. 2002. Study on chemical components and fatty acid from silkworm pupae for processing. In: XIX Congress of the international sericultural commission proceedings, 21st–25th september, queen sirikit national convention center, Bangkok, Thailand, pp. 550–552.

Kobkul S., Yaowapa S.,Supreeya S., Araporn S., Udorn L., Suwit I. 2000. Study on the chemical composition and fatty acid of chrysalis for processing. 2000 research report, Mukdahan Sericulture Institute, Department of Agriculture, Ministry of Agriculture and Cooperatives.

Khandare J.N., Madhavi G. and Tamhankar B.M. 1994. Niosomesnovel drug delivery system. The Eastern Pharmacist.37: 61-64.

Kikuchi K., Tagami H. 2008. The Japanese cosmetic scientist task force for skin care of atopic D. noninvasive biophysical assessments of the efficacy of a moisturizing cosmetic cream base for patients with atopic dermatitis during different seasons. British Journal of Dermatology. 158:969-978.

Kundu S.C., Dash B.C., Dash R., Kaplan D.L. 2008. Natural protective glue protein, sericin bioengineered by silkworms: potential for biomedical and biotechnological applications. Progress in Polymer Science 33:998-1012.

Kirikawa M, Kasaharu T, Kishida K, Akiyama ,D. 2000. Silk protein micropowders for coating with excellent feeling, antistaticity and moisture absorbability and releasability and there manufacture. Jpn Kokai Tokkyo Koho Jap 2000044598 A 2.

Kligman AM, Zheng P, Lavker RM. 1985. The anatomy and pathogenesis of wrinkles. Br J Dermatol; 113: 37-42

Leonards, K.S. 1988. Changes in the surface charge properties of isolated cardiac sarcolemmal vesicles measured by light scattering. I. Characteristics of rat and canine preparations. BBA-Biomembranes. 938(2): 293-309.

Lentz, B.R. 1993. Use of fluorescent probes to monitor molecular order and motions within liposome bilayers. Chem Phys Lipids. 64(1-3): 99-116.

Lasch, J. 1995. Interaction of detergents with lipid vesicles. *Biochim Biophys Acta.* 1995 Jul 17;1241(2):269–292.

Lizardi, P.M. 1979. Genetic polymorphism of silk fibroin studied by two - dimensional translation pause fingerprints. Cell. 18,581-589.

Lakhana ,R .,Oratai K. 1999. Complete research report "studies on production and utilization of processed oil from silk worm (chrysalis) for consumption (1st Year), Folk Product Research and Development Unit, Science and Technology Research and Development Institute, Chiang Mai University.

Lakhana ,R. 1995. Analysis result of silk worms'oil through HPLC Process, Department of Food Sciences and Technologies, Faculty of Agricultural Industry, Chiang Mai University.

Laemmli, U.K. 1970. Cleavage of structural proteins during the assembly of the head of bacteriophage T4.Nture.227:680-685.

Lawless HT, Heymann H. 1998. Sensory evaluation of food: principles and practices. Aspen Publishers, Inc. Gaithersburg, Maryland.

Laguerre M., Lecomte J., Villeneuve P. 2007. Evaluation of the ability of antioxidants to counteract lipid oxidation: existing methods, new trends and challenges. Prog Lipid Res. 46 : 244-282.

Letelier M.E., Berríos A.M., Troncoso J.C., Sandoval J.J., Holst M., Palma K., Montoya M., Miranda D., Lira. V.G. 2008. DPPH and oxygen free radicals as pro-oxidant of biomolecules. Toxicol *In Vitro*. 22(2): 279-286.

Lee H.K., Seo Y.K., Baek J.H., Koh J.S. 2008. Comparison between ultrasonogra phy (Dermascan C version3) and transparency profilometry (skin visiometer SV 600). Skin Res and Technol. 14: 8-12.

Leibovitz B., Siegel, B.1980. Aspects of free radical reactions in biological systems. Aging. J. Gerontal.35: 45-56.

Lee M.S., Lee K.H., Sin H.S., Um S.J., Kim J.W., Koh B.K. 2006. A newly synthesized photostable retinol derivative (retinyl N-formyl aspartamate) for photodamaged skin: profilometric evaluation of 24-week study. J Am Acad Dermatol. 55(2): 220-224.

Lee K., Kweon H., Yeo J.H., Woo S.O., Lee Y.W., Cho C.-S., Kim K.H., Park Y.H., 2003. Effect of methyl alcohol on the morphology and conformational characteristics of silk sericin. Inter. J. of Biolo Macromo. 33:75-80.

Liyana-Pathirana C.M., Shahidi F. 2007. Antioxidant and free radical scavenging activities of whole wheat and milling fractions. Food Chem. 101(3): 1151-1157.

Life-cycle-of-silkworm. 2008. [Online]. Available http://mulberrysilkworm.blogspot.com/2008/06/life-cycle-of-silkworm.htm [2008, September 12].

LG Wade J. 2000. Organic chemistry, Fourth edition, Prentice hall international editions1, 221.

Lu P., Chacko E. 1998. Evaluation of granier's sap flux sensor in young mango trees. Agronomie 18:461-471

Long, Z.P., R.P Hyang, K.P Yun, K.L Seung, H.P Jeong, and K.P Man. 2000. Mushroom tyrosinase inhibition activity of some chromones. J. Chem. Pharm. Bull. 50(3): 309-311.

Lu, P., Lai, B., Yan, X., Wang, Y., Zheng, C., and Tan, Y. 1998. GC-MS analysis of fatty acid composition in silkworm pupa oil. Peop. Rep. China.Zhongguo Yaoxue Zazhu (Beijing). 33(3), 138-140.

Manosroi A., Wongtrakul P., Manosroi J., Midorikawa U., Hanyu Y., Yuasa M., Sugawara F., Sakai H., Abe M. 2005. The entrapment of kojic oleate in bilayer vesicles. Int J Pharm 298, 13-25.

Manosroi A., Chutoprapat R., Abe M., Manosroi J. 2008. Characteristics of niosomes prepared by supercritical carbon dioxide ($scCO_2$) fluid. Int J Pharm. 352: 248-255.

Manosroi A, Khanrin P, Lohcharoenkal W, Werner R.G. , Gotz F, Manosroi W, Manosroi. J. 2010. Transdermal absorption enhancement through rat skin of gallidermin loaded in niosomes. Inter. J. of Pharmac, 392: 304-310

Marvin J.H. 1973. Textile Processing Vol.1. State department of education office of vocation education : South Carolina.

Martin K. 1999. Infrared and raman studies of skin and hair: a review of cosmetic spectroscopy. Internet J. Vib Spectro. 3(2). http://www.ijvs.com/volume3/ edition2/section2. htm, Perkin-Elmer

Manit S., Nattripop, P. 2000. Eating soybean. Kasikorn.73 (2):172-176.

McCormack B. and Gregordias G. 1998. Drugs-in-cyclodextrins-in-liposomes: an approach to controlling the fate of water insoluble drugs in vivo. Int. J. Pharm. 162: 59-69.

Michael J.B., Barbara B., Paul M.C., Keith D.I., Jan B.F.N.E., Lisette S. 2000. Vesicle-α-amino acid and vesicle–amide interactions: effects of added α-amino acids and amides on gel to liquid–crystal transitions for four aqueous vesicular systems. Thermochimica Acta. 364(1-2): 173-179.

Mi Y.A., Jung E.H., Jae-H.R., Hyekyoung J., Wan T.C. 2007. Antioxidant activity of cholesterol derived from silkworm pupae. Natural product science.13 (3):220-224.

Minamoto, T., Hiroya,I. 1999. Extraction of sericin and powdery sericin. Patent abstracts of Japan. Publication No. 2001-039999.

Minakawa M. 1985. Science silk. translated and compiled by *Kawaae, Aeeshi* and *Khemachai Hemchan.* committee product Thai promotion. Department of Industrial promotion.387.

Mita K., Ichimura S., Zama M., James T.C. 1988. Specifie codon usage pattern and its implications on the secondary structure of silk fibroin mRNA. Journal of Molecular Biology 203:917-925

Miteva M., Richter S., Elsner P., Fluhr J.W. 2006. Approaches for optimizing the calibration standard of tewameter TM300. Exp Dermatol. 15: 904-912.

Miyashita T. 1999. Sweat and sebum absorbing cosmetics containing cellulose fibres. Jpn Kokai Tokkyo Koho Jap 11152206 A2.

Motoii M., Aeechi K., and Kemchai H. 1987. Silk technology no1. Department of Industrial Promotion, Bangkok.386.

Mori K., Tanaka K., Kikuchi Y., Waga M., Waga S., Mizuno S. 1995. Production of a chimeric fibroin light-chain polypeptide in a fibroin secretion-deficient naked pupa mutant of the silkworm Bombyx mori. J. of Molecu Biol.251:217-228

Moreno A.O., Dorantes L., Galíndez J., Guzmán R.I. 2003. Effect of different extraction methods on fatty acids, volatile compounds, and physical and chemical properties of avocado *(Persea americana Mill.)* oil. J. of Agric.and Food Chem. 51:2216-2221.

Mondal. M., K. Trivedy , Nirmal Kumar. S. 2007. The silk proteins, sericin and fibroin in silkworm; *Bombyx mori.Linn.*, - a review.Caspian J. Env. Sci. Vol. 5 No. 2. 63-76

Müller, Werner E. G. 2003. The origin of metazoan complexity: porifera as integrated animals. Integrated Computational Biology 43 (1): 3–10.

Nagaraju, J., A. Sharma, B.N., Sethuraman, G.V. Rao., Singh ,L. 1995. DNA fingerprinting in silkworm *Bombyx mori* using banded krait minor satellite DNA. Derived probe. Electrophoresis 16(9): 1639- 1642.

Nandeesha M.C., Srikanth G.K., Keshavanath P., Varghese T.J., Basavaraja N., Das S.K. 1990. Effects of non-defatted silkworm-pupae in diets on the growth of common carp, Cyprinus carpio. Biological Wastes 33:17-23.

Nirmala X, Mita K, Vanisree V, Zurovec M, Sehnal F. 2001b. Identification of four small molecular mass proteins in the silk of *Bombyx mori*. Insect Molecular Biology. 10: 437–445.

Nipha B., Arunyakorn, J. 1997. Insect as food: how to consider for safety. J. of Food. 27(3):168-173.

Niki E., Yoshida Y., Saito Y., Noguchi N. 2005. Lipid peroxidation: mechanisms, inhibition, and biological effects. Biochem Biophys Res Commun. 338: 668-676.

Nipa B., Uruyakorn J. 1997. Edible insects, how to choose the safe meals, Foods, 27(3): p. 168-173.

Niosome. 2010. [Online]. Available http://www.pharmainfo.net/../Niosome%20structure.jpg [2010, August 8].

Niosome unique drug delivery system. 2010. [Online]. Available http://www.pharmainfo.net/Reviews/niosome-unique-drug-delivery-system

Nutsawan C., Watchree P. 2002. The experimental study of silk protein cream in anti-aging effect. Department of Pharmacy, Faculty of Pharmacy, Mahidol University.

Obrev H. 2005. Application of cutometer area parameters for the study of human skin fatigue. Skin Rese and Techno 11:120-122.

Oratai K. 1998. Chemical composition and storage period of processed silk worm oil. Master of Sciences, Department of Food Sciences and Technologies, Chiang Mai University.

Oxtoby E. 1987. Spun yarn technology. Butterworth & Co., (Publisher) Ltd. London. 250.

Okamoto H., Ishikawa E., Suzuki Y. 1982. Structural analysis of sericin genes. hologies with fibroin gene in the 5' flanking nucleotide sequences. Journal of Biological Chemistry 257:15192-15199.

Ou B, Hampsch-Woodill M.,Prior R.L. 2001. Development and validation of an improved oxygen radical absorbance capacity assay using fluorescein as the fluorescent probe. J Agr Food Chem. 49: 4619-4626.

Ogawa A, Yamada H. 1999. Antiaging cosmetic containing sericin or hydrolysates and saccharomyces extracts. Jpn Kokai Tokkyo Koho Jap 11193210 A2; p.9.

O/W formula moisturizing cream PC49031/5 [Online]. Available www.eac.com, [2008, January.22]

Pattanasattanun W. 1990. Wild silk tarsar *(Antheraea mylitta Drury)*. The Kasetsart J. Agric Scie. 23(5-6): 189-199.

Pauwels M., Rogiers V. 2004. Safety evaluation of cosmetics in the EU reality and challenges for the toxicologist. Toxicol Lett. 151: 7-17.

Padamwar MN, Pawar AP. 2004. Silk sericin and its applications: a review. J.of Sci and Ind Res. 63:323–329.

Padamwar MN, Pawar AP, Daithankar AV, Mahadik KR. 2005. Silk sericin as a moisturizer: an in vivo study. J. of Cosm and Dermato. 4: 250– 257.

Padamwar MN, Daithankar AV, Pisal SS, Pawar AP. 2002. Evaluation of moisturizing efficiency of silk protein. II. silk sericin. sixty second world congress of FIP Nice.

Padamwar, M.N.and Pawar, A.P. 2004. Silk sericin and its application: a review. J. of sci. Indus. Res. 63(4):323-329 pp. (Abstract).

Pérez G.R.M., Luna H.H., Garrido S.H. 2006. Antioxidant activity of *Tagetes erecta* essential oil. J. of the Chil Chemi Soci. 51:883-886.

Peter J. Wan , Michael K. Dowd. 2000. Comparative study of the extraction and measurement of cottonseed free fatty acids. JAOCS, Vol. 77, no. 1.23-27.

Pimporn L. 2001, Natural cosmetics: skin care products, Faculty of Pharmacy, Chiang Mai University.

Pereira N.R., Ferraress.F.O., Matsushita, M., de Soouza, N.E. 2003. Proximate composition and fatty acid profile of *Bombyx mori L.* chrysalis toast. J. food Comp Anal. 16(4), 451-457.

Proksch E, Brandner JM, Jensen JM. 2008. The skin: an indispensable barrier. Exp Dermatol. 17(12):1063-72.

Pises L., Benjawan Y.,Krabuan W., Mukda K., Hunsa P. 2006. Properties of oil extracted from *Jatropha curcas Linn.* Seeds. [28] congress on science and technology of Thailand, Bangkok (Thailand), 24-26 Oct 2002 Department of Botany, Faculty of Science, Chulalonglorn University, Bangkok 10330, Thailand. 3-37.

Piao L.Z., Park H.R., Park Y.K., Lee S.K., Park J.H., Park M.K. 2002. Mushroom tyrosinase inhibition activity of some chromones. Chem & Pharmac Bulle 50(3) 309-311.

Pongsathorn S , Parparrt, P. 1990. Nutrition value of unconventional protein source. Insect J Nutr 17: 1–5.

Pongsatharg S., Parpasrt P. 1990. Nutrition value of unconventional protein source. Insect J. of Nutrition.17:1-5.

Prakash A. 2001. Microbial limit test. In : Clontz L.,ed. Microbial limit and bioburden tests: Validation approaches and global requirements, CRC press. 19(2): 1-6.

Prateep M., Siriporn S., Wasan Nui-pirom., Budsara R., Danai N., Boonya S. 2002. Study on insoluble silk powder production, documents to the Conference of Sericulture Centers 2002: "Sericulture" on 27th February – 1st March 2002, at Nakhon Phrae Townwork Hotel, Phrae Province, Department of Agriculture, Ministry of Agriculture and Cooperatives.

Prota G. 1980. Recent advances in the chemistry of melanogenesis in mammals. J Invest Dermatol. 75: 122-127.

Rainer J., Brouwer, M. 1993. Hemocyanin synthesis in the blue crab *callinectes sapidus*. comparative biochemistry and physiology Part B: comparative Biochemistry 104:69-73

Rawinu B., Nilpan, S., Hongtongdang, P., Vilai, S., Panyawanich, M. 1999. Base on somecharacteristics of non-mulberry trees for feeding wild silkworms. Annual Research Report of Sericultural Research Institute. Department of Agriculture.1-10.

Rayner H. 1921. Silk throwing and waste silk spinning. 2nd ed., Scott Greenwood & Son.London.199.

Rainer V., Jurg M., Rolf, B. 1993. Sericin silk protein: unique structure and properties. Cos & Toil, (Dec). (108):101-108.

Reinert,G.,Fuso,F.,Hilifiker,R., Schmidt,E. 1997. UV-protecting properties of textile fabrics and their improvement. Textile Chemist and Colorist. 29(12):36-43 (Abstract)

Rowe A.,Bertoni, S.A.,Pereira, P.L.,Matsushita, M., de Souza, N.E. 1997. Colesterol emcarnes bovinas,sunas,frangos e derivados de carnes comercializados em Maringa,Parana, Brasil.Archivos Latino Americanos de Nutricion.47,282-284.

Roy, S. Mishra., Chaudhuri, T.K. 2005. Cloning, sequence analysis, and characterization of a novel beta-glucosidase-like activity from *Pichia etchellsii*, *Biochem. Biophys. Res. Commun.* 336 (1) (2005), pp. 299–308.

Sawai B. 2001. Insect taxonomy, Department of Psychology, Faculty of Agriculture, Chiang Mai University, Chiang Mai; p.441

Sarovart S, Sudatis B, Meesilpa P, Grady BP, Magaraphan R. 2003. The use of sericin as an antioxidant and ntimicrobial for polluted air treatment. Review of Adva Mate Scien. 5: 193 –198.

.Sappayatosok. S. 1988. Nutrition and bio-chemistry, Chulalongkorn University Press. Bangkok.

Sawattat A, 1976. Silk chrysalis. Agricultural Sciences. 609-615.

Salter D. 1996. Non-invasive cosmetic efficacy testing in human volunteers: some general principles. Skin Res Technol. 2: 59-63.

Sarwar, G. 1999. Influence of feeding alkaline/ heat processed proteins on growth and Mineral status of rats. Adv Exp. Med. Biol. 459: 161- 77.

Sakamoto K., Yamakishi, K. 2000. Sericin containing cleaning composition.Jpn Kokai Tokkyo Koho Jap 2000073090 A2; 2000.

Sepswade P .,Satyawiwut, T. 1977. Some data of wild silk. Farmer. 5(3):148-157.

Sericulture Research Institute. 2003. Silkworm in Thailand.

Sehnal F. 2008. Prospects of the practical use of silk sericins. Entomological Research 38:S1-S8

Sericin. 2007. [Online]. Available. http://www.dongchangchemical.com/template/cpd-en.htm [2007, October 28].

Structure of silk. 2010. [Online]. Available. http://www.biochem.usyd.edu.au [2010, May 9].

Sericin and Fibroin. 2006. [Online]. Available. http://www.newsilkroad.com.[2006, May.15]

Structure of β-sheet and α-helix of silk. 2010 [Online]. Available http://www.chembio.ca [2010, Janjuary 18].

Sprague K. 1975. The *Bombyx mori* silk proteins: characterization of large polypeptides. Biochemistry 14: 925–931

Sheena I.P., Singh U.V., Kamath R., Uma Devi P., Udupa N. 1998. Niosomal withaferin A, with better tumor efficiency. Indian J. Pharm. Sci.60 (1):45-48.

Shen Y., Johnson M.A., Martin D.C. 1998. Microstructural characterization of Bombyx mori silk fibers. Macromolecules 31:8857-8864.

Shankar S.S., Ahmad A., Sastry M. 2003. Geranium leaf assisted biosynthesis of silver nanoparticles. Biotechnology Progress 19:1627-1631.

Shin S.C., Cho C.W., Oh I.J., 2001. Effects of non-ionic surfactants as permeation enhancers towards piroxicam from the poloxamer gel through rat skins. Inter J. of Phar. 222:199-203

Shah K.A., Date A.A., Joshi M.D., Patravale V.B. 2007. Solid lipid nanoparticles (SLN) of tretinoin: potential in topical delivery. Int J Pharm. 345: 163-171.

Shapiro S.S., Saliou C. 2001. Role of vitamins in skin care. Nutrition 17:839-844.

Sikorski, Zdzisław E. 2001. Chemical and functional properties of food proteins. Boca Raton: CRC Press. 242.

Stamatas G.N., de Sterke J., Hauser M., von Stetten O., van der Pol A. 2008. Lipid uptake and skin occlusion following topical application of oils on adult and infant skin. J Dermatol Science. 50(2): 135-142.

Sompote T. 1992. Powdered silk chrysalis for young- fatten pig feeds, Sukorn Sarn, 19(1); 5-10.

Sonwalker T.N. 1993. Handbook of silk technology. Wiley Eastern Limited: New Delhi.167-170.

Sorbitan monooctadecanoate, poly (oxy-1, 2-ethanediyl). [Online]. Available http://www.lookchem.com/cas-900/9005-67-8.html. [2010, Janjuary 8].

Sophie B, Katarina E, Goran K, Michel O, and Sylviane L. 1998. New sterically stabilized vesicles based on nonionic surfactant,cholesterol, and poly (ethylene glycol)-holesterol conjugates. Biophysical J. V. 74 June: 3198–3210.

Soler C. 2005. Moisturizing facter. Available form: URL http://www.centerchem.com/Moisturizing factor.pdf (2005 Sepember,24)

Soderhall, C, Marenholz I, Kerscher T., Rüschendorf F., Rüschendorf F., Esparza-Gordillo, J. C., Mayr, G. 2007. Variants in a novel epidermal collagen gene (COL29A1) are associated with atopic dermatitis. *PLoS Biology* 5 (9): 242.

Suja K.P., Jayalekshmy A., Arumughan C. 2005. Antioxidant activity of sesame cake extract. Food Chem. 91: 213-219.

Szoka F.Jr ., Papahadyopoulos D. 1980. Comparative properties and methods of preparation of lipid vesicles (liposomes). Ann. Rev. Biophys-Bioeng.9:467-508.

Taylor S., Westerhof W., Im S., Lim J. 2006. Noninvasive techniques for the evaluation of skin color. J Am Acad Dermatol. 54(5): 282-290.

Tanaka K., Mori K., Mizuno S. 1993. Immunological identification of the major Disulfide-linked light component of silk fibroin. J. of Bio.114:1-4

Tashiro Y., Otsuki E., Shimadzu T. 1972. Sedimentation analyses of native silk fibroin in urea and guanidine-HCl. BBA - protein structure 257:198-209.

Tashiro Y., Otsuki E. 1970. Studies on the posterior silk gland of the silkworm *Bombix mori*. IV. ultracentrifugal analyses of native silk proteins, especially fibroin extracted from the middle silk gland of the mature silkworm. J.of Cell Biology 46:1-16.

Tashiro Y., Otsuki E. 1970. Dissociation of native fibroin by sulphydryl compounds. BBA - Protein Structure 214:265-271.

Terada S., Takada N., Itoh K., Saitoh T., Sasaki M., Yamada H. 2007. Silk protein sericin improves mammalian cell culture, in: R. Smith (Ed.), Cell technology for cell products, Springer Netherlands. 397-401.

Theresa M.A. 1998. Drugs published by adis international Ltd. 56(5):747-756.

The Customs Department and Department of Export Promotion, 2003, Silk and products export status, documents to silk and silk production.

Thiele JJ, Weber SU, Packer L. 1999. Sebaceous gland secretion is a major physiologic route of vitamin E delivery to skin. J Invest Dermatol; 113:1006

Thai Industrial Standards 176, 2519.

Tsubouchi Kozo, Yamada Hiroo and Takasu Yoko. 1997. Method for obtaining high molecular weight sericin by extraction. patent abstracts of Japan. Publication No.11-092564.

Tyrosinase activity inhibitor. 2006 [Online]. Available form: URL: http://www.freepatentsonline.com/5399785.html.(2006 Sepember,24)

Uchegbu I.F., Double J.A., Kelland L.R., Turton J.A., Florence A.T. 1996. The activity of doxorubicin niosomes against an ovarian-cancer cell- line and 3 *in-vivo* mouse-tumor models. J Drug Target. 3: 399-409.

Uchegbu IF., Vyas. 1998. Non-ionic surfactant vesicles (noisome) in drug delivery.Int.J.Pharm.172:33-70.

Uchegbu, IF., Alexander T. F. 1995. Non-ionic surfactant vesicles (Niosomes) physical and pharmaceutical chemistry. Adv. in Colloid and Interface Sci.58: 1-55.

Udayasekhara, P. 1994. Chemical composition and nutritional evaluation of spent silk worm pupae. J. Agric. Food Chem.42: 2201-2203.

Voegeli R, Meier J, Blust R. 1993. Sericin silk protein: unique structure and properties. Cosmet Toilet.; 108:101–8.

Vilai S., Hongtongdang, S. 2000. Collection and preservation of Eri wild silkworm. Annual Research Report of Sericultural Research Institute. Department of Agriculture.167-170.

Waninge R., Nylander T.P., Bergenståhl B. 2003. Milk membrane lipid vesicle structures studied by Cryo-TEM. colloid surfaces B. 31: 257-264.

Wade, L.G., Jr. 2000. Organic chemistry. fourth edition, Prentice Hall.USA.

Werasak Udomkijdecha, 1999, Fiber Science, 1st Edition, Chulalongkorn University Printing House.

Wissing S.A., Muller R.H. 2003. The influence of solid lipid nanoparticles on skin hydration and viscoelasticity - *in vivo* study. Eur J Pharm Biopharm. 56: 67-72.

Wongtong S., Areekul, P., Onlamoon, A., Tragoolgarn, S. 1980. Research on wild silkworm cultivation in the highland of northern Thailand. final report, highlands agricultural project, June 1976- June 1980. Kasetsart University, Bangkok, Thailand.199.

Wu J-, Wang Z, Xu S-Y. 2007. Preparation and characterization of sericin powder extracted from silk industry waste water. Food Chem 103: 1255–1262.

Wu J-H, Wang Z, Xu S-Y. 2008. Enzymatic production of bioactive peptides from sericin recovered from silk industry waste water. Process Biochem 43:480–487.

Yamada H, Fuha Y, Yuri O, Obayashi M, Arashima T. 1998. Collagen formation promoters containing sericin or its hydrolyzates and antiaging cosmetics. Jpn Kokai Tokkyo Koho, JP 10226653 A2; 1998.

Yasuda N, Yamada H, Nomura M. 1998. Sericin from silk as dermatitis inhibitor. Jpn Kokai Tokkyo Koho Jap 10245345 A2; 1998.

Yang M L.,Chen Y L.,Qian H.,Zhang G Yi. 1993. Optimization of the extraction of the silkworm chrysalis oil (SCO) from silk worm chrysalis by the orthogonal experimental design. J. Food Research and Development; 2006-10.

Yamada H, Yamasaki K, Zozaki K. 2001. Nail cosmetics containing sericin. PCT Int ApplWO 2001015660 A1.

Yamada H, Yuri O. 1998. Sericin coated powders for cosmetics. Jpn Kokai Tokkyo Koho Jap 10226626 A2.

Yamada H, Yamazuki K, Nozaki K. 2001. Skin moisturizing and conditioning cosmetics containing sericin and saccharides. Jpn Kokai Tokkyo Koho Jap 2001064148 A2.

Yoshioka M, Segawa A, Veda A, Omi S. 2001. UV absorbing compositions containing fine capsules. Jpn Kokai Tokkyo Koho Jap.

Zasadzinski J.A.,Kisak E.,Evans C. 2001. Complex vesicle-based structures. Curr Opin In Colloid In. 6: 85-90.

Yoshioka T., Stermberg B. Florence A.T. 1994. Preparation and properties of vesicles (niosomes) of sobitan monoesters (Span 20, 40, 60, and 80) and a sorbitan triester (Span 85). Int J Pharm.105:1-6.

Zulueta A., Esteve M.J., Frgola A. 2009. ORAC and TEAC assays comparison to measure the antioxidant capacity of food products. Food Chem. 114(1):310-316.

Zhang Y.Q., Tao M.L., Shen W.D., Zhou Y.Z., Ding Y., Ma Y., Zhou W.L. 2004. Immobilization of L-asparaginase on the microparticles of the natural silk sericin protein and its characters. Biomaterials 25:3751-3759.

Zhang YQ. 2002. Applications of natural silk protein sericin in biomaterials. Biotechnol Adv.; 20:91–100.

Zhaorigetu S, Yanaka N, Sasaki M, Watanabe H, Kato N. 2003a. Inhibitory effects of silk protein, sericin on UVB-induced acute damage and tumor promotion by reducing oxidative stress in the skin of hairless mouse. J. of Photochem and Photobiology. B 71: 11–7.

Zhang Y.Q., Tao M.L., Shen W.D., Zhou Y.Z., Ding Y., Ma Y., Zhou W.L. 2004. Immobilization of L-asparaginase on the microparticles of the natural silk sericin protein and its characters. Biomaterials 25:3751-3759.

APPENDICES

APPENDIX A

Chemical and physical properties of compounds used in this study

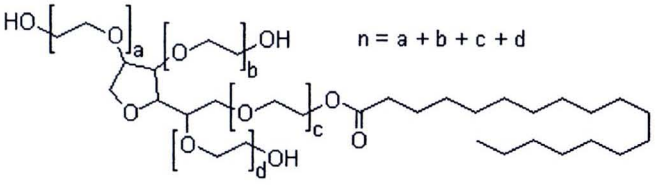
1. Sorbitan monooctadecanoate, poly (oxy-1, 2-ethanediyl)
(http://www.lookchem.com/cas-900/9005-67-8.html)

Name : Sorbitan monooctadecanoate, poly (oxy-1, 2-ethanediyl)

Chemical name: Sorbitan monooctadecanoate

Synonyms : Sorbitan,monostearate, polyoxyethylene derivs. (8CI);
Ahco DFS 100; Tween 18:0; Tween 60; Tween 61

Molecular Structure:



Molecular Weight :1311.65

Density :1.095～1.105

Boiling Point :> 100 C

Flash Point :>230 °F

Solubility :Soluble

Particular :particular

Physical appearance :white powder

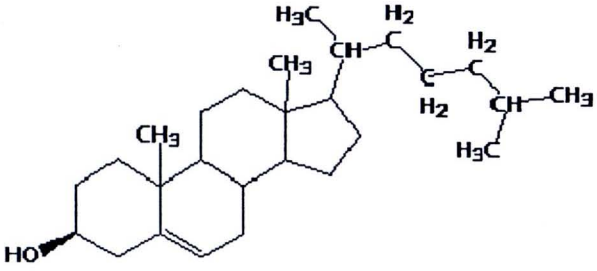
2. Cholesterol (http://www.serva.de)

Name : Cholesterol ($C_{27}H_{46}O$)

Chemical name: Cholesterol

Synonyms : 3β-Hydroxy-5-cholestene, 5-Cholesten-3β-ol

Molecular Structure:



Molecular Weight	: 386.65
Density	: 1.067 g/mL at 25 °C
Boiling Point	: 360 °C
Meting Point	: 147-149 °C
Solubility	: Soluble
Physical appearance	: white powder
Storage temperature	: −20°C

APPENDIX B

1. Preparation of the reagent solutions for SDS-PAGE assay (Laemmli, 1970)

1.1 Reagent solution

1. Acrylamide stock solutions (acrylamide 30%w/v.Bis 0.8%w/v)

Acrylamide	60	g
N-N'Methylenebisacrylamide (Bis)	1.6	g
Deionized water	200	ml

(Storage temperature : 4°C and not being contacted to light)

2.1.5 M Tris Cl

Tris	36.3	g
Deionized water	200	ml

Adjust to pH 8.8 by 4 N HCl

3. 0.5 M TrisCl

Tris	3.0	g
Deionized water	50	ml

Adjust to pH 6.8 by 4 N HCl

4. 10% SDS solution

Sodium dodecylsulfate (SDS)	5.0	g
Deionized water	50	ml

5. 10% APS

Ammonium persulfate (APS)	0.1	g
Deionized water	1.0	ml

(Prepared freshly before use only)

1.2 Preparation of gel

Table B1 Preparation of the separating gel and stacking gel

chemical	% of separating gel				stacking gel, 4%
	7.5	10	12.5	15	
Acrylamide stock solution	7.5ml	10ml	12.5ml	15ml	0.67ml
1.5 M Tris Cl	7.5ml	7.5ml	7.5ml	7.5ml	
0.5 M Tris Cl					1.25ml
10% SDS	0.3ml	0.3ml	0.3ml	0.3ml	0.05ml
Deionized water	14.6ml	12.1ml	9.6ml	7.1ml	3.0ml
10% APS	150µl	150µl	150µl	150µl	25µl
TEMED	10µl	10µl	10µl	10µl	2.5µl
Final volume	30ml	30ml	30ml	30ml	5ml

1.3 Preparation of 2X sample treatment buffer

0.5 M Tris Cl	2.5	ml
10% SDS	4.0	ml
Glycerol	2.0	ml
2-mercaptoethanol	0.2	ml
(or Dithiothreitol (DTT))	0.3	g
Bromphenol Blue	0.2	mg
Deionized water	10.0	ml (Kept at temperature-20°C)

1.4 Preparation of 10X electrode buffer

Tris	30.28	g
Glycine	144.13	g
SDS	10	g
Deionized water	1,000	ml (Diluted 10 times before used)

1.5 Preparation of coomassie stain solution

Coomassie Blue R-250	0.5	g
Methanol	800	ml
Glacial acetic acid (99%)	140	ml
Deionized water	2,000	mlr

1.6 Preparation of destaining solution

Methanol	50	ml
Glacial acetic acid (99%)	140	ml
Deionized water	1,000	ml

1.7 Evaluation of molecular weight by the SDS-PAGE method (Procedure)

Extraction of protein from the 5 breeds by bringing the sample which the is extracted protein to calculate and find pure molecular enzyme weight by finding the value from the moving distance of protein per the distance of color movement as an indicator (Rf),Then compare with the Rf of standard protein that the weight is known exactly (precision plus standard, dual colors: 10, 20, 25, 37, 50, 75, 100, 150 and 250 kDa).

APPENDIX C

Friedman Test

Analysis of Variance Friedman.

This method compares several related samples and can be used as a non-parametric alternative to the two ways ANOVA. The power of this method is low with small samples but it is the best method for non-parametric two way analysis of variance with sample sizes above five.

The analysis and interpretation of Friedman's test was base on the following equations:

$$\chi^2_r = T = \frac{12}{bt\ (t+1)} * (R_1^2 + R_2^2 + R_3^2 + R_4^2) - 3b\ (t+1)$$

b= number of respondents t = number of samples

R_1= total of rank for sample1 t-1 = df.

Differences of satisfactory level for multiple samples is calculated by LSD for Rank data

$$\text{LSD rank} = Z_{\alpha/2} \sqrt{\frac{bt\ (t+1)}{6}}$$

$Z_{\alpha/2}$ = 1.96 at confidential level %95

APPENDIX D

Survey Sheet

Consumer Acceptance Study

To: Respondents

Subject: Consumer acceptance study on anti-wrinkle serum containing niosomes entrapped with sericin and oil of Thai native silkworms

Notification: This survey sheet is used to study the consumer acceptance on anti-wrinkle serum containing niosomes entrapped with sericin and oil of Thai native silkworms which is a part of the research of Miss Supanida Winitchai.Your cooperation in completing the survey sheet is appreciated. All of your information filled in this sheet will be useful for the research. Your response will not cause any problems to you.

Explanation: The development of anti-wrinkle serum containing niosomes entrapped with sericin and oil of Thai native silkworms in this project is aimed to promote the value of Thai local silkworms. The important ingredients are silkworm oil and silk cocoon amino acids that are good nutrients for repairing aging skin. With nanotechnology, the ingredients which are entrapped in niosomes formula are added to the anti-wrinkle serum in order to expedite its efficiency. The developed anti-wrinkle serum is enabling to get rid of face wrinkles efficiently, to help firm up and smoothen skin. Besides, it naturally whitens the skin, nourishes skin moisture, and improves skin elasticity.

Sample Product: The sample product of anti-wrinkle serum containing niosomes entrapped with sericin and oil of Thai native silkworms

Instruction: Apply the serum to your face thoroughly after washing every morning and night. Rub your face gently until the serum is absorbed into your face skin. Use daily for 14 days. Answer the questions on the survey sheet.

Note: - The sample product should be kept at room temperature not over 35°C. Avoid keeping it in sunlight and high temperature.

- Stop using in all cases of irritation.

Thank you for your response to all of the questions

The researcher

Direction: Put ✓ in ( ) for the answers that are right to your thought.

Part I: Personal information of the volunteer

1. Age

( ) 30-40 years old ( ) 41-50 years old

( ) 51-60 years old ( ) more than 61 years old

2. The highest obtained academic degree

( ) Lower than high-school ( ) Primary high-school

( ) Secondary high-school/vocational school

( ) College diploma ( ) Bachelor degree

( ) Master degree or higher degree

3. Occupation

( ) School student ( ) Government or state enterprise officer

( ) Employee of private organization ( ) College student

( ) Professional employment ( ) Business owner

( ) Housewife ( ) Other, please specify.....

4. Monthly income

( ) Less than 10,000 baht ( ) 10,001-20,000 baht

( ) 20,001-30,000 baht ( ) 30,001-40,000 baht

( ) 40,001-50,000 baht ( ) Over 50,000 baht

5. Type of frequently used anti-wrinkle moisturizing products (Choose only one answer.)

( ) Cream ( ) Gel

( ) Lotion ( ) Cream gel

( ) Other, Please specify.....

Part II: Consumer acceptance study on the anti-wrinkle serum containing niosomes entrapped with sericin and oil of Thai native silkworms - What do you think about the product, after you have used the product for 1 month? Please answer the following questions.

6. What do you think about this product in comparing to your frequently used anti-wrinkle moisturizing products given in item 5.

.....

.....

7. What do you think about this product comparing to other products in the market?

( ) This product is better ( ) This product is as good as others

( ) This product is not as good as others

8. Do you accept this product?

( ) Yes. (go to item 10) ( ) No. (continue on item 9)

9. Please give the reasons for not accepting the product.

( ) Slow absorption to skin ( ) Greasy residue on skin after applying

( ) Strong smell / less fragrance ( ) unsatisfactory color

( ) Short-term moisturizing ( ) unsatisfactory serum texture

( ) Unnoticeable whitening effect ( ) Unnoticeable wrinkle reduction

( ) Irritation, i.e. rash, irritating ( ) Other, Please specify.....

10. Please evaluate the product and fill the preference survey table according to your opinion on the product. (Mark ✓ on the selected preference level)

Description	dislike extremely	Dislike very much	Dislike moderately	Dislike slightly	Neither nor dislike	Like slightly	Like moderated	Like very much	like Extremely
1. Overall liking									
2. Color									
3. Odor									
4. Distribution to face skin									
5. Absorbency to skin									
6. Skin moisture after use									
7. Softness and smoothness of skin after use									
8. Reduction of deep wrinkles									

11. How are you satisfied with the characteristics of the sample product after the trial use? (Mark ✓ in the field right to your opinion)

Characteristics	Satisfaction level				
	Much too neck	Slight too weak	Just-right	Slightly too strong	Much too strong
1. Serum color					
2. Serum smell					
3. Effect on wrinkles reduction					
4. Softness of skin after use					
5. Firm and smoothness of skin					
6. Effect on skin whitening					

12. Will you buy the product when it is launched in the market?

( ) Yes. (go to item 14) ( ) No. (continue on item 13)

13. The reason for not buying the product.

( ) Greasy residue after applying ( ) Appearance of the serum

( ) Short-term moisturizing ( ) Slow absorption to skin

( ) Strong smell / less fragrance ( ) Unsatisfactory color

( ) Unnoticeable whitening effect to skin

( ) Unnoticeable effect on wrinkle reduction

( ) Do not like texture serum

( ) Irritation, i.e. rash, irritating ( ) Other, please specify……

14. Appropriate selling price for 50 gram (Eucerin 1,790 baht, Liposome serum 2,500 baht*)

( ) Lower than the market ( ) Similar to the market

( ) Higher than the market

15. Other suggestion (if any)

……

……...

Remark: * Price is according to the retailing price at Siam Paragon in Bangkok in January 2010.

แบบสอบถาม

การทดสอบการยอมรับของผู้บริโภค

เรียน ผู้ตอบแบบสอบถาม

เรื่อง การทดสอบการยอมรับของผู้บริโภคต่อผลิตภัณฑ์เซรัมลบริ้วรอยและชะลอความแก่ที่มีส่วนผสมของนีโอโซมจากโปรตีนไหมพันธุ์ไทยพื้นเมือง

คำชี้แจง แบบสอบถามชุดนี้ เป็นการทดสอบการยอมรับของผู้บริโภคที่มีต่อผลิตภัณฑ์เซรัมลดริ้วรอยที่มีส่วนผสมของนีโอโซมจากโปรตีนไหมพันธุ์ไทยพื้นเมือง เพื่อประกอบการทำวิทยานิพนธ์ของ น.ส.สุพนิดา วินิจฉัย นิสิตปริญญาเอก สาขาวิชาเภสัชศาสตร์ คณะเภสัชศาสตร์ มหาวิทยาลัยเชียงใหม่ ดังนั้นจึงใคร่ขอความร่วมมือจากท่านกรุณาตอบแบบสอบถามให้สมบูรณ์ ข้อมูลทั้งหมดที่ท่านตอบมา จะเป็นประโยชน์อย่างยิ่งสำหรับงานวิจัยนี้ และจะไม่มีผลกระทบใดๆ ต่อท่านทั้งสิ้น

คำอธิบาย การพัฒนาผลิตภัณฑ์ผลิตภัณฑ์เซรัมลดริ้วรอยและชะลอความแก่ที่มีส่วนผสมของนีโอโซมจากโปรตีนไหมพันธุ์ไทยพื้นเมือง เป็นงานวิจัยเพื่อใช้เป็นแนวทางในการเพิ่มมูลค่าของไหมสายพันธุ์ไทย ซึ่งเป็นส่วนประกอบที่สำคัญคือ โปรตีนที่อยู่ในรังไหม และกรดไขมันในดักแด้ไหม โดยการนำนวัตกรรมด้านนาโนเทคโนโลยี มาเพื่อให้สามารถนำส่งผ่านสารสำคัญประเภทโปรตีนและกรดไขมันที่ถูกกักเก็บในถุงขนาดนาโนในรูปแบบนีโอโซม คืออนุภาคขนาดเล็กไปช่วยเพิ่มประสิทธิภาพให้ตรงเป้าหมายและเฉพาะเจาะจงยิ่งขึ้น **ตัวอย่างที่แจกให้:** ตัวอย่างผลิตภัณฑ์เซรัมลดริ้วรอยและชะลอความแก่ที่มีส่วนผสมของนีโอโซมจากโปรตีนไหมพันธุ์ไทยพื้นเมือง

คำแนะนำในการใช้: ทดสอบตัวอย่างทุกวันหลังล้างหน้าเช้าและเย็น บีบออกแล้วทาบนผิวหน้า โดยใช้เซรัมทาผิวหน้าเป็นเวลานาน 4 สัปดาห์ แล้วตอบคำถามในแบบสอบถาม

หมายเหตุ
- กรุณาเก็บตัวอย่างที่อุณหภูมิห้อง ไม่ควรเก็บไว้กลางแดด
- หากมีอาการระคายเคืองใด ๆ กรุณาหยุดใช้ทันที ห้ามใช้ร่วมกับผลิตภัณฑ์อื่น

ขอขอบพระคุณที่ท่านให้ความร่วมมือในการตอบแบบสอบถาม

ผู้วิจัย

คำแนะนำ : กรุณาใส่เครื่องหมาย ✓ ลงในวงเล็บ ( ) หน้าคำตอบที่เห็นว่าเหมาะสมและตรงตามความคิดเห็นของท่านมากที่สุด

ส่วนที่ 1 : ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

1. อายุ

( ) 30 – 40 ปี ( ) 41 – 50 ปี

( ) 51 – 60 ปี ( ) 61 ขึ้นไป

2. การศึกษาสูงสุดที่ได้รับ

( ) ต่ำกว่ามัธยมศึกษา ( ) มัธยมศึกษา-ปวช

( ) อนุปริญญา / ปวส.- ปริญญาตรี ( ) ปริญญาโท

( ) ปริญญาเอก

3. อาชีพ

( ) นักเรียน/นักศึกษา ( ) ข้าราชการ / รัฐวิสาหกิจ

( ) พนักงานบริษัทเอกชน ( ) ธุรกิจส่วนตัว

( ) แม่บ้าน ( ) อื่น ๆ โปรดระบุ .....

4. รายได้ต่อเดือน

( ) ไม่เกิน 10,000 บาท ( ) 10,001-20,000 บาท

( ) 20,001-30,000 บาท ( ) 30,001-40,000 บาท

( ) 40,001-50,000 บาท ( ) 50,001-60,000 บาท

( ) มากกว่า 60,000 บาท

5. ผลิตภัณฑ์ลบเลือนริ้วรอยที่ท่านใช้ **บ่อยที่สุด** มีรูปแบบใด (ตอบได้เพียง 1 ข้อ)

( ) เนื้อครีม ( ) เนื้อเจล

( ) เนื้อโลชัน ( ) เนื้อครีมเจล

( ) อื่นๆ .....

ส่วนที่ 2 : ข้อมูลเกี่ยวกับการทดสอบผลิตภัณฑ์เซรัมลบริ้วรอยผสมของนีโอโซมที่กักเก็บเซริซินและน้ำมันจากไหมพันธุ์ไทยพื้นเมือง

ภายหลังที่ท่านได้ทดลองใช้ผลิตภัณฑ์นี้ เป็นเวลา 1 เดือน ท่านมีความคิดเห็นอย่างไรเกี่ยวกับผลิตภัณฑ์ กรุณาตอบคำถามดังนี้

6. ท่านมีความคิดเห็นเกี่ยวกับผลิตภัณฑ์นี้อย่างไร เมื่อเปรียบเทียบกับผลิตภัณฑ์เซรัมลบริ้วรอยและชะลอความแก่ที่ท่านใช้บ่อยที่สุดในข้อ 5

.....

.....

7. ท่านมีความคิดเห็นอย่างไรกับผลิตภัณฑ์นี้เมื่อเปรียบเทียบกับผลิตภัณฑ์ลบริ้วรอยที่มีจำหน่ายในท้องตลาด

( ) ดีกว่า ( ) ดีเท่ากัน ( ) ดีน้อยกว่า

8. ท่านยอมรับผลิตภัณฑ์นี้หรือไม่

( ) ยอมรับ (ข้ามไปตอบข้อ 10)

( ) ไม่ยอมรับ (ตอบข้อ 9 ต่อ)

9. เหตุผลที่ไม่ยอมรับผลิตภัณฑ์ (ตอบได้มากกว่า 1 ข้อ)

( ) ซึมซาบเข้าสู่ผิวช้า ( ) เหนียวเหนอะหนะ

( ) กลิ่นแรงเกินไปหรือน้อยเกินไป ( ) สีและกลิ่นไม่น่าใช้

( ) ให้ความชุ่มชื้นในระยะเวลาสั้น ( ) การกระจายตัวได้ยาก

( ) ขณะทาเกิดเป็นสีขาวเกาะผิว ใช้เวลานานในการเกลี่ย ( ) ข้นมากเกินไป

( ) เหลวมากเกินไป

( ) อื่น ๆ โปรดระบุ.....

10. กรุณาให้ **คะแนนความชอบ** ด้านต่างๆ ให้ตรงกับความชอบที่มีต่อผลิตภัณฑ์ (กรุณาให้เครื่องหมาย ✓ ในช่องว่างให้ตรงกับความรู้สึกของท่าน)

คุณลักษณะ	ไม่ชอบมากที่สุด	ไม่ชอบมาก	ไม่ชอบปานกลาง	ไม่ชอบเล็กน้อย	เฉย ๆ	ชอบเล็กน้อย	ชอบปานกลาง	ชอบมาก	ชอบมากที่สุด
1.ความชอบโดยรวม									
2.สีของเซรัม									
3.กลิ่นของเซรัม									
4.ความข้นหนืด									
5.การกระจายตัวบนผิวหน้า									
6.ความชุ่มชื้นผิวภายหลังการใช้									
7.ความเนียนนุ่ม/เรียบเนียนผิวภายหลังการใช้									
8.ความสามารถลบริ้วรอยร่องลึกบนผิวหนัง									
9.รู้สึกเบาสบายไม่เหนียวเหนอะหนะหลังใช้									
10. การซึมเข้าสู่ผิว									

11. ท่านมี ความพึงพอใจ อย่างไรเกี่ยวกับคุณสมบัติที่มีในผลิตภัณฑ์เซรัมลบริ้วรอยและชะลอความแก่ภายหลังการทดลองใช้ (กรุณาให้เครื่องหมาย ✓ ในช่องว่างให้ตรงกับความคิดเห็นของท่าน)

คุณสมบัติ	ระดับความพึงพอใจ				
	น้อยที่สุด	น้อยมาก	ปานกลาง	มาก	มากที่สุด
1.สี					
2.กลิ่น					
3.ความสามารถลดริ้วรอย					
4.ความชุ่มชื้นหลังใช้					
5.ยกกระชับและเนียบผิว					
6.ความขาวขึ้นของผิว					

12. หากผลิตภัณฑ์มีวางจำหน่ายในท้องตลาดท่านจะซื้อหรือไม่

( ) ซื้อ (ข้ามไปตอบข้อ 14) ( ) ไม่ซื้อ (ตอบข้อ 13 ต่อ)

13. เหตุผลที่ไม่ซื้อผลิตภัณฑ์

( ) ใช้แล้วเกิดอาการแพ้ เช่น เกิดผื่นแดง, แสบและคัน ( ) เหนียวเหนอะหนะมากไป

( ) ลักษณะของเนื้อเซรัม ( ) ใช้แล้วผิวแห้ง

( ) อื่น ๆ โปรดระบุ .....

14. ราคาที่เหมาะสมในการจัดจำหน่ายผลิตภัณฑ์ต่อ 50 กรัม (ยูเซอรีน ราคา 950 บาท *)

( ) น้อยกว่าผลิตภัณฑ์ตลาด ( ) เท่ากับผลิตภัณฑ์ตลาด

( ) มากกว่าผลิตภัณฑ์ตลาด

15. ข้อเสนอแนะอื่นๆ (ถ้ามี)

.....

.....

.....

หมายเหตุ * ราคาสินค้าสำรวจที่ห้างสรรพสินค้าสาขาเซ็นทรัลลาดพร้าว เมื่อ พฤศจิกายน 2552

ขอบคุณค่ะ

Questionnaire Quality Assessment Method.

1. On conducting the research, the surveying tools which are questionnaires and computer were created for use in data surveying and analysis, researcher creates the questionnaires by own self derived from the concept as a result of the study from the documents and research work relating to the anti-wrinkle cosmetics by dividing the questionnaire into 2 steps which were data on consumers who give their replies in responding to the general questionnaire and those who give replies specifically on the anti-wrinkle products that mix with niosomes entrapped with oil and sericin.

2. The instrument test begins to run from the creation of the questionnaire by making presentation to sensory evolution test advisor to determine the accuracy of the contents and the questionnaire will then be improved at the advices of the Advisor. Thereafter, the questionnaires are brought to 3 persons well-versed in the specific field which are the experts engaged in cosmetic business and consumer test advisor and cosmetic analyst to determine the accuracy of the contents for more perfection. Thereafter, the questionnaire reliability test is conducted with a sampling group of the population and the result of the test is always steadily achieved with the Reliability value of more than 0.6. Such result signifies that this set of questionnaire is reliable and worthwhile using for the study. Thereafter, the questionnaire is conducted with the real sampling group which is the group of population of female sex aged 25 and over by distributing random sampling questionnaires according to the occupational group by relying on the principle of probability of 30 sets for home use test distributions for 4 weeks and, next, result of the research will be improved in order to

find the errors where the reliability coefficient value level of which must be equal to 0.97 in order to obtain the clarity before the questionnaires are used for further inquiries

3. After good questionnaires are achieved, 300 sets of them will be distributed to target sampling group being female sex aged 30 and over residing in Bangkok and its perimeter together with distributing serum products. During the period of conducting the research from December to January, questionnaires are distributed directly to the persons designated to be the target group using the products for a period of 4 weeks and, thereafter, the questionnaires are gathered from the target group by own self for data processing. In such data processing, the data from all sets of the questionnaires must be gathered in order that the accuracy can be reviewed; the replies sorted out and classified in groups including reply coding, printing and feeding data for processing by computer by using SPSS program for statistical data analysis where the percentage and variable mean are achieved and then, from that point, conclusion is made and relevant report written. (Chompreeda P. and Rimkhiri H., 2002).

Product Test Volunteer Selection Basis.

1. Person of good health: volunteer is required to fill data in health data form. She must be a person of good health; not being sick of preventable disease; her annual checkups must be regularly conducted; she must not be hooked to addictive substances; such as, alcoholic beverages and smoking.

2. The ages from 25 to 65 years; female sex; living in the Bangkok areas and its perimeters and able to travel for taking the tests.

3. After a good health volunteer has been recruited, appointment shall be made; test timetables prepared and the products given to her.

4. Things ought to know and do while skin tests are conducted: By beginning with the designation of the point or the area to be measured which is the facial area both on the left and right sides by fixing the certain position. The volunteer must thoroughly clean her face with the prescribed cleaning substance in order to make her face cleaned. Next, her body shall suitably be adjusted in the temperature-controlled room of 20±2 degree celsius under the moisture of 50±5% for 10 minutes. Applying the product and then measuring the initial skin quality (to) and, afterwards, the product shall be brought back home for use. Following the due date of two week periods, the volunteer shall return to get her skin condition measured as original practiced.

APPENDIX E

The estimated cost of niosomes entrapped with None Ruesee strain silkworm extracts containing sericin and oil

Table E1 Estimated cost calculation of oil from the silkworm pupa

Raw material	Unit price /kg.	Unit price /grams	Quantity (grams/1000g)	Raw material costs (Baht)
Oil silkworm	120	0.12	25	3
D.I. water	65	0.065	4,000	260
Filter paper	430	4.30	6	25.8
GF/A filter paper	14,000/30m.	466.7	2 ม.	933.4
Power (volt)	-	2.5 unit	65ชม.	162.5
				1,384.7
Costs/1000 g of initiative raw material	35.2% of initiative raw material			
Costs/1000 g of product	(1000*1772.2)/352.0 = 3,933.8			

Table E2 Estimated cost calculation of sericin from silk cocoon

Raw material	Unit price /kg.	Unit price /grams	Quantity (grams/1000g)	Raw material costs (Baht)
Sericin	3,933.8	3.9338	5	19.7
D.I. Water	65	0.065	1700	110.5
Cholesterol	5,500/100g	275	5	1,375
Chloroform	800/2,500ml	0.32	1000	320
Tween 61	2,806/500g	5.612	8	44.9
Power (volt)	-	2.5 unit	115 hr.	287.5
				2,157.6
Costs/1000 g Of the initiative raw material	4.91% of initiative raw material			
Costs/1000 g of product	(1,000*2157.6)/49.1 = 43,942.9			

Table E3 Costs of the serum with base compositions

Raw material used	Quantity used (g/1000 g)	Cost per unit (Baht/ 1000 g)	Cost (Baht)
Water	679	50	33.95
Sodium EDTA	0.5	250	0.125
Glycerin	30	75	2.25
Carbopo®Ultrez21 polymer	2	1,000	2
Triethanolamine	5	150	0.75
C14-22 alkylalcohol and C12-20 alkylglucoside (Montanov L)	16	750	12
Simusol 165	4	800	3.2
Propylene glycol	15	650	9.75
Florasun 90	23	800	18.4
Silsense™ DW-18	30	1,100	33
Finsolv TN	20	320	6.4
Octyldodecanol	15	280	4.2
Octyl palmitate	20	280	5.6
Floramac® 10	10	2,200	22
Tocopheryl acetate	2	900	1.8
Vitamin A 0.01%	1	54,000	54
Panthanol	2	450	0.9
Butylated hydroxytoluene	1	1,100	1.1
Shea butter	4	550	2.2
Methyl paraben	1	220	0.22
Propyl paraben	1	240	0.24

Table E3 Costs of the serum with base compositions (continued)

Raw material used	Quantity used (g/1000 g)	Cost per unit (Baht/1000 g)	Cost (Baht)
Germaben® II E	4	750	3
Cyclopentasiloxane,dimethiconol,dimethicone crosspolymer (and) phenyltrimethicone blend (DCCB 3031)	15	350	5.25
sericin	14	5,000	70
Water D.I.	60	50	3
Sodium Polyacrylate (and)dimethicone (and) cyclopentasiloxane (and)trideceth-6 (and) PEG/PPG -18/18dimethicone (DCRM 2051)	20	1,300	26
Perfume	6	1,542	9.252
musk	0.3	1,100	0.33
Total			330.9

Note: Loss of weight during the production process (% weight loss) was equal to10%.

APPENDIX F

Cosmetic ingredients and raw material specifications

Table F 1 The of common names and international nomenclature of cosmetic ingredients

International nomenclature of cosmetic i ngredients	Common names	Function
Arachidyl alcohol [and] behenyl alcohol [and] arachidyl glucoside	Montanov 202	Self emulsifier
Cetearyl alcohol/Cetearyl glucoside	Montanov 68	Emulsifier
Isononyl isononanoate	Lanoll 99	Emollient
Dipalmitoylhydroxy Proline	Sepilift DPHP	Whitening agent
Cetearyl Olivate, Sorbitan Olivate	Olivem 1000	Self emulsifier
Cetyl Palmitate, Sorbitan Palmitate, Sorbitan Olivate.	Oliwax LC	Vegetal wax
Caprylic/Capric Triglyceride	Capric triglyceride	Emulsifier, Solubilizer, Moisturizer
Jojoba Esters 60	Floralester 60	Emollient,wax Lubricant, Moisturizer
Cetyl/Stearyl alcohol	Laurex CS	Emulsifier, Thickener
Cyclopentasiloxane (and) dimethicone/vinyl dimethicone crosspolymer	SFE 839	Silicone
Dimethyl polysiloxane, Polydimethylsiloxane,	Dimethicone TSF 451-100	Silicone oil
Tocopherol	Vitamin E	Antioxidant

Table F 1 The of common names and international nomenclature of cosmetic ingredients (continued)

International nomenclature of cosmetic ingredients	Common names	Function
PEG-100 Stearate & Glyceryl stearate	Simusol 165	Emulsifier, Thickener, Moisturizer
Arylates/C10-30 alkyl acrylate crosspolymer	Carbopol ® Ultrez 21 Polymer	Thickening, Stabilizing, Suspending
Water & Hexapeptide-11	Peptamide 6	Anti-aging agent
1,3-bis(hydroxymethyl)-5,5-dimethylimidazolidine-2,4-dione	DMDM hydantion	Preservative
Prop-2-enoic acid	Carbomer 940	Thickening, Suspending Stabilizing
Helianthus Annus (Sunflower) Seed Oil	Florasun 90	Emollient
Dimethicone PEG-7 Isostearate	Silsense™ DW-18	Silicone
C12-15 Alkyl Benzoate	Finsolv TN	Emollient ester.
Octyldodecanolum	Octyldodecanol	Emollients, Thickeners, Emulsifiers
2-Ethylhexyl palmitate	Octyl palmitate	Emollients, Thickeners Emulsifiers
Ethly Macadamiate (and) Tocopherol (and) Malic Acid]	Floramac® 10	Emollient
Cyclomethicone & Dimethicone Copolyol	SF 1328	Silicone
Butylated hydroxytoluene	BHT	Antioxidant
Nitro musk fragrances	Musk	Fixative

Table F 1 The of common names and international nomenclature of cosmetic ingredients (continued)

International nomenclature of cosmetic ingredients	Common names	Function
Sodium Polyacrylate (and) Dimethicone (and) Cyclopentasiloxane (and) Trideceth-6 (and) PEG/PPG-18/18 Dimethicone	DCRM 2051	Thickening Agent
Cetearyl Alcohol (and) Ceteth-20 Phosphate (and) Dicetyl Phosphate	Crodafos CS-20 acid	Emulsifier
PPG-3 Benzyl Ether Myristste	Crodamol STS	Emollient ester
Polyacrylamide and C13-14 isoparaffin and laureth-7	Sepic gel 305	Stabilizing and thickening agent
Butyrospermum Parkii	Shea butter	Moisturizer
Phytelene EG 88 chamomile	Phytelene chamomile	Skin lightening
Phenoxyethanol / methylparaben / ethyl paraben / propylparaben / butylparaben	Sepicide HB	Preservative
Imidazolidinyl urea	Sepicide CI	Preservative
Sodium acrylate/acryloyldimethyl taurate copolymer (and) isohexadecane (and) polysorbate 80	Simugel EG	Emulsifier and stabilizing
Propylene Glycol (and) Diazolidinyl Urea (and) Methylparaben (and) Propylparaben	Germaben® II E	Preservative
Cyclopentasiloxane,dimethiconol,dimethicone crosspolymer (and) phenyltrimethicone blend	DCCB 3031	Thickening agent
Sodium Polyacrylate (and)Dimethicone (and) Cyclopentasiloxane (and)Trideceth-6 (and) PEG/PPG -18/18Dimethicone	DCRM 2051	Thickening agent

Raw material specification

1. Promois® SERICIN-P (SEIWA KASEI Co. Ltd., Japan)

Promois" was our trade name for polypeptide and its derivatives obtained through hydrolysis of various proteins. Being originated from natural resources, "Promois" was ecological human friendly raw material. "Promois" was hydrolyzed protein which had proper molecular weight in cosmetic use. It can bring out some effective results to skin or hair as moisturizing, protecting and repairing. Which type of origin and chemical-modification were used can differ its nature and characteristics

INCI Name	Sericin
M.W	2000
Appearance	White to light yellow powder
pH	5.0-8.0 (1% water solution)
Purity (Heavy metals)	20 ppm Max.
Purity (Arsenic)	2 ppm Max.
Loss on drying	12 % Max.
Nitrogen	13.0-18.0 %
Primary skin irritation	Non-irritation (10% solution)
Eye irritation (HET-CAM)	Non irritation (2 % solution, chorioallantoic membrane)
Reverse mutageneous (AMES)	Non-mutagenic (10 % solution)
Skin sanitization	Non-irritation (10 % solution)

Amino acid composition (mg/100 g)

Glycine	15.0	Hydroxyproline	0.0
Arginine	3.1	Alanone	6.0

Threonine	7.7	Histidine	1.9
Valine	3.6	Serine	28.0
Lysine	1.8	Leucine	1.2
Tyrosine	1.4	Hydroxylysine	0.0
Isoleucine	0.9	Half cystine	0.8
Aspartic acid	18.6	Phenylalanine	0.0
Cysteic acid	4.2	Glutamic acid	5.7
Proline	0.0	Methionine	0.2

Promois® SERICIN-P has much of serine which human natural moisturizing factor (NMF) highly contains and it is quite superior in moisturizing.

2. Naomi Fragrance

Physical aspect	Liquide incolore a jaune pale / colourless to pale yellow liquid
Specific gravity	0.986-1.006
Refractive index	1.454-1.464
Flash point	> 100 °C – closed up

Composition on ingredients

Geraniol (with citronellol)	$0 \leq x\ \% < 2.5\ \%$
Hexyl cinnamic aldehyde	$2.5 \leq = \% < 1\ \%$
1,3,4,6,7,8- Hexahydro-4,6,6,8,9-hexamethyl-indeno [5,6-C] pyran	$0 \leq x\ \% < 2.5\ \%$
P-tert-butyl alpha-methyldih ydrocinnmic aldehyde (lilial)	$2.5 \leq = \% < 1\ \%$

Butylated hydroxytoluene	$0 \leq x\ \% < 2.5\ \%$
Citronellol	$0 \leq x\ \% < 2.5\ \%$
Citronellyl acetate	$0 \leq x\ \% < 2.5\ \%$
Cis-3-hexenyl salicylate	$0 \leq x\ \% < 2.5\ \%$
Ionone beta	$0 \leq x\ \% < 2.5\ \%$
Linalool	$2.5 \leq = \%$ < 1 %
3-methyl-5-phenylpentanol	$0 \leq x\ \% < 2.5\ \%$

CURRICULUM VITAE

NAME Miss Supanida Winitchai

DATE OF BIRTH November 29, 1986

EDUCATION

1987-1991 Biotechnology B.Sc.(Science) Rangsi, University, Bangkok, THAILAND
1994-1995 Certification of Quality Assurance Agriculture and Agro-Industrial. Product. Agriculture and Agro-Industrial Product. Kasetsart University, Bangkok, THAILAND
1995-1998 M.Sc.(Science) Product Development Kasetsart University, Bangkok, THAILAND
2005-2010 Ph.D. (Pharmaceutical Science). Pharmaceutics. Chang Mai University,Chang Mai, THAILAND

SCHOLARSHIPS AND AWARDS

-Best Personnel Award of Kasetsart University, 2007

-Research foundation the 12 th Presentation Ceremony Thailand

Toray Science

RESEARCH EXPERIENCES

1. Raw material and cosmetics product from agricultural materials
2. Product development
3. Microbiology in cosmetics
4. Sensory in cosmetics and quality control in cosmetic products

WORK EXPERIENCES

1991-1994: Head Section of tropical fruit product, Pineapple Ltd. (public) Prachoapkhirikhn Province. Thailand.

1994-1995: Supervisor, Grander Pharmacy, Ltd, Bangkok, Thailand

1998-persent: Researcher, Kasetsart Agriculture and Agro-Industrial Product Improvement Institute (KAPI), Kasetsart University, Bangkok, Thailand

SCIENTIFIC PUBLICARIONS

Manosroi A., Boonpisuttinant K., Winitchai S., Manosroi W., Manosroi J., 2010. Free radical scavenging and tyrosinase inhibition activity of oils and sericin extracted from Thai native silkworms (*Bombyx mori*). Pharmaceutical Biology 48:855-860.

Winitchai S, Manosroi A, Manosroi J. and Boonpisuttinant K.2010. Free Radical Scavenging Activity, Tyrosinase Inhibition Activity and Fatty Acids Compositions of the Native Thai Silkworm Pupae (*Bombyx mori* L.) Oils. The proceeding of 48 th Kasetsart University Annual Conference, Bangkok (Thailand), 3-5February, 2010. Vol 8.345-353p. (Poster presentation)

SCIENTIFIC PRESENTATAIONS

Silpradit, K, Rimkeeree H,Tadakittasarn S, Winitchai, Haruthaithanasan V. 2009. Optimization of rice bran protein hydrolysate production using alcalase. Food innovation asia. Conference. 18-19 June..88p. Bitec Bangkok, Thailand. (Poster presentation)

Silpradit, K, Rimkeeree H, Tadakittasarn S, Winitchai S, Haruthaithanasan V. 2009. Consumer behavior and consumer need in skin firming or skin care products in Bangkok, Thailand. The 14th National Graduate Research Conference. September 10-11, 2009. King Mongkut's University of Technology North

Bangkok. (Oral presentation)

Winitchai,P, Manosroi,A,and Manosroi,J. Effect of native Thai silk varieties (*Bombyx mori L.*) and extraction method on chemical compositions of silkworm oil for food and cosmetics applications. The proceeding of 46th Kasetsart University Annual Conference. 29 January -1 February 2008.Vol 7. 435-443p. (Poster)

Manosroi,J.,Winitchai,P.,Boonpisuttnant,S.,Sundhrarajun,S and Manosroi,A. Free radical scavenging activity of saboo dum (*Jatropha curcas L.)* oil. The International Workshop on Medical & Aromatic Plants. Royal Flora Ratchaphruek 15-18 January 2007. Lotus Pang Suan Kaew Hotel. Chiang Mai, Thailand.

Manosroi A, Boonpisuttnant S, Winitchai P, and Manosroi.J.2007. Free Radical Scavenging activity and Tyrosinase Inhibition Activity of Physic Nut (*Jatropha curcas L.)* Seed oil Entrapped in Niosome for Cosmeceuticals. The 1st Thailand National Nanotechnology Conference on Nanomaterial, Pharmaceuticals,Devices and their Application, August 14-16, The Empress Hotel, Chiang Mai, Thailand. (Oral Presentation)

Winitchai,P., Manosroi,J.,Boonpisuttnant,S.,Sundhrarajun,S and Manosroi,A. 2006. Free radical scavenging activity of the native Thai silk worm pupae oil. The international workshop on medical and aromatic plants. Royal Flora Ratchaphruek. Lotus Pang Suan Kaew Hotel Chiang Mai, Thailand. January 15-18, 2007. 81 p

Supjarean S, Rimkeeree H, Chantrpornchai W, and Winitchai S. 2007. Development of leave on hair care product with rice bran Protein. The 1 st Symposium on Cosmetics and Health Innovations.(CHI2007) May 26-27.40-44p .

Winitchai P, Thanapane W, Kongtud W, Ruangmarerng J, Meewang C, and Supjarean S. 2006. Antimicrobial property of the essential oil and crude extract from Patchouli leaves (*Pogostemon cablin).*Abstracts. Science and technology for sufficiency Economy.32 nd Congress Science and Technology of Thailand (STT 32).October 10-12,(Poster).February, 664p.

Manosroi,J.,Winitchai,P.,Boonpisuttnant,S.,Sundhrarajun,S and Manosroi,A. Free radical scavenging activity of saboo dum (*Jatropha curcas L.)* oil. The

International Workshop on Medical & Aromatic Plants. Royal Flora Ratchaphruek .15-18 January 2007. Lotus Pang Suan Kaew Hotel. Chiang Mai, Thailand. 82p. (Poster presentation)

Jessadaporn Ruangmarerng, Pongsiri Winitchai. Jessadaporn Ruangmarerng, Hathairaral Rimkeeree, and Vichai Haruthaithanasan. Development of Scrub Cream with Silica from Rice Husk. The seventh national seminar on Pharmaceutical biotechnology "Innovation: Applications of nanotechnology in pharmaceuticals,cosmetics and natural products" the seventh national seminar on pharmaceutical biotechnology. By Chiang Mai University, Thailand, Nanoscience and Nanotechnology research center. Faculty of science, National Nanotechnology Center.9-11August 2006. 261-262p.Book: ISBN 974-656-990-2.(Poster)

Manosroi,J.,Winitchai,P.,Boonpisuttnant,S.,Sundhrarajun,S and Manosroi,A. 2007.Free radical scavenging activity of the native Thai silk worm pupae oil. the International Workshop on Medical & Aromatic Plants. Royal Flora Ratchaphruek .15-18 January 2007. Lotus Pang Suan Kaew Hotel. Chiang Mai, Thailand.81p. (Poster presentation) *International presentation

Rosalind C. P, Thanapase W. and Winitchai P. 2001. American consumer and retailer Attitudes to wards Hand-Made Thai paper crafts, 2001. In proceeding of the International Symposium on paper Mulberry and Hand-made paper for Rural Development 19-24 March, Bangkok Thailand.

Manosroi A, Boonpisuttinant S, Winitchai P, and Manosroi J. 2007. Free Radical Scavenging Activity of Oil and Sericin Extracted from Thai Native Silk Variety, Somrong (*Bombyx Mori*) Entrapped in Niosomes for Cosmeceuticals" The 33rd Congress on Science & Technology, Thailand (STT33), Science and Technology for Global Sustainability. October, 18-20, 2007. Walailak University, Nakhon Si Thammarat, Thailand. (Oral presentation)

Manosroi A, Boonpisuttinant S, Winitchai P and Manosroi J. 2007. Free Radical Scavenging and Tyrosinase inhibition Activity of Physic Nut (*Jatropha curcas* Linn.) Seed Oil Entrapped in Niosomes" The 3rd Academic Day, Research Path: Towards a green and Happy Society. November 23-25, 2007.

Chiang Mai University, Chiang Mai, Thailand. (Poster presentation)

Winitchai, P., Manosroi, A., Manosroi, J., and Boonpisuttnant, S.2008. Effect of native Thai silk varieties (*Bombyx mori* L.) and extraction method on chemical compositions of silkworm oil for food and cosmetics applications. The proceeding of 46th Kasetsart University Annual Conference. January 29 February 1, 2008. Vol 7. 435-443p. (Poster presentation)

Winitchai S, Vaithanomsat P. and Apiwattanapiwat W. 2008. Development of facial clay mask containing pineapple bromelain. The proceeding of 46 th Kasetsart University Annual Conference, Bangkok (Thailand), January 29 February 1, 2008. Vol 7. (Poster presentation)

Winitchai S and Vaithanomsat P. 2010. Free Radical Scavenging and Tyrosinase Inhibition Activity of Eri Silk Cocoons (*Philosamia recini*) Protein Hydrolysate. The proceeding of 48 th Kasetsart University Annual Conference, Bangkok (Thailand), 3-5 February, 2010. Vol 6.252-259p. (Poster presentation)