REFERENCES

Thai

ก่องกานดา ชายามมฤต. 2540. สมุนไพรไทย. กรุงเทพมหานคร : กรมป่าไม้.

นันทวัน บุณยะประภัศร. 2533. ก้าวไปกับสมุนไพร. กรุงเทพมหานคร : คณะเภสัชศาสตร์ มหาวิทยาลัยมหิดล.

นันทวัน บุณยะประภัศร และ อรนุช โชคชัยเจริญพร, บรรณาธิการ. 2542 สมุนไพรไม้พื้นบ้าน. กรุงเทพมหานคร : สำนักพิมพ์ประชาชน.

นิจศิริ เรืองรังษี และ พะยอม ตันติวัฒน์. 2534. พืชสมุนไพร. กรุงเทพมหานคร : สำนักพิมพ์โอเดียนสโตร์.

วัฒนีย์ ปานจินดา. 2535. การติดตามการหายของแผลเรื้อรังภายหลังการทำแผลด้วยครีมเปลือกมังคุด 1.5 เปอร์เซ็นต์. วิทยานิพนธ์ปริญญามหาบัณฑิต สาขาวิชาพยาบาลศาสตร์ คณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล.

วันดี กฤษณพันธ์. 2537. สมุนไพรน่ารู้. กรุงเทพมหานคร : สำนักพิมพ์จุฬาลงกรณ์มหาวิทยาลัย.

เสาวลักษณ์ พงษ์ไพจิตร, เมตตา องค์สกุล, ลัดดา นิลรัตน์, ประสิทธิ์ ธราวิจิตรกุล, ศิริพรรณ บุญชู, ธวัชชัย เชื้อประไพศิลป์ และ พิเชษฐ์ วิริยะจิตรา. 2537. ฤทธิ์ของสารสกัดจากเปลือกมังคุดต่อ *Staphylococcus aureus* ที่ดื้อยา methicillin (mRSA) และ *Enterococcus species*. วารสารสงขลานครินทร์. ปีที่ 16 ฉบับที่ 4 : 399-405.

อัมพร ศรประสิทธิ์, แก้วตา ศรีปิยะรัตนกุล, ปราณี ช่วยยิ้ม และ เพียงวดี ธนกิติธรรม. 2530. การศึกษาทางพิษวิทยาเบื้องต้นของสารแมงโกสติน. วารสารสงขลานครินทร์. ปีที่ 9 ฉบับที่ 1 : 51-57.

English

American Society for Testing and Materials. 1997. Annual Book of ASTM standards; Part 35: Plastics-General test method; Nomenclature. Philadelphia, PA : n.p.

Anders, R., and Merkle, H.P. 1989. Evaluation of laminated mucoadhesive patchs for buccal delivery. Int. J. Pharm. 49: 231-240.

Anlar, S., Capan:, O. Guven, O., Gogus, A., Dalkara, T., and Hincal, A.A. 1994. Formulation and in vivo evaluation of buccoadhesive morphine sulfate tablet. Pharm. Res. 11(2): 231.

Arvanitoyanis, I.S., Nakayama, A., and Aiba, S. 1998. chitosan and gelatin edible films. Carbohydr. Polym. 37: 371-382.

Aulton, M.E., and Razzak, A. 1981. The mechanical properties of Hydroxypropyl methylcellulose films. Drug. Dev. Ind Pharm. 7(6): 649-668.

Begin, A., and Calsteren, M.R.V. 1999. Antimicrobial films produced from chitosan. Int. J. Biol. Macromol. 26:63-67.

Bremecker, K.D., Strempel, H., and Klein; G. 1984. Novel concept for a mucosal adhesive ointment. J. Pharm. Sci. 73(4): 548-552.

Brine, C.J., Sanford, P.A., and Zikakis, J.P. 1992. Advances in Chitin and Chitosan. London : Chapman and Hall.

Bruneton, J. 1995. Pharmacognosy and Phytochemistry Medicinal Plants. Paris : Lavoisier.

Budavari, s., ed. 1996. The Merck Index : An encyclopedia of chemicals, drugs and biologicals. 12 th ed. New Jersey : Merck.

Cartensen, J.T. 1990. Drug Stability. New York: Marcel Dekker.

Cassidy, J.P., Berner, B., Chan, K., John, V., Toon, S., Holt, B., and Rowland, M. 1993. Human transbuccal absorption of diclofenac sodium from a prototype hydrogel delivery device Pharm. Res. 10: 126-131.

Cassidy, J.P., Landzert, N.M., and Quadros, E. 1993. Controlled buccal delivery of buprenorphine. J. Controlled Release. 25: 21-26.

Castellanos, M.R.J., Zia, H., and Rhodes, C.T. 1993. Mucoadhesive drug delivery systems. Drug Dev. Ind. Pharm. 19(1-2): 143-194.

Cawson, R.A., and Odell, E.W. 1998. Essential of oral pathology and oral medicine. 6thed. London : Harcout Brace.

Ch'ng, H.S., Park, H., Kelly, P., and Robinson, T.R. 1985. Bioalhesive polymers as platforms for oral controlled drug delivery II. : Synthesis and evaluation of

some swelling, water-insoluble bioadhesive polymers. J. Pharm. Sci. 74(4): 399-405.

Chairungsrilerd, N. 1997. Chemical and Pharmacological studies on the constituents of thai medicinal plant *Garcinia mangostana*. Doctoral dissertation, Department of Pharmaceutical Molecular Biology, Faculty of Pharmaceutical Science, Tohoku University.

Chairungsrilerd, N., Furukawa, K., Ohta, T., Nozoe, S., and Ohizumi, Y. 1996. Histaminergic and serotonergic receptor blocking substances from the medicinal plant *Garcinia mangostana*. Planta Med. 62(5): 471-472.

Chen, L.T., and Cry, G.N. 1970. Composition producing adhesion through hydration. Adhesive in Biological System. New York : Academic Press.

Chen, S.X., Wan, M., and Loh, B.N. 1996. Active constituents against HIV-1 protease from *Garcinia mangostana*. Planta Med. 62(4): 381-382.

Collins, A.E., and Deasy, P.B. 1990. Bioadhesive lozenge for the improved delivery of cetylpyridinium chloride. J. Pharm. Sci. 79(2): 116-119.

Duchene, D., Touchard, F., and Peppas, N.A. 1988. Pharmaceutical and medical aspects of bioadhesive systems for drug administration. Drug Dev. Ind. Pharm. 14(2-3): 283-318.

Dumitriu, S. 1994. Polymer Biomaterial. New York : Marcel Dekker.

Felt, O., Buri, P., and Gurny, R. 1988. Chitosan : A unique pdysaccharide for drug delivery. Drug Dev. Ind. Pharm.

Flebrig, I., Harding, S.E., Row, A.J., and Hyman, S.C. 1995. Transmission electron microscopy studies on pig gastric mucin and its interactions with chitosun. Curbohydr. Polym. 28: 239-244.

Farnsworth, N.R., and Bunyapraphatsara, N. 1992. Thai Medicinal Plants. Bangkok : Prachachon.

Gandhi, R.B., and Robinson, J.R. 1988. Bioadhesion in drug delivery. Indian J. Pharm. Sci. 50(3): 145-152.

Gaserod, O., Jolliffe, I.G., Hampson, F.C., and Dettmar, P.W. 1998. The detachment of the bioadhesive properties of calcium alginate gel beads by coating with chitosan. Int. J. Pharm. 175: 237-246.

Govindacharit, T.R., Kalyanaraman, P.S., Muthukumaraswamy, N., and Pai, B.R. 1971a. Isolation of three new xanthones from *Garcinia mangostana* Linn. Indian J. Chem. 9: 505-506.

Govindacharit, T.R., Kalyanaraman, P.S., Muthukumaraswamy, N., and Pai, B.R. 1971b. Xanthones of *Garcinia mangostana* Linn. Tetrahedron 27: 3919-3926.

Guo, J.H. 1994. Investigation of surface properties and bioadhesive of buccal patch. J. Pharm. Pharmacol. 46: 647-650.

Guo, J.H., and Cooklock, K.M. 1996. The effects of backing materials and multilayered systems on the characteristics of bioadhesive buccal patches. J. Pharm. Pharmacol. 48: 255-257.

Gupta, A., Garg, S., and Khar, R.K. 1994. Interpolymer complexation and its effect on bioadhesive strength and dissolution characteristic of buccal drug delivery. Indian Drug. 28: 315-325.

Gurny, R., Meyer, J.M., and Peppas, N.A. 1984. Bioadhesive intraoral release systems : Design, testing and analysis. Biomaterials 5: 336.

Henriksen, I., Green, K.L., Smart, J.D., Smistad, G., and Karlsen, J. 1996. Bioadhesion of hydrated chitosans. Int. J. Pharm. 145: 231-240.

Higuchi, T. 1963. Mechanism of sustained-action medication : Theoretical analysis of rate of release of solid drugs dispersed in solid matrices. J. Pharm. Sci. 52 (12): 1145-1149.

Iinuma, M., Tosa, H., Tanaka, T., Asiai, F., Ashi, Y.K., Shimano, R., and Miyauchi, K.I. 1996. Antimicrobial activity of xanthones from Guttiferaeous plants against Methicillin-resistance. *Staphylococcus aureus*. J. Pharm. Pharmacol. 48: 861-865.

Ilango, R., Kavimani, S., and Jayakar, B. 1997. In vitro studies on buccal strips of glibenclamide using chitosan. Indian. J. Pharm. 59: 232-235.

Ishida, M., Machida, Y., Nambu, N., and Nugai, T. 1981. New mucosal dosage form of insulin. Chem. Pharm. Bull. 29(3): 810-816.

Ishida, M., Nambu, N., and Nagai, T. 1982. Mucosal dosage form of lidocaine for toothache using hydroxypropyl cellolose and carbopol. Chem. Pharm. Bull. 30(3): 980-984.

Ishida, M., Nambu, N., and Nagai, T. 1983a. Ointment type oral mucosal dosage form of carbopol containing prednisolone for treatment. of aphtah. Chem. Pharm. Bull. 31(3): 1010-1014.

Ishida, M., Nambu, N., and Nagai, T. 1983b. Highly viscous gel ointment containing carbopol for application to the oral mucosa. Chem. Pharm. Bull. 31(12): 4561-4564.

Jabbari, E., Wisniewski, N., and Peppas, N.A., 1993. Evidence of mucoadhesion by chain interpenetration at a poly (acrylic acid)/mucin. J. Controlled Release. 26: 99-108.

Jones, D.S., Woolfson, A.D., and Brown, A.F. 1997. Textural, viscoelastic and mucoadhesive properties of pharmaceutical gels composed of cellulose polymers. Int. J. Pharm. 151: 223-233.

Kellaway, I.W. 1990. Bioadhesion : Possibilities and Future Trends. Stuttgart.

Kim, C.J. 2000. Controlled release dosage form design. USA: Technormic.

Kim, J.H., Kim, J.Y., Lee, Y.M., and Kim, K.Y. 1992. Properties and swelling characteristics of cross-linked poly (vinyl alcohol)/chitosan blen membrane. J. Appl. Polym. Sci. 45: 1711-1717.

Leffler, C.C., and Muller, B.W. 2000. Influence of the acid type on the physical and drug liberation properties of chitosan – gelatin sponges. Int. J. Pharm. 194: 229-237.

Lehr, C.M., Bodde, H.E., Bouwstra, J.A., and Junginger, H.E. 1993. A surface energy analysis of mucoadhesion II: Prediction of mucoadhesive performance by spreading coefficients. Eur. J. Pharm. Sci. 1: 19-30.

Lehr, C.M., Bouwstra, J.A., Schacht, E.H., and Junginger, H.E. 1992. In Vitro evaluation of mucoadhesive properties of chitosan and some other natural polymer. Int. J. Pharm. 78: 43-48.

Leung, S.S., and Robinson, J.R. 1990. Polymer structure features contributing to mucoadhesion II. J. Controlled Release. 12: 187-194.

Lim, L.Y., and Wan, L.S.C. 1995. Heat treatment of chitosan films. Drug Dev Ind Pharm. 21(7) : 839-846.

Lopez, C.R., Portero, A., Jato, J.L.V., and Alonso, M.J. 1998. Design and evaluation of chitosan/ethylcellulose mucoadhesive bilayered devices for buccal drug delivery. J. Controlled Release. 55: 143-152.

Lorian, V. 1991. Antibiotics in Laboratory Medicine. 3rd ed. New York : Williams and Wilkins.

Mahabusarakam, W., and Wiriyachitra, P. 1987. Chemical constituents of *Garcinia mangostana* Linn. J. Nat. Prod. 50(3): 474-478.

Mahabusarakam, W., Wiriyachitra, P., and Phongpaichit, S. 1986. Antimicrobial activities of chemical comstituents from *Garcinia mangostana* Linn. J. Sci. Soc. Thailand. 12: 239-242.

Mahon, R.C., and Manuselis, G. 2000. Textbook of diagnostic microbiology. 2nd ed. Philadelphia: WB Saunders.

Markle, H.P., and Wolany, G.J.M. 1992. Buccal delivery of peptide drugs. J. Controlled Release. 21: 155.

Mathiowitz, E. 1999. Encyclopedia of Controlled Drug Delivery. New York : Wiley Interscience.

Mathiowitz, E., Chickering, D.E., and Lehr, C.M. ed. 1999. Bioadhesive Drug Delivery Systems : Fundamental Novel Approaches, and Development. New York : Marcel Dekker.

Miyazaki, S., Yamaguchi, H., and Takada, M. 1990. Pharmaceutical application of biomedical polymers. 2: 401-406.

Mortazavi, S.A. 1995. Aninvitro assessment of mucus/mucoadhesion interaction. Imt. J. Pharm. 124: 173-182.

Mortazavi, S.A., and Smart, J.D. 1994. An in vitro method for assessing the duration of mucoadhesion. J. Controlled Release. 311: 207-212.

Nagai, T., and Machida, Y. 1985. Mucosal dosage form of insulin. Pharm. Int. 6: 196.

Nigalaye, A.G., Adusumilli, P., and Bolton, S. 1990. Investigation of prolong drug release from matrix formulations of chitosan. Drug Dev. Ind. Pharm. 16(3): 449-467.

Nunthanid, J., Puttipipatkhachorn, S., Yamamoto, K., and Peck, G.E. 2001. Physical properties and molecular behavior of chitosan films. Drug Dev. Ind. Pharm. 27(2) : 143-157.

Nyqvist, H. 1983. Saturated salt solutions for maintaining specified relative humidities. Int. J. Pharm. Tech. 4(2): 47-48.

Okamoto Y., Nose, M., Miyatake K., Sekine, J. Oura, R., Shigemasa, Y., and Minami, S. 2001. Physical change of chitin and chitosan in canine gastrointestinal tract. Carbohydr. Polym. 44: 211-215.

Panomsuk, S.P., Hatanaka, T., Aiba, T., Katayama, K., and Koizumi, T. 1995. A study of the hydrophilic cellulose matrix. Chem. Pharm. Bull. 43(6): 994-999.

Park, K., and Robinson, J.R. 1984. Bioadhesive polymers as platforms for oral controlled drug delivery : Method to study bioadhesion. Int. J. Pharm. 19 : 107-127.

Patel, D., Smith, A.W., Grist, N., and Barnett, P. 1999. An in vitro mucosal model predictive of bioadhesive agents in the oral cavity. J. Controlled Release. 61: 175-183.

Patel, V.R., and Amiji, M.M. 1996. Preparation and Characterization of freez-dried chitosan PEO hydrogels for site specific antibiotic delivery in the stomach. Pharm. Res. 13: 588-593.

Peh, K., Khan, T., and Ch'ng, H. 2000. Mechanical, bioadhesive strength and biological evaluations of chitosan films for wound dressing. J. Pharm. Pharm. 3(3): 303-311.

Peh, K.K., and Wong, C.F. 1999. Polymeric films as vehicle for buccal delivery : Swelling, mechanical and bioadhesive properties. J. Pharm. Pharm. 2(2): 53-61.

Ponchel, G., Touchard, F., Duchene, D., and Peppas, N.A. 1987. Bioadhesive analysis of controlled–release system I : Fracture and interpenetration analysis in poly (acrylic acid) containing systems. J. Controlled Release. 5 : 129-141.

Perry, LM., Metzger, J. 1980. Medicinal Plants of East and Southeast Asia : Attributed Properties and Uses. England : The MIT Press.

Pyvik, K., and Graffner, C. 1992. Investigation of the applicability of a tensile testing for measuring mucoadhesion strength. Acta. Pharm. Nord. 4: 79-84.

Qaqish, R.B.Q., and Amiji, M.M. 1999. Synthesis of a fluorescent chitosan derivative and its application for the study of chitosan-mucin interactions. Carbohydr. Polym. 38: 99-107.

Rao, K.V.R., Buri, P. 1989. A novel in situ method to test polymers and coated microparticles for bioadhesion. Int. J. Pharm. 52: 265-270.

Rao, Y.M., Vani, G., and Chary, R.B.R. 1998. Design and evaluation of mucoadhesive drug delivery system. Indian Drug. 35(9): 558-565.

Rathbone, M.J. ed. 1996. Oral Mucosal Drug Delivery. New York : Marcel Dekker.

Ritthidej, G.C., Phaechamud, T., and Koizumi, T. 2002. Moist heat treatment on physicochemical change of chitosan salts films. Int. J. Pharm. 232: 11-22.

Rodo, B., and Russell, C.M. 1988. Performance of hydroxypropyl cellulose film former in normal and ulcerated oral mucosa. Oral Surg. 65: 699-703.

Rodu, B., Russell, C.M., and Desmarais, A.J. 1988. Clinical and chemical properties of a novel mucosal bioadhesive agent. J. Oral. Pathol. 17: 564.

Rossi, S., Fewari, F., Bonferoni, M.C., and Caramella, C. 2000. Characterization of chitosan hydrochloride-mucin interaction by means of viscosimetric and turbidimetric measurements. Eur. J. of. Pharm. Sci. 10: 251-257.

San, A.P., Heuij, J.T.M., and Tukker, J. 1992. Mucoadhesion of both film forming and non film forming of polymeric material as evaluation with the Wilhelmy plate method. Int. J. Pharm. 79: 97-105.

Saralump, P., Chuakul, W., Tensiririrkkul, R., and Clayton, T. 1996. Medicinal Plant in Thailand. Bangkok : Amarin.

Schor, J.M., Davis, S.S., Nigalaye, A., and Bolton, S. 1983. Susadrin transmucosal tablets. Drug Dev. Ind. Pharm. 9(7): 1359-1377.

Sen, A.K., Sarkar, K.K., Mazumder, P.C., Banerji, N., Uusvuorit, R., and Haset, T.A. 1980. A xanthone from *Garcinia mangostana*. Phytochemistry. 19: 2223-2225.

Sen, A.K., Sarkar, K.K., Mazumder, P.C., Banerji, N., Uusvuorit, R., and Haset, T.A. 1982. The structures of Garcinones A, B and C : Three new xanthones from *Garcinia mangostana*. Phytochemistry 21: 1747-1750.

Senel, S., Lkinei, G., Kas, S., Rad, A.Y., and Sargon, M.F. 2000. Chitosan films and hydrogels of chlorhexidine gluconate for oral mucosal delivery. Int. J. Pharm. 193: 197-203.

Singh, D.K., and Ray, A.R. 1995. Characterization of ghafted chitosan films. Carbohydr. Polym. 36: 251-255.

Skaugrud, O. 1989. Chitosan makes the grade. Manuef. Chem. 60: 31-35.

Smart, J.D. 1991. An in vitro assessment of some mucosa – adhesive dosage forms. Int. J. Pharm. 73: 65-74.

Smart, J.D., Kellaway, J.W., and Worthington, H.E.C. 1984. An in Vitro investigation of mucosa – adhesive materials for use in controlled drug delivery. J. Pharm. Pharmacol. 36: 295-299.

Soames, J.V., and Southam, J.C. 1985. Oral pathology. New York : Oxford University Press.

Sperling, L.H. 1992. Introduction to physical polymer science. USA : Wiley Interscience.

Sundaram, B.M., Gopalakrihnan, C., Subramanian, S., Shankaranarayanan, D., and Kameswaran, L. 1983. Antimicrobial activities of *Garcinia mangostana*. Planta Med. 48(1): 59-60.

Thacharodi, D., and Rao, K.P. 1993. Release of nifedipine through crosslinked chitosan membrane. Int. J. Pharm. 96: 33-39.

Tsuruta, T., Hayashi, T., and Kataoka, K. 1993. Biomedical application of polymeric material. Florida : CRC Press.

Veiilard, M.M., Longer, M.A., Martens, T.W., and Robinson, J.R. 1987. Preliminary studies of oral mucosal delivery of peptide drugs. J. Controlled Release. 6: 123-127.

Vengnaud, J.M. 1993. Controlled drug release of oral dosoge form. England : Ellis Horword.

Voyutskii, S.S. 1971. Some components on the series of papers : Interfacial contact and bonding in autoadhesion. J. Adhesion. 5: 69-76.

Warren, S.J, Kellaway, I. W., and Timmins, P. 1990. The in vitro characterization of mucoadhesive hydrogel material for the buccal delivery of peptides. J. Pharm. Pharmacol. 42: 140-145.

Wong, C.F., Yuen, K.H., and Peh, K.K. 1999. An in vitro method for buccal adhesion studies : Importance of instrument variables. Int. J. Pharm. 180 : 47-57.

Wu, S. 1970. Surface and interfacial tensions of polymer melts. II. : Poly (methyl-methacrylate), poly (n-butyl methacrylate), and poly styrene. J. Phys. Chem. 74: 632-638.

Yan, K.L., Khor, E., and Lim, L.Y. 2001. Chitosan-alginate films prepared with chitosan of different molecular weights. J. Biomed Mat. Res. 58(4) : 358-365.

APPENDICES

APPENDIX A

MATERIALS AND INSTRUMENTS

INSTRUMENTS

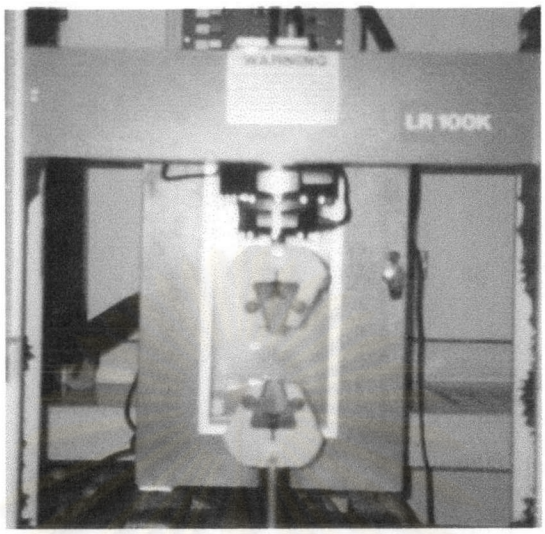

Figure 1A The tensile tester apparatus.

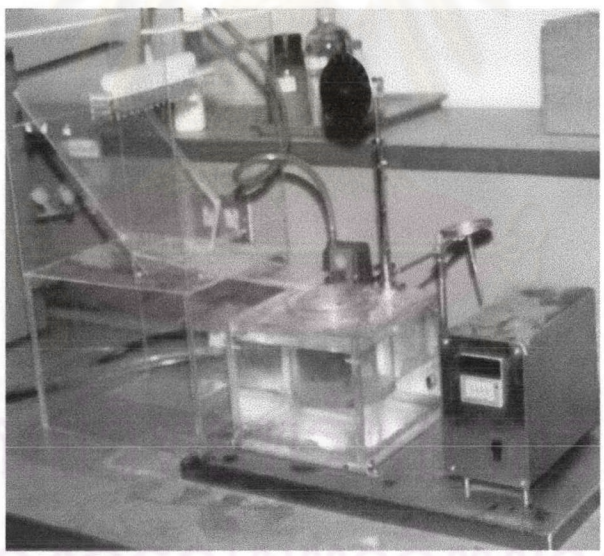

Figure 2A The water repellent and mucoadhesion tester apparatus.

MATERIALS

Isotonic pH 6.0 phosphate buffer solution

Sodium dihydrogen phosphate (dihydrate)	9.0 g.
Disodium hydrogen phosphate (dihydrate)	1.6 g.
Sodium chloride	5.1 g.
Purified water qs. Ad	1000.0 g.

Artificial saliva

Na_2S	0.160 mg.
$CO(NH_2)_2$	100.000 mg.
Mucin	300.000 mg.
Na_2HPO_4	60.000 mg.
$Mgcl_2$	0.136 mg.
KC1	40.000 g.
NaC1	39.832 g.
Purified water qs. ad	1.00 ml.

APPENDIX B
IDENTIFICATION AND MICROBIOLOGICAL STUDY DATA

IDENTIFICATION DATA

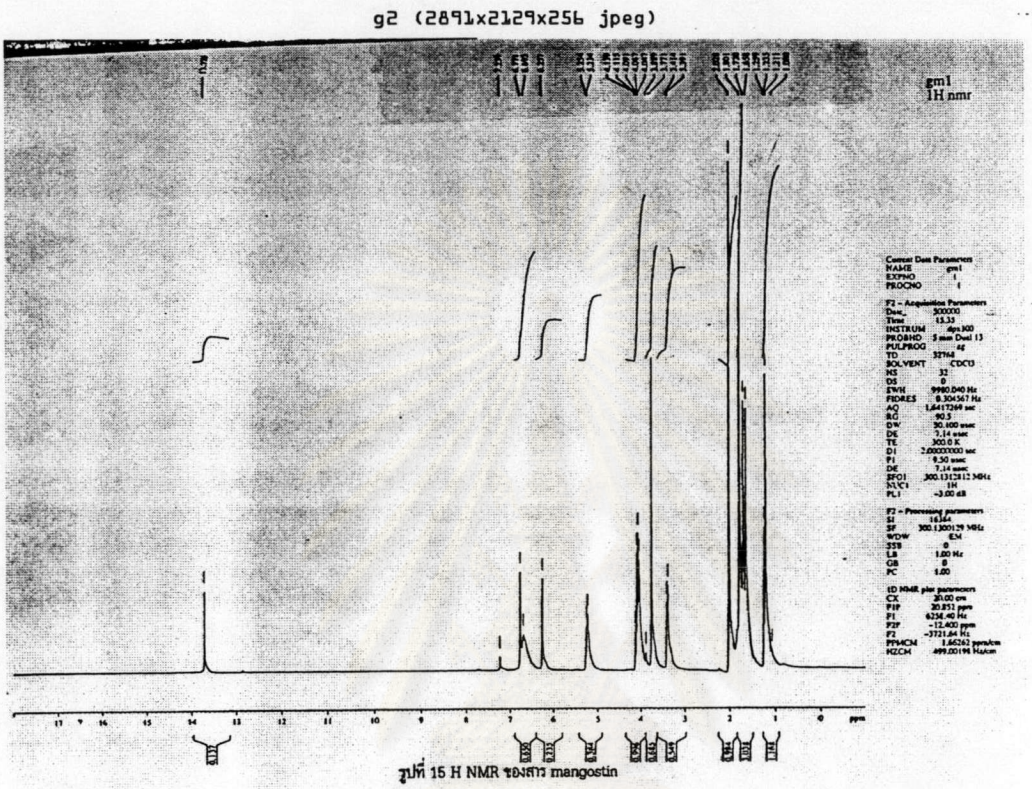

Figure 1B H NMR spectra of mangostin.

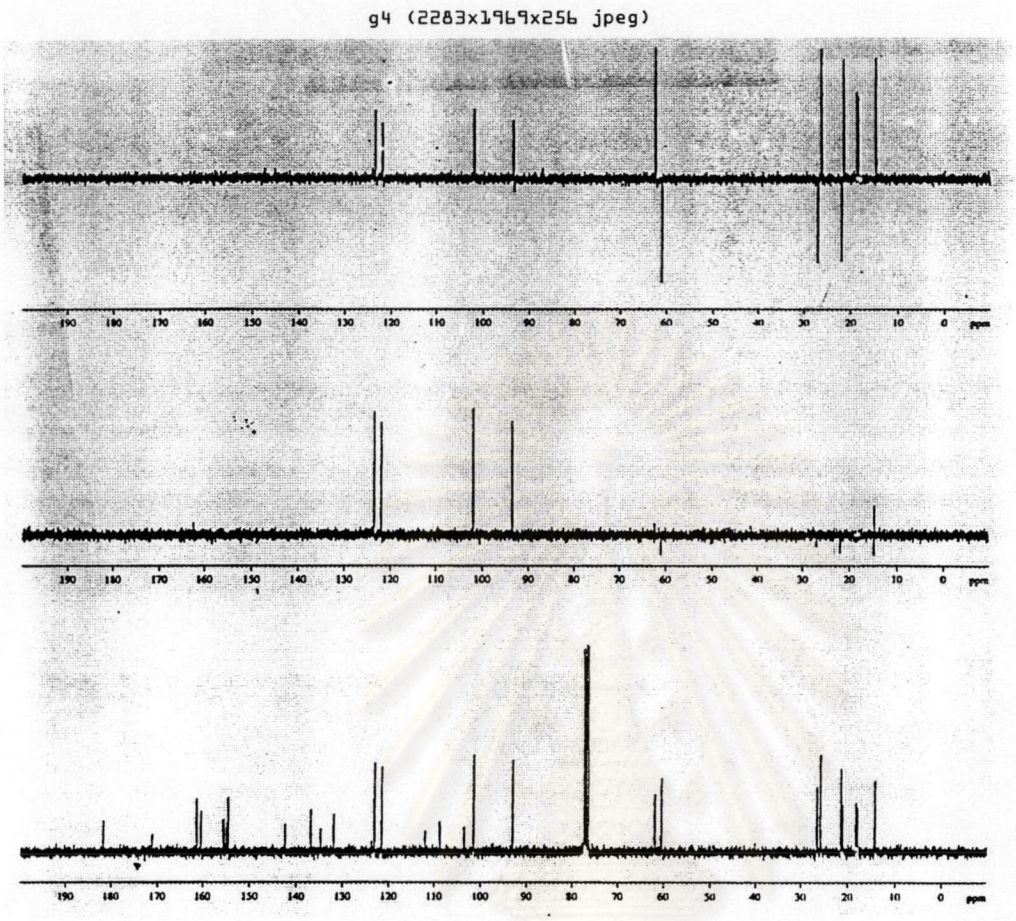

Figure 2B C NMR spectra of mangostin.

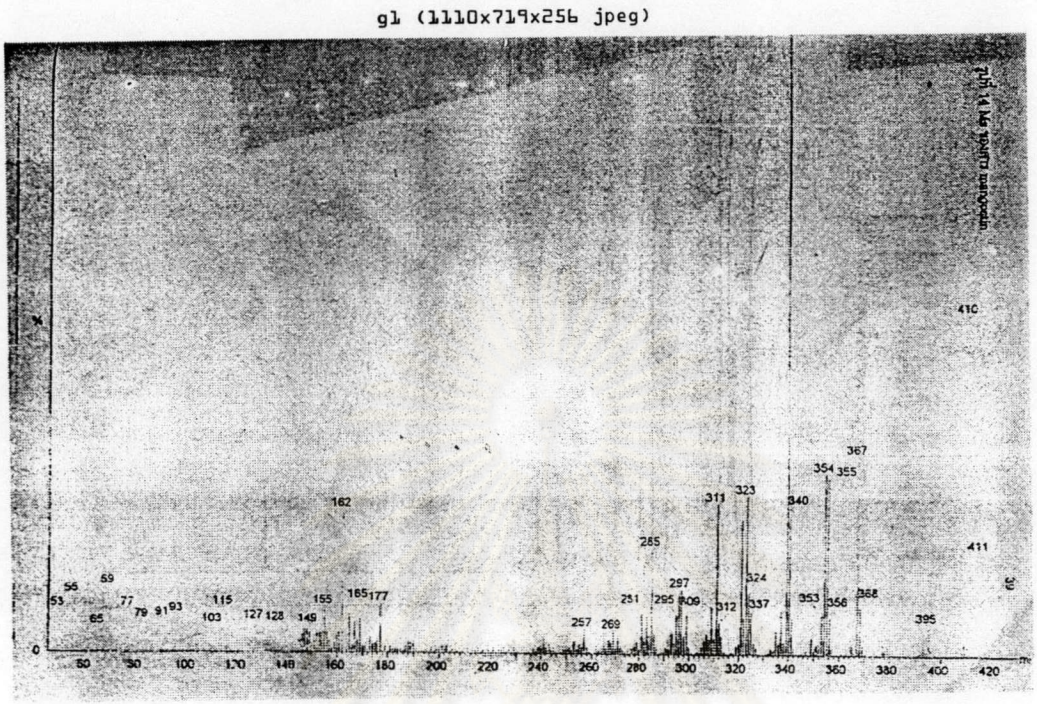

Figure 3B MS spectra of mangostin.

MICROBIOLOGICAL DATA

Table 1B The inhibition zone diameters of various concentrations of purified extract which presented inhibitory effect on various types of bacteria.

Type of bacteria	Average inhibition zone diameter (mm)				
	control	12.5 mcg	25 mcg	50 mcg	100 mcg
Staphylococcus aureus ATCC 25923	0	13.10	13.20	13.85	14.10
Streptococcus mutans ATCC KPSK2	0	13.25	14.55	14.70	18.90
Streptococcus sanguis (a clinical isolate)	0	13.30	14.40	15.10	19.10

Table 2B The minimum concentration of ethanol with inhibitory effect on *Staphylococcus aureus* ATCC 25923.

Tube No.	1	2	3	4	5	6	7	8	9	10	11
Conc of ETOH (% v/v)	50.0	25.0	12.50	6.25	3.125	1.5625	0.7813	0.3906	0.195	-	-
%Transmittance (average)	99.80	99.15	99.80	81.00	33.20	27.90	26.40	27.20	26.70	26.40	100.00

Table 3B The minimum concentration of ethanol with inhibitory effect on *Streptococcus mutans* ATCC $KPSK_2$.

Tube No.	1	2	3	4	5	6	7	8	9	10	11
Conc of ETOH (% v/v)	50.0	25.0	12.5	6.25	3.125	1.5625	0.7813	0.3906	0.195	-	-
%Transmittance (average)	99.80	85.85	85.15	89.40	44.90	9.90	9.85	9.80	9.88	9.80	100.00

Table 4B The minimum concentration of ethanol with inhibitory effect on *Streptococcus sanguis* (a clinical isolate).

Tube No.	1	2	3	4	5	6	7	8	9	10	11
Conc of ETOH (% v/v)	50.0	25.0	12.5	6.25	3.125	1.5625	0.7813	0.3906	0.195	-	-
%Transmittance (average)	99.90	89.82	87.70	88.60	56.70	9.90	9.95	9.80	9.90	9.90	100.00

APPENDIX C
ANALYTICAL DATA

ANALYTICAL DATA

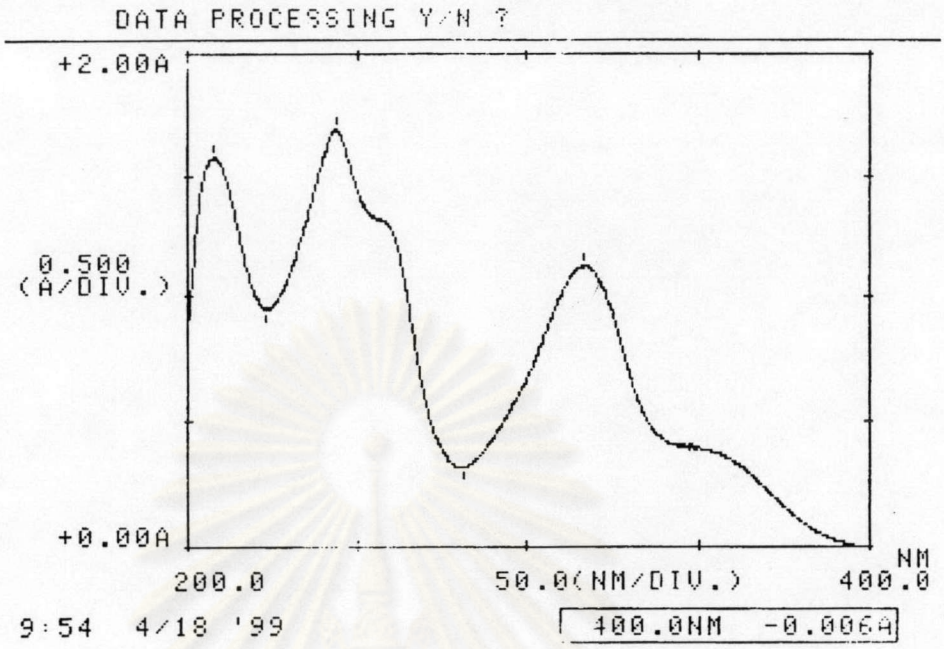

Figure 1C Spectra of mangostin in 35%v/v ETOH:Isotonic phosphate buffer.

Carlibration curve for solubility

X(conc mcg/m	0.00	2.40	3.60	4.80	6.00	7.20	8.40	9.60
Y(abs)	0.000	0.250	0.371	0.487	0.615	0.728	0.846	0.975

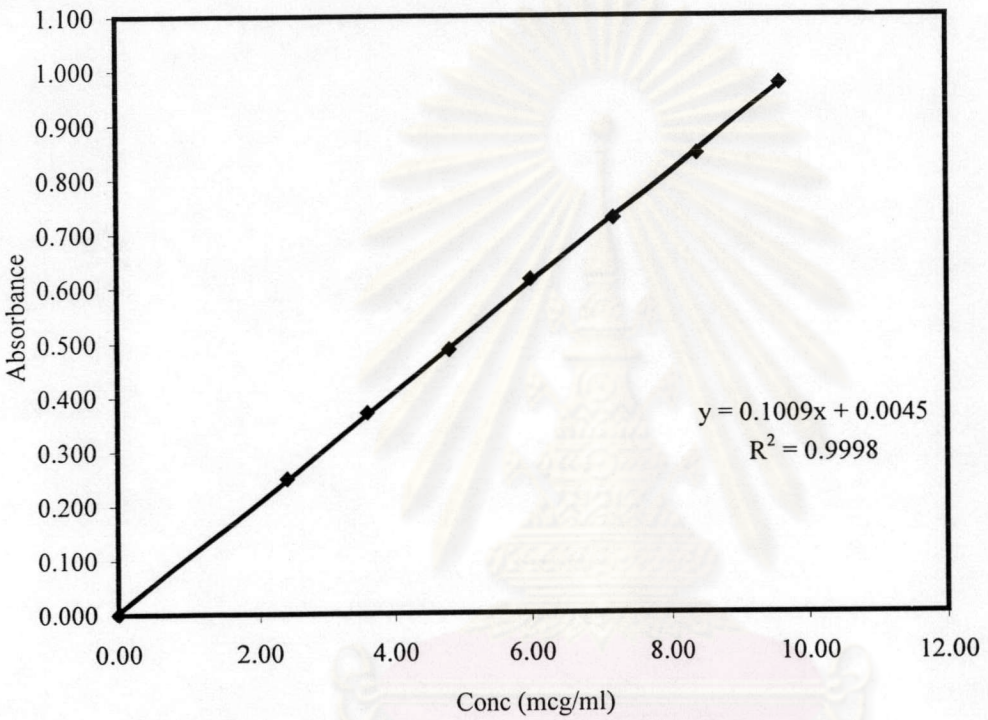

Figure2C Calibration curve of mangostin in 35% v/v ETOH: Isotonic phosphate buffer for solubility determination.

Calibration curve for release studty

X(conc mcg	0	2.40	3.60	4.80	6.00	7.20	8.40	9.60	10.8
Y(abs)	0.000	0.205	0.308	0.402	0.499	0.601	0.705	0.801	0.895

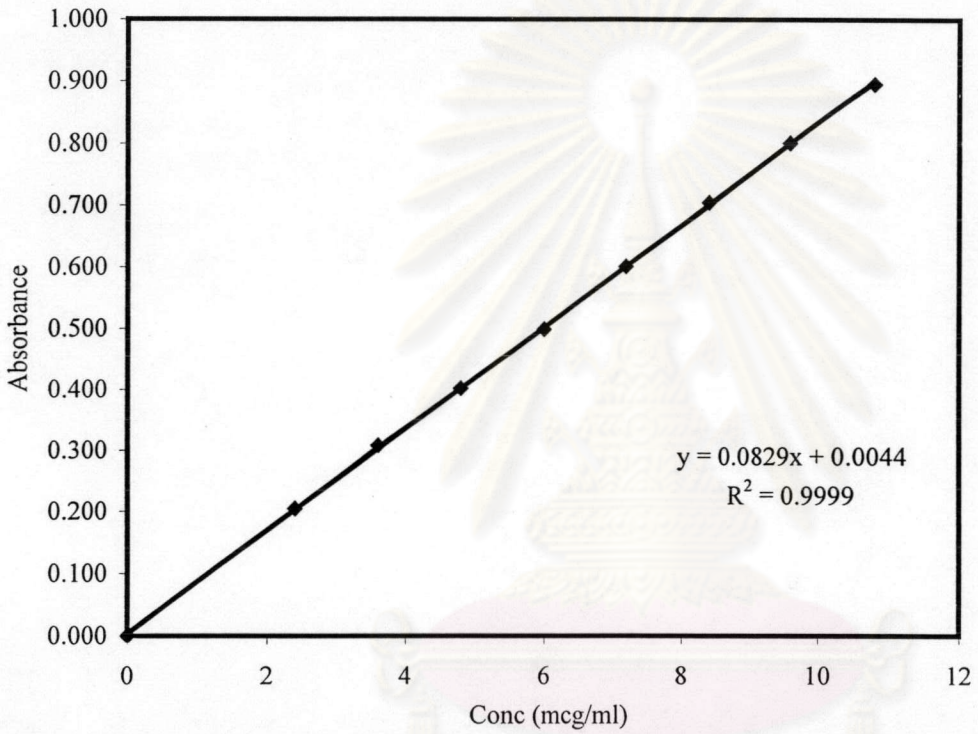

Figure 3C Calibration curve of mangostin in 35%v/v ETOH:Isotonic phosphate buffer for release study.

```
Software Version: 4.1<2F12>
Date: 10/4/02  16:03
Sample Name   : Stdcong pure
Data File     : C:\TC4\DATA\MANGO\16-2-45\DATA001B.RAW   Date: 16/2/02  17:36
Sequence File: C:\TC4\METHOD\MANGO.SEQ   Cycle: 3   Channel : A
Instrument    : LC250B - 0:A   Rack/Vial: 0/2   Operator: P
Sample Amount     : 1.0000                    Dilution Factor   : 1.00
```

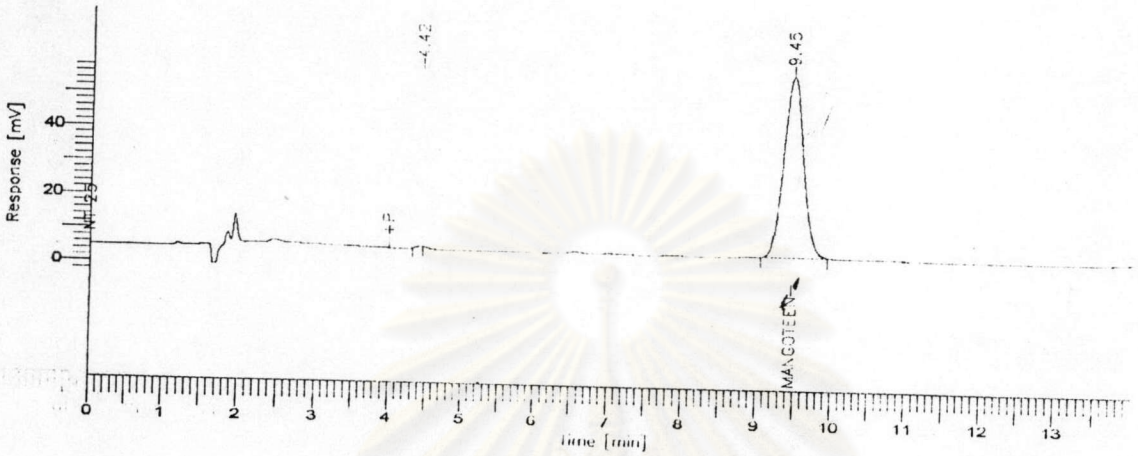

Figure 4C Chromatogram of mangostin standard solution.

```
Date: 10/4/02  16:03
Sample Name   : internal std Pure
Data File     : C:\TC4\DATA\MANGO\16-2-45\DATA001.RAW   Date: 16/2/02  17:06
Sequence File: C:\TC4\METHOD\MANGO.SEQ   Cycle: 1   Channel : A
Instrument    : LC250B - 0:A   Rack/Vial: 0/1   Operator: P
Sample Amount     : 1.0000                    Dilution Factor   : 1.00
```

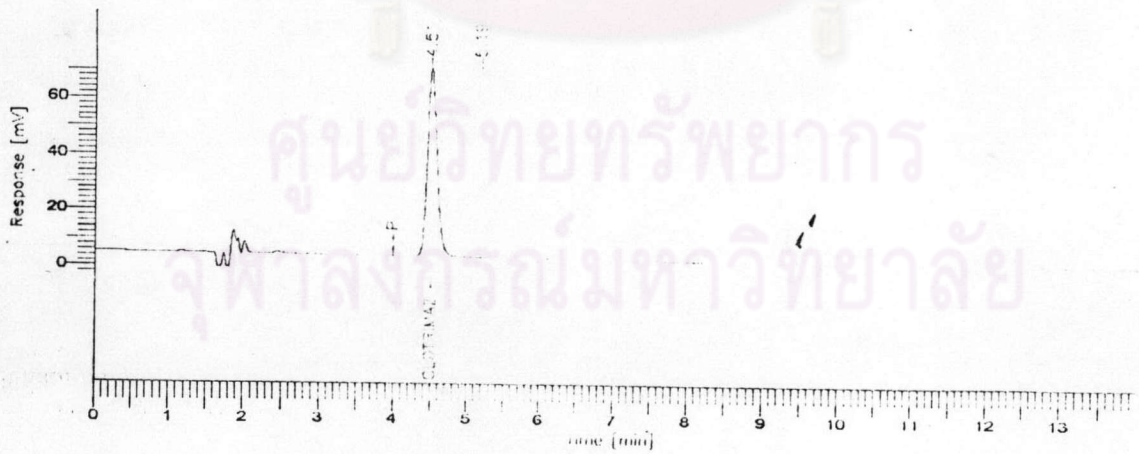

Figure 5C Chromatogram of internal standard solution (clotrimazole).

oftware Version: 4.1<2F12>
Date: 10/4/02 16:05
Sample Name : STD19.2
Data File : C:\TC4\DATA\MANGO\16-2-45\DATA001K.RAW Date: 16/2/02 19:51
Sequence File: C:\TC4\METHOD\MANGO.SEQ Cycle: 12 Channel : A
Instrument : LC250B - 0:A Rack/Vial: 0/6 Operator: P
Sample Amount : 1.0000 Dilution Factor : 1.00

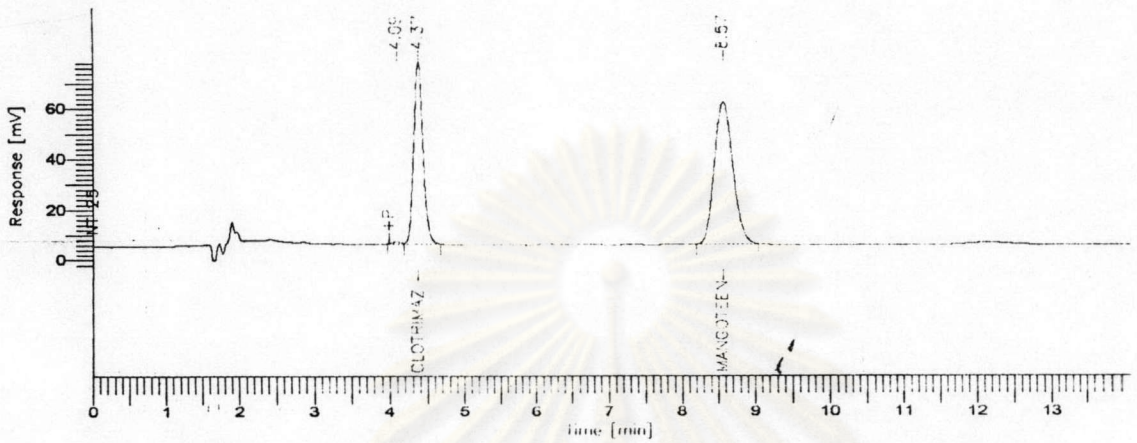

Figure 6C Chromatogram of mixture of mangostin and internal standard.

Software Version: 4.1<2F12>
Date: 10/4/02 16:03
Sample Name : Base A
Data File : C:\TC4\DATA\MANGO\16-2-45\DATA001D.RAW Date: 16/2/02 8:06
Sequence File: C:\TC4\METHOD\MANGO.SEQ Cycle: 5 Channel : A
Instrument : LC250B - 0:A Rack/Vial: 0/3 Operator: P
Sample Amount : 1.0000 Dilution Factor : 1.00

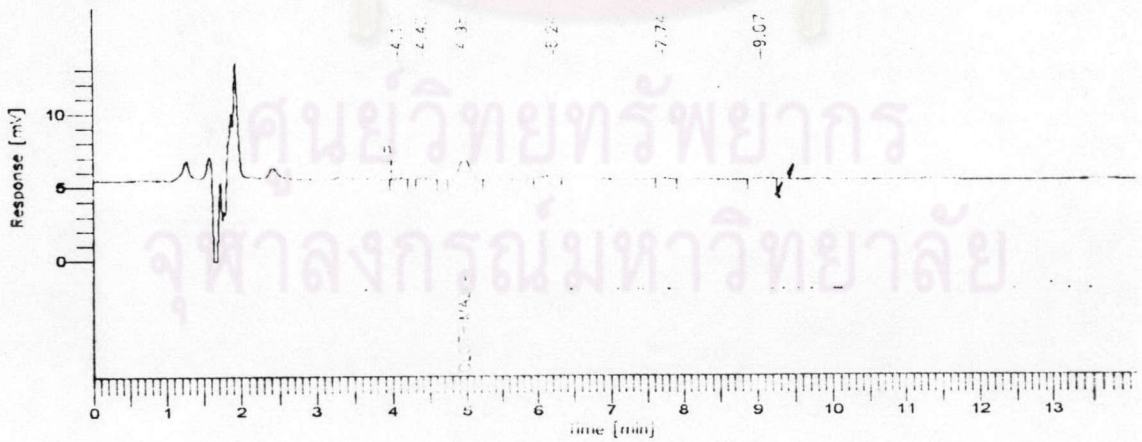

Figure 7C Chromatogram of MA1 free film extract.

Software Version: 4.1<2F12>
Date: 10/4/02 16:04
Sample Name : Base L
Data File : C:\TC4\DATA\MANGO\16-2-45\DATA001F.RAW Date: 16/2/02 18:36
Sequence File: C:\TC4\METHOD\MANGO.SEQ Cycle: 7 Channel : A
Instrument : LC250B - 0:A Rack/Vial: 0/4 Operator: P
Sample Amount : 1.0000 Dilution Factor : 1.00

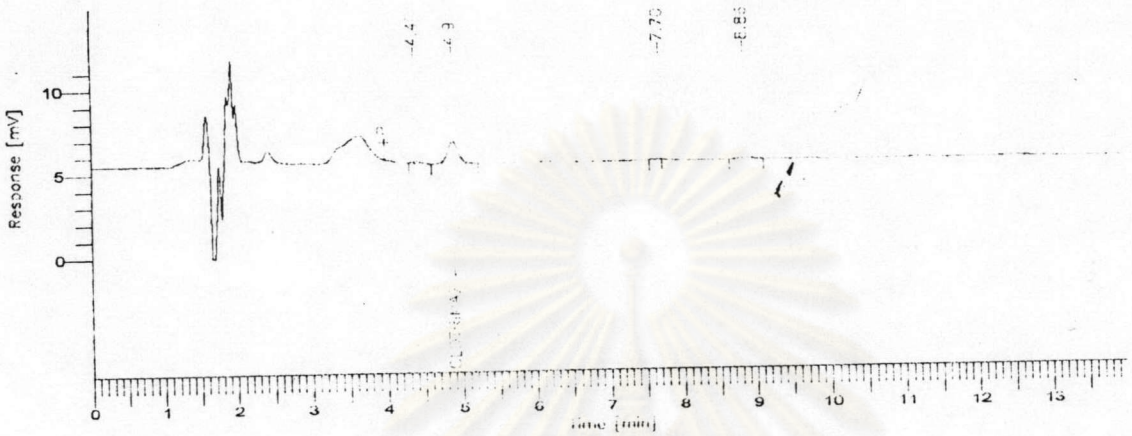

Figure 8C Chromatogram of ML1 free film extract.

Software Version: 4.1<2F12>
Date: 10/4/02 16:04
Sample Name : Base C
Data File : C:\TC4\DATA\MANGO\16-2-45\DATA001H.RAW Date: 16/2/02 19:06
Sequence File: C:\TC4\METHOD\MANGO.SEQ Cycle: 9 Channel : A
Instrument : LC250B - 0:A Rack/Vial: 0/5 Operator: P
Sample Amount : 1.0000 Dilution Factor : 1.00

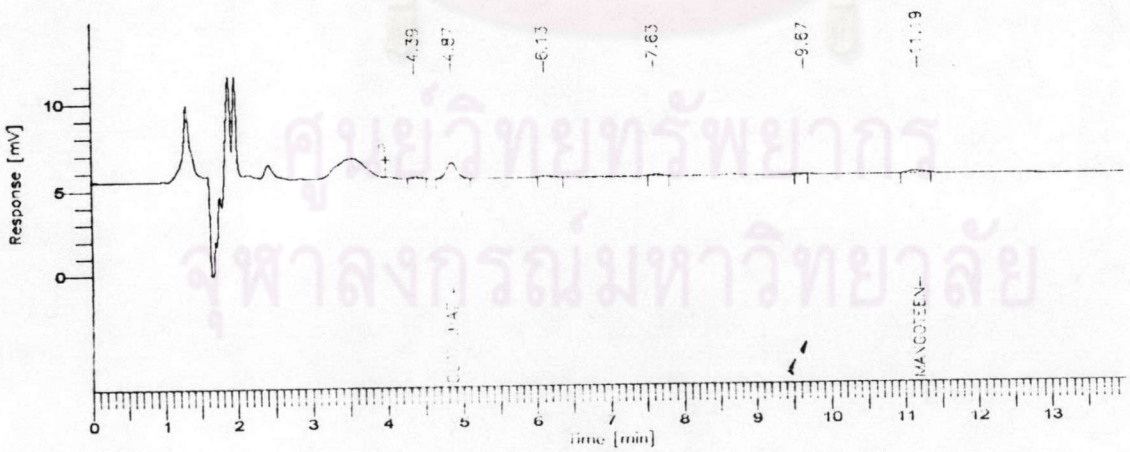

Figure 9C Chromatogram of HC2 free film extract.

SYSTEM SUITABILITY REPORT

Software Version : 4.1<2F12>
Date : 16/3/02 19:24
Instrument : LC250B_-_0:A
Instrument Method : C:\TC4\METHOD\MANGO
Suitability Method File : C:\TC4\DATA\MTEST\9-3-02\MTEST.SUI
Author :

Liquid Chromatography -
Instrument :
Column :
Column Length :
Particle Size :
Column Diameter:
Mobile Phase :
Flow Rate :
Back Pressure :
Temperature :
Detector 1 : 243
Detector 2 :

Compliance : USP
Alpha and Resln Calc. : Adjacent SUIT Components
Tailing Factor Calc. : 5% Peak Height
Void Time : 0.000 min
S/N Window Start : 0.000 min
S/N Window End : 1.000 min
S/N n Sigma : 4

Result File	Sample Name	Acquisition Date
mango.rst	5	9/3/02 16:20

Peak Name	Ret.Time [min]	Peak Area [uV*sec]	Peak Height [uV]	N Tan [plates]	N Foley [plates]	Tail Fact	K'	Resln	Alpha	S/N
internal sta	4.845	618779	65191	5929.69	5115.00	1.187	N/A	N/A	N/A	4.1e+03
STD	9.643	308008	15951	5536.08	4846.74	1.180	N/A	12.461	1.99	819

Peak Name	PW 0.05 [sec]	PW 0.10 [sec]
internal sta	19.189	16.427
STD	38.684	33.548

Figure 10C System suitability data by HPLC method.

Calibration curve data at initial time

Conc(mcg/ml)	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00
Peak area ratio	0.4950	0.9257	1.4127	1.9012	2.3687	2.7868	3.3461	3.7996

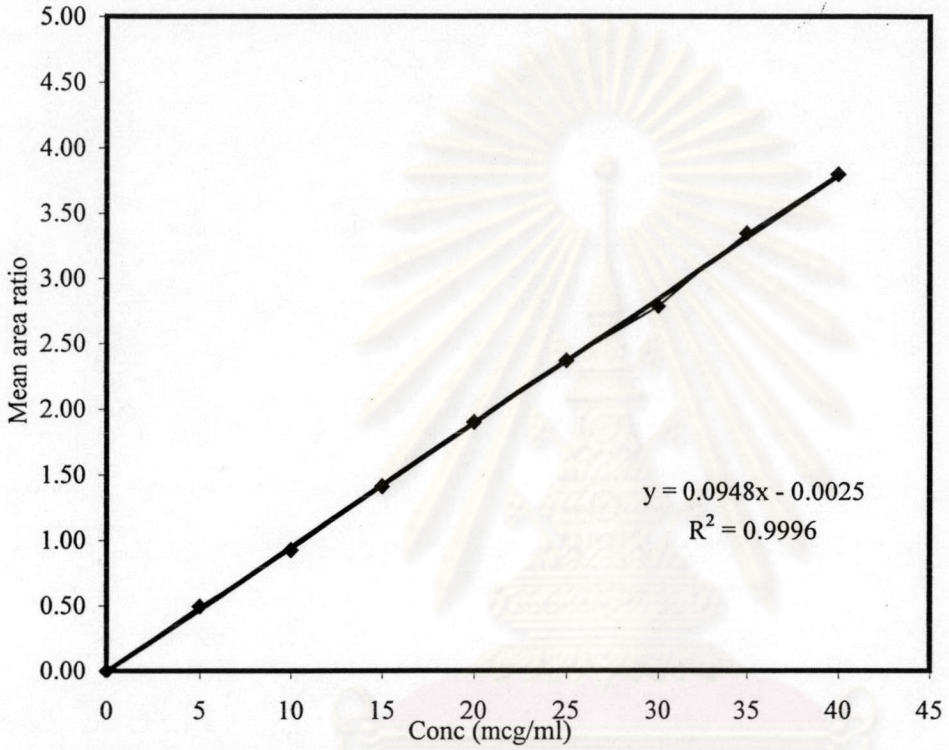

Figure 11C Calibration curve of mangostin for stability test at initial time.

Calibration curve data at the first month

Conc(mcg/ml)	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00
Peak area ratio	0.50124	0.945601	1.422699	1.920159	2.39694	2.850935	3.345675	3.738841

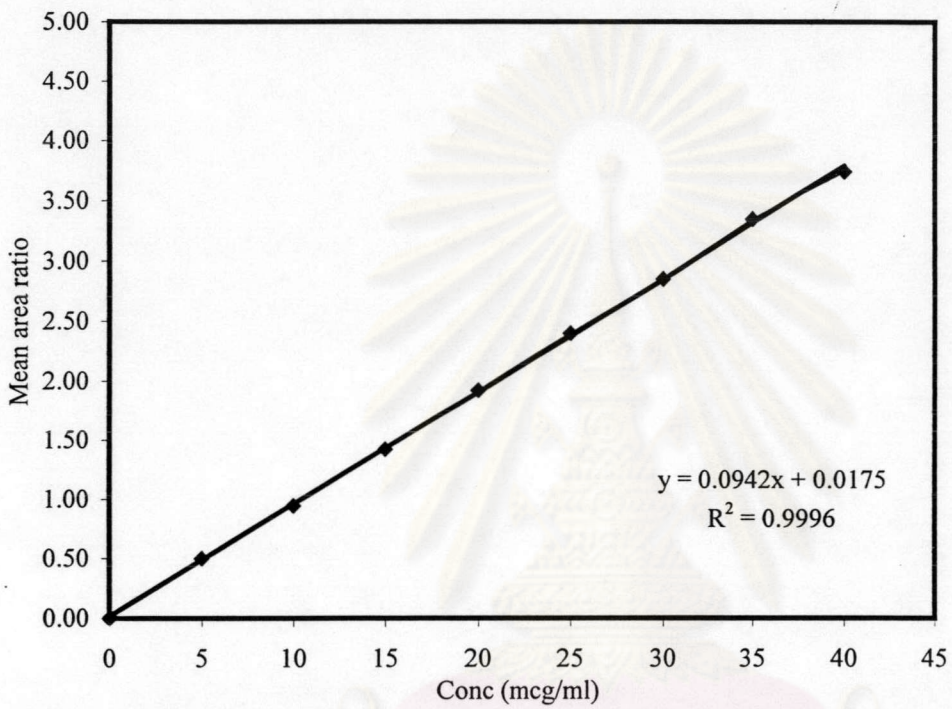

Figure 12C Calibration curve of mangostin for stability test at the first month.

Calibration curve data at the second month

Conc(mcg/ml)	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00
Peak arca ratio	0.459658	0.943878	1.408886	1.87284	2.325262	2.778659	3.234916	3.64838

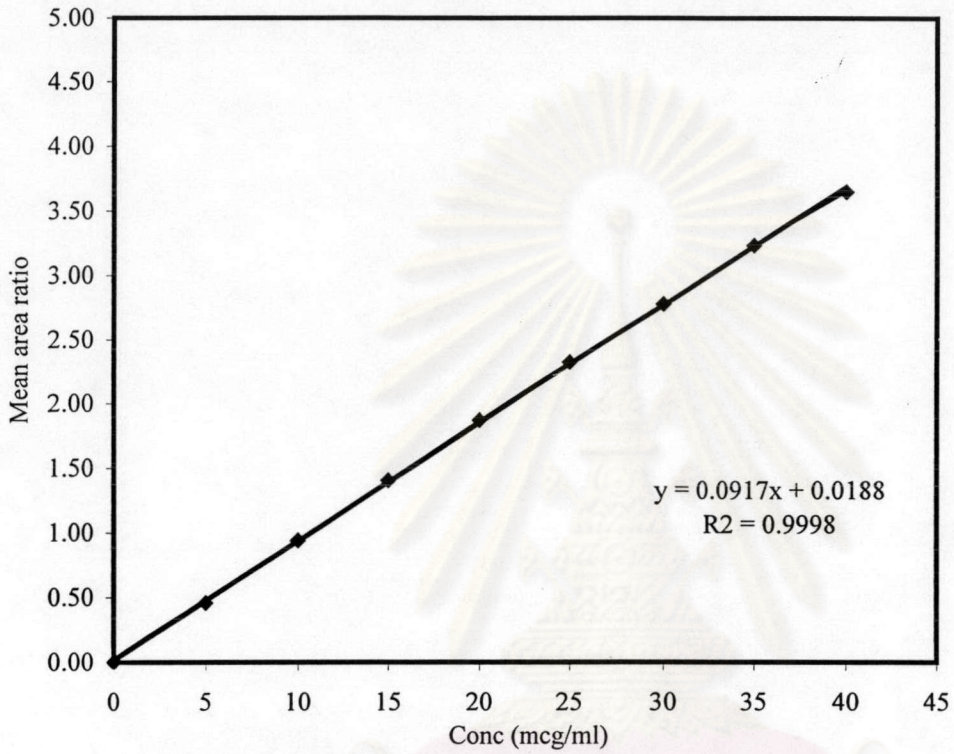

Figure 13C Calibration curve of mangostin for stability test at the second month.

Calibration curve data at the third month

Conc(mcg/ml)	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00
Peak area ratio	0.504683	0.959565	1.43466	1.894115	2.392338	2.846121	3.296344	3.773342

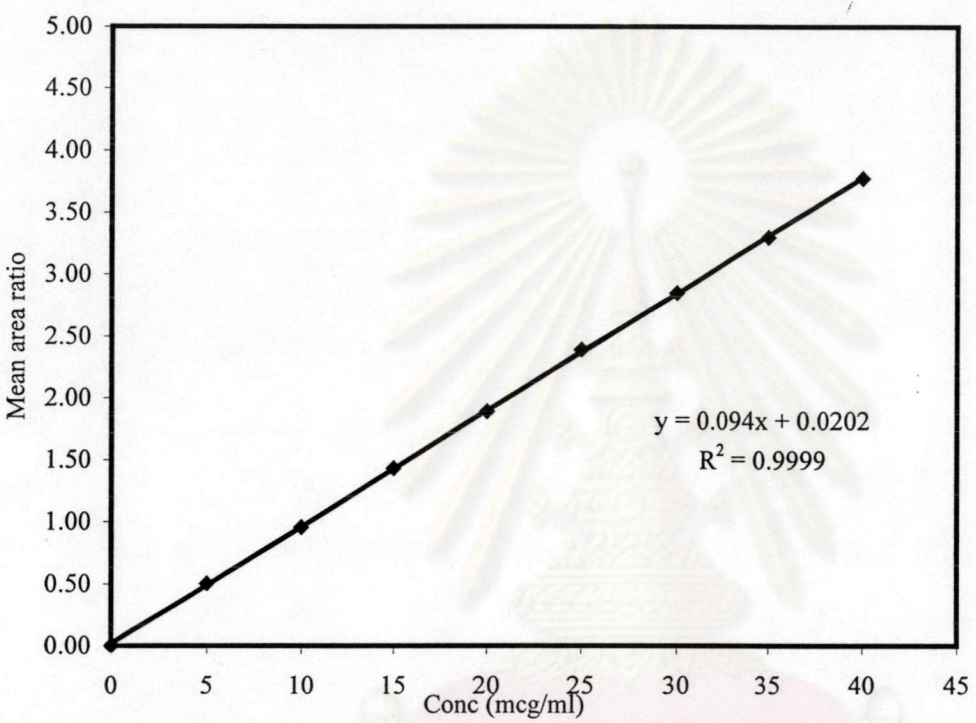

Figure 14C Calibration curve of mangostin for stability test at the third month.

APPENDIX D
EXPERIMENTAL DATA

Table1D The thickness of monolayered mucoadhesive film measured with dial thickness gauge.

		Thickness (mcm)							
Formulas	Sample No	Point1	Point2	Point3	Point4	Point5	Mean	S.D	%C.V
LA1	1	65	65	72	70	68	68	2.76	4.05
	2	62	62	65	68	65	64.4	2.24	3.49
	3	62	68	68	70	62	66	3.35	5.07
LA2	1	72	65	68	65	65	67	2.76	4.11
	2	65	68	65	70	62	66	2.76	4.18
	3	70	65	65	70	72	68.4	2.87	4.20
LL1	1	65	65	72	65	62	65.8	3.31	5.03
	2	65	65	70	68	68	67.2	1.94	2.89
	3	72	65	70	65	65	67.4	3.01	4.46
LL2	1	75	72	75	70	72	72.8	1.94	2.66
	2	70	75	75	72	68	72	2.76	3.83
	3	75	68	68	70	70	70.2	2.56	3.65
MA1	1	62	70	62	65	65	64.8	2.93	4.52
	2	65	62	65	65	68	65	1.90	2.92
	3	68	62	65	68	65	65.6	2.24	3.42
MA2	1	68	65	65	62	65	65	1.90	2.92
	2	65	62	62	60	65	62.8	1.94	3.09
	3	62	62	65	65	62	63.2	1.47	2.33
ML1	1	68	68	72	62	68	67.6	3.20	4.73
	2	70	68	72	65	68	68.6	2.33	3.40
	3	65	65	68	70	70	67.6	2.24	3.32
ML2	1	75	78	72	75	68	73.6	3.38	4.60
	2	72	75	75	70	72	72.8	1.94	2.66
	3	78	70	75	72	72	73.4	2.80	3.81
HA1	1	72	72	68	68	72	70.4	1.96	2.78
	2	62	65	65	68	62	64.4	2.24	3.49
	3	65	62	68	70	68	66.6	2.80	4.20
HA2	1	62	65	65	68	62	64.4	2.24	3.49
	2	65	65	70	62	68	66	2.76	4.18
	3	65	68	65	68	68	66.8	1.47	2.20

Table1D The thickness of monolayered mucoadhesive film measured with dial thickness gauge(cont).

Formulas	Sample No	Thickness (mcm)							
		Point1	Point2	Point3	Point4	Point5	Mean	S.D	%C.V
HL1	1	65	68	70	68	65	67.2	1.94	2.89
	2	68	68	65	68	70	67.8	1.60	2.36
	3	65	65	68	68	72	67.6	2.58	3.81
HL2	1	72	75	68	68	70	70.6	2.65	3.76
	2	75	75	68	72	72	72.4	2.58	3.56
	3	75	72	72	75	68	72.4	2.58	3.56
S0	1	65	68	66	68	65	66.4	1.36	2.04
	2	62	65	65	68	70	66	2.76	4.18
	3	65	62	68	62	66	64.6	2.33	3.61
SC1	1	65	68	65	70	68	67.2	1.94	2.89
	2	65	65	62	60	65	63.4	2.06	3.25
	3	65	65	65	68	62	65	1.90	2.92
SC2	1	68	72	68	70	68	69.2	1.60	2.31
	2	65	70	62	65	65	65.4	2.58	3.94
	3	68	62	70	62	65	65.4	3.20	4.89
H0	1	68	65	65	62	65	65	1.90	2.92
	2	70	68	62	72	68	68	3.35	4.92
	3	62	68	65	70	68	66.6	2.80	4.20
HC1	1	62	72	66	62	70	66.4	4.08	6.14
	2	65	68	62	68	68	66.2	2.40	3.63
	3	70	68	68	62	68	67.2	2.71	4.04
HC2	1	72	70	65	68	62	67.4	3.56	5.27
	2	68	68	62	72	66	67.2	3.25	4.84
	3	65	68	68	72	70	68.6	2.33	3.40

Table 2D The ultimate tensile strength and percentage elongation at break of SCMC film. and SCMC combined with CP934 films

Formulation	Sample No	Mean thickness (mm)	Crossection Area(mm^2)	Breaking Force (N)	Ultimate Tensile Strength(N/mm^2)	%Elongation at break
S0	1	0.064	0.320	14.03	43.85	1.461
	2	0.067	0.336	13.38	39.83	1.485
	3	0.065	0.324	12.91	39.91	1.399
	4	0.067	0.333	12.96	38.98	1.453
	5	0.066	0.329	14.18	43.16	1.414
	Mean	0.066	0.328	13.49	41.12	1.442
	SD	0.001	0.006	0.59	2.20	0.355
	%CV	1.98	1.98	4.38	5.34	2.46
SC1	1	0.066	0.329	18.85	57.29	2.551
	2	0.068	0.339	19.65	57.95	2.563
	3	0.067	0.334	19.42	58.15	2.612
	4	0.064	0.320	17.58	54.94	2.684
	5	0.066	0.328	18.26	55.75	2.542
	Mean	0.066	0.330	18.75	56.84	2.590
	SD	0.001	0.007	0.85	1.41	0.590
	%CV	2.17	2.17	4.52	2.48	2.28
SC2	1	0.070	0.350	24.39	69.68	2.053
	2	0.075	0.377	25.57	67.82	2.115
	3	0.068	0.341	23.52	68.98	2.068
	4	0.072	0.360	24.85	69.04	2.025
	5	0.072	0.360	23.87	66.31	2.202
	Mean	0.072	0.358	24.44	68.35	2.092
	SD	0.003	0.013	0.81	1.33	0.694
	%CV	3.75	3.75	3.31	1.95	3.32

Table 3D The ultimate tensile strength and percentage elongation at break of HPMC film and HPMC combined with CP934 films.

Formulas	Sample No	Mean thickness (mm)	Crossection Area(mm^2)	Breaking Force (N)	Ultimate Tensile Strength(N/mm^2)	%Elongation at break
H0	1	0.068	0.341	20.90	61.30	11.725
	2	0.066	0.332	20.02	60.39	11.943
	3	0.072	0.360	21.83	60.64	11.872
	4	0.065	0.325	19.02	58.52	11.700
	5	0.067	0.334	20.42	61.14	11.682
	Mean	0.068	0.338	20.44	60.42	11.784
	SD	0.003	0.013	1.04	1.11	1.160
	%CV	3.97	3.97	5.10	1.84	0.98
HC1	1	0.065	0.325	15.91	48.94	5.727
	2	0.070	0.350	16.73	47.79	5.624
	3	0.068	0.342	17.73	51.85	5.585
	4	0.065	0.326	16.26	49.89	5.631
	5	0.073	0.363	18.22	50.25	5.542
	Mean	0.068	0.341	16.97	49.75	5.622
	SD	0.003	0.016	0.98	1.51	0.687
	%CV	4.69	4.69	5.76	3.04	1.22
HC2	1	0.065	0.326	16.67	51.21	3.436
	2	0.068	0.342	18.42	53.85	3.489
	3	0.066	0.328	17.54	53.48	3.561
	4	0.070	0.350	19.12	54.62	3.611
	5	0.073	0.363	19.95	55.03	3.540
	Mean	0.068	0.342	18.34	53.68	3.527
	SD	0.003	0.015	1.29	1.49	0.674
	%CV	4.52	4.52	7.02	2.77	1.91

Table 4D The ultimate tensile strength and percentage elongation at break of low molecular weight chitosan films perpared from acetic acid and lactic acid.

Formulas	Sample No	Mean thickness (mm)	Crossection Area(mm^2)	Breaking Force (N)	Ultimate Tensile Strength(N/mm^2)	%Elongation at break
LA1	1	0.068	0.342	14.93	43.72	7.695
	2	0.064	0.318	13.77	43.36	7.715
	3	0.065	0.326	14.62	44.85	7.483
	4	0.065	0.325	13.91	42.79	7.666
	5	0.063	0.313	13.52	43.21	7.593
	Mean	0.065	0.325	14.15	43.59	7.630
	SD	0.002	0.011	0.60	0.78	0.947
LA2	1	0.07	0.33	13.35	39.97	7.37
	2	0.069	0.343	14.72	42.92	7.513
	3	0.068	0.340	13.24	38.95	7.395
	4	0.062	0.312	12.72	40.77	7.603
	5	0.065	0.325	13.66	42.02	7.441
	Mean	0.066	0.331	13.54	40.93	7.465
	SD	0.003	0.013	0.74	1.58	0.939
LL1	1	0.065	0.323	2.55	7.92	23.411
	2	0.07	0.34	3.02	8.85	24.06
	3	0.065	0.325	2.73	8.41	23.846
	4	0.067	0.333	2.91	8.74	24.385
	5	0.066	0.328	2.56	7.82	24.748
	Mean	0.066	0.330	2.76	8.35	24.091
	SD	0.001	0.007	0.21	0.47	5.104
LL2	1	0.069	0.347	1.20	3.45	32.381
	2	0.069	0.345	1.20	3.48	33.042
	3	0.07	0.34	1.26	3.69	32.55
	4	0.070	0.352	1.26	3.59	33.264
	5	0.072	0.358	1.33	3.72	31.841
	Mean	0.070	0.349	1.25	3.59	32.615
	SD	0.001	0.006	0.06	0.12	5.616

Table5D The ultimate tensile strength and percentage elongation at break of medium molecular weight chitosan films perpared from acetic acid and lactic acid.

Formulas	Sample No	Mean thickness (mm)	Crossection Area(mm^2)	Breaking Force (N)	Ultimate Tensile Strength(N/mm^2)	%Elongation at break
MA1	1	0.069	0.345	17.67	51.28	5.797
	2	0.067	0.336	17.39	51.75	5.924
	3	0.066	0.328	16.67	50.82	5.625
	4	0.066	0.332	17.15	51.65	5.683
	5	0.068	0.340	17.32	50.94	5.454
	Mean	0.067	0.336	17.24	51.29	5.697
	SD	0.001	0.006	0.37	0.41	1.775
MA2	1	0.06	0.32	15.88	49.46	5.00
	2	0.063	0.315	15.34	48.78	4.716
	3	0.069	0.343	16.90	49.35	4.929
	4	0.065	0.327	15.90	48.61	4.756
	5	0.068	0.340	16.76	49.29	4.899
	Mean	0.066	0.329	16.15	49.10	4.859
	SD	0.002	0.012	0.66	0.38	1.191
ML1	1	0.072	0.360	7.32	20.33	27.093
	2	0.07	0.34	6.84	19.88	26.80
	3	0.070	0.351	7.22	20.58	27.314
	4	0.069	0.343	7.01	20.46	26.543
	5	0.066	0.332	6.83	20.61	26.941
	Mean	0.069	0.346	7.04	20.37	26.939
	SD	0.002	0.011	0.22	0.30	2.915
ML2	1	0.072	0.358	2.48	6.93	35.775
	2	0.072	0.360	2.60	7.22	36.104
	3	0.07	0.36	2.46	6.83	36.65
	4	0.071	0.354	2.47	6.99	35.915
	5	0.072	0.358	2.55	7.14	35.536
	Mean	0.072	0.358	2.51	7.02	35.997
	SD	0.000	0.002	0.06	0.16	4.218

Table6D The ultimate tensile strength and percentage elongation at break of high molecular weight chitosan films perpared from acetic acid and lactic acid

Formulation	Sample No	Mean thickness (mm)	Crossection Area(mm^2)	Breaking Force (N)	Ultimate Tensile Strength(N/mm^2)	%Elongation at break
HA1	1	0.070	0.350	19.88	56.79	2.623
	2	0.066	0.329	19.33	58.75	2.667
	3	0.068	0.341	19.77	57.97	2.599
	4	0.067	0.334	19.08	57.13	2.452
	5	0.068	0.342	19.98	58.41	2.647
	Mean	0.068	0.339	19.61	57.80	2.598
	SD	0.002	0.008	0.38	0.83	0.086
HA2	1	0.07	0.35	19.58	55.79	2.46
	2	0.072	0.361	20.41	56.54	2.612
	3	0.068	0.342	19.27	56.42	2.433
	4	0.067	0.333	18.41	55.29	2.552
	5	0.068	0.340	19.15	56.31	2.489
	Mean	0.069	0.345	19.36	56.08	2.510
	SD	0.002	0.011	0.73	0.52	0.072
HL1	1	0.070	0.352	11.46	32.57	18.775
	2	0.07	0.36	11.16	30.84	19.06
	3	0.070	0.351	11.20	31.92	18.524
	4	0.073	0.364	11.27	30.96	18.347
	5	0.069	0.344	10.84	31.51	19.247
	Mean	0.071	0.355	11.19	31.55	18.792
	SD	0.002	0.008	0.23	0.71	0.371
HL2	1	0.073	0.363	3.82	10.53	29.932
	2	0.070	0.349	3.88	11.12	30.274
	3	0.07	0.36	3.95	10.97	29.04
	4	0.074	0.369	3.94	10.69	31.045
	5	0.071	0.354	3.91	11.07	29.541
	Mean	0.072	0.359	3.90	10.87	29.967
	SD	0.002	0.008	0.05	0.26	0.757

Table 7D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of SCM combined with 10% CP934 films.

SC1(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0069	0.0069	0.0071	0.0069	0.0072	0.0072
	2	0.0070	0.0069	0.0070	0.0072	0.0069	0.0071
	3	0.0069	0.0069	0.0069	0.0070	0.0069	0.0068
W2(at t)	1	0.0886	0.0918	0.1156	0.1277	0.1415	0.1507
	2	0.0843	0.0941	0.1143	0.1344	0.1367	0.1555
	3	0.0883	0.0954	0.1149	0.1322	0.1346	0.1437
W2-W1	1	0.0817	0.0849	0.1085	0.1208	0.1343	0.1435
	2	0.0773	0.0872	0.1073	0.1272	0.1298	0.1484
	3	0.0814	0.0885	0.1080	0.1252	0.1277	0.1369
mean		0.0801	0.0869	0.1079	0.1244	0.1306	0.1429
i=(w2-w1)/w	1	11.8380	12.3068	15.2875	17.5067	18.6507	19.9296
	2	11.0494	12.6365	15.3238	17.6639	18.8105	20.8972
	3	11.7918	12.8203	15.6567	17.8825	18.5063	20.1291
mean		11.5597	12.5879	15.4227	17.6844	18.6558	20.3186
SD		0.4426	0.2602	0.2035	0.1887	0.1522	0.5109
SC1(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0069	0.0070	0.0071	0.0072	0.0072	0.0072
	2	0.0070	0.0071	0.0072	0.0072	0.0070	0.0071
	3	0.0072	0.0071	0.0072	0.0070	0.0070	0.0072
W2(at t)	1	0.0775	0.0878	0.1019	0.1119	0.1211	0.1277
	2	0.0801	0.0897	0.1053	0.1091	0.1146	0.1272
	3	0.0834	0.0909	0.1038	0.1080	0.1170	0.1305
W2-W1	1	0.0706	0.0808	0.0948	0.1047	0.1139	0.1205
	2	0.0731	0.0826	0.0981	0.1019	0.1076	0.1201
	3	0.0762	0.0838	0.0966	0.1010	0.1100	0.1233
mean		0.0733	0.0824	0.0965	0.1025	0.1105	0.1213
i=(w2-w1)/w	1	10.2308	11.5405	13.3500	14.5366	15.8247	16.7296
	2	10.4429	11.6341	13.6216	14.1467	15.3670	16.9099
	3	10.5882	11.8078	13.4212	14.4289	15.7211	17.1219
mean		10.4206	11.6608	13.4643	14.3707	15.6376	16.9205
SD		0.1797	0.1356	0.1408	0.2014	0.2400	0.1964

Table 8D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of SCMC combined with 20% CP934 films.

SC2(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0072	0.0069	0.0071	0.0070	0.0072	0.0072
	2	0.0070	0.0072	0.0070	0.0072	0.0069	0.0071
	3	0.0073	0.0069	0.0072	0.0070	0.0071	0.0072
W2(at t)	1	0.0550	0.0552	0.0626	0.0652	0.0812	0.1030
	2	0.0548	0.0585	0.0625	0.0688	0.0768	0.1003
	3	0.0552	0.0558	0.0632	0.0684	0.0806	0.1046
W2-W1	1	0.0478	0.0483	0.0555	0.0582	0.0740	0.0958
	2	0.0478	0.0513	0.0555	0.0616	0.0699	0.0932
	3	0.0479	0.0489	0.0560	0.0614	0.0735	0.0974
mean		0.0478	0.0495	0.0557	0.0604	0.0725	0.0955
i=(w2-w1)/w	1	6.6374	6.9949	7.8211	8.3093	10.2835	13.3092
	2	6.8227	7.1219	7.9309	8.5606	10.1309	13.1310
	3	6.5635	7.0922	7.7728	8.7785	10.3574	13.5251
mean		6.6745	7.0697	7.8416	8.5495	10.2573	13.3218
SD		0.1335	0.0664	0.0810	0.2348	0.1155	0.1974
SC2(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0072	0.0074	0.0075	0.0075	0.0072	0.0072
	2	0.0075	0.0072	0.0074	0.0073	0.0075	0.0074
	3	0.0073	0.0075	0.0072	0.0076	0.0072	0.0073
W2(at t)	1	0.0498	0.0515	0.0542	0.0597	0.0627	0.0678
	2	0.0513	0.0504	0.0557	0.0599	0.0643	0.0706
	3	0.0491	0.0539	0.0550	0.0652	0.0639	0.0703
W2-W1	1	0.0426	0.0441	0.0467	0.0522	0.0555	0.0606
	2	0.0438	0.0432	0.0483	0.0526	0.0568	0.0632
	3	0.0418	0.0464	0.0478	0.0576	0.0567	0.0630
mean		0.0428	0.0446	0.0476	0.0541	0.0563	0.0622
i=(w2-w1)/w	1	5.9200	5.9652	6.2238	6.9545	7.7115	8.4133
	2	5.8424	5.9981	6.5220	7.2058	7.5722	8.5355
	3	5.7280	6.1926	6.6396	7.5852	7.8731	8.6285
mean		5.8301	6.0520	6.4618	7.2485	7.7189	8.5258
SD		0.0966	0.1229	0.2143	0.3175	0.1506	0.1079

Table 9D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of low molecular weight chitosan films prepared from 1% acetic acid.

LA1(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0062	0.0064	0.0062	0.0061	0.0068	0.0068
	2	0.0062	0.0064	0.0063	0.0060	0.0067	0.0068
	3	0.0062	0.0064	0.0063	0.0062	0.0068	0.0069
W2(at t)	1	0.0482	0.0590	0.0680	0.0731	0.0942	0.1285
	2	0.0488	0.0603	0.0667	0.0733	0.0898	0.1293
	3	0.0490	0.0619	0.0691	0.0766	0.0931	0.1318
W2-W1	1	0.0420	0.0526	0.0618	0.0670	0.0874	0.1217
	2	0.0426	0.0539	0.0604	0.0673	0.0831	0.1225
	3	0.0428	0.0555	0.0628	0.0704	0.0863	0.1249
mean		0.0425	0.0540	0.0617	0.0682	0.0856	0.1230
Wi=(w2-w1)/w1	1	6.7742	8.2188	9.9677	10.9836	12.8529	17.8971
	2	6.8710	8.4219	9.5873	11.2167	12.4030	18.0147
	3	6.9032	8.6719	9.9683	11.3548	12.6912	18.1014
mean		6.8495	8.4375	9.8411	11.1850	12.6490	18.0044
SD		0.0672	0.2270	0.2198	0.1876	0.2279	0.1026
LA1(AS)	sample no	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0058	0.0059	0.0060	0.0062	0.0059	0.0061
	2	0.0058	0.0061	0.0061	0.0061	0.0059	0.0062
	3	0.0059	0.0061	0.0060	0.0060	0.0061	0.0059
W2(at t)	1	0.0448	0.0579	0.0615	0.0659	0.0665	0.0831
	2	0.0437	0.0546	0.0612	0.0656	0.0675	0.0877
	3	0.0452	0.0583	0.0608	0.0657	0.0719	0.0823
W2-W1	1	0.0390	0.0520	0.0555	0.0597	0.0606	0.0770
	2	0.0379	0.0485	0.0551	0.0595	0.0616	0.0815
	3	0.0393	0.0522	0.0548	0.0597	0.0658	0.0764
mean		0.0387	0.0509	0.0551	0.0596	0.0627	0.0783
Wi=(w2-w1)/w1	1	6.7241	8.8214	9.2459	9.6290	10.2761	12.6220
	2	6.5413	7.9519	9.0333	9.7581	10.4348	13.1518
	3	6.6607	8.5634	9.1260	9.9437	10.7924	12.9499
mean		6.6420	8.4456	9.1351	9.7769	10.5011	12.9079
SD		0.0928	0.4466	0.1066	0.1582	0.2645	0.2674

Table 10D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of low molecular weight chitosan films prepared from 2% acetic acid.

LA2(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0059	0.0061	0.0060	0.0062	0.0063	0.0061
	2	0.0058	0.0061	0.0061	0.0062	0.0063	0.0062
	3	0.0059	0.0061	0.0060	0.0062	0.0063	0.0061
W2(at t)	1	0.0463	0.0531	0.0648	0.0696	0.0880	0.1089
	2	0.0454	0.0544	0.0620	0.0748	0.0849	0.1083
	3	0.0463	0.0549	0.0620	0.0740	0.0843	0.1078
W2-W1	1	0.0404	0.0470	0.0588	0.0634	0.0817	0.1028
	2	0.0396	0.0483	0.0559	0.0686	0.0786	0.1021
	3	0.0404	0.0488	0.0560	0.0678	0.0780	0.1017
mean		0.0401	0.0480	0.0569	0.0666	0.0794	0.1022
Wi=(w2-w1)/w1	1	6.8475	7.7049	9.8000	10.2258	12.9628	16.8505
	2	6.8276	7.9180	9.1587	11.0653	12.4837	16.4662
	3	6.8541	7.9967	9.3358	10.9350	12.3863	16.6757
mean		6.8431	7.8732	9.4315	10.7420	12.6109	16.6641
SD		0.0138	0.1510	0.3312	0.4518	0.3086	0.1924
LA1(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0058	0.0061	0.0060	0.0062	0.0061	0.0061
	2	0.0058	0.0060	0.0061	0.0062	0.0062	0.0062
	3	0.0059	0.0060	0.0060	0.0062	0.0061	0.0061
W2(at t)	1	0.0410	0.0503	0.0573	0.0667	0.0754	0.0879
	2	0.0456	0.0478	0.0540	0.0633	0.0738	0.0919
	3	0.0444	0.0518	0.0554	0.0650	0.0742	0.0913
W2-W1	1	0.0352	0.0442	0.0513	0.0605	0.0693	0.0818
	2	0.0398	0.0418	0.0479	0.0571	0.0676	0.0857
	3	0.0385	0.0458	0.0494	0.0588	0.0681	0.0852
mean		0.0378	0.0439	0.0495	0.0588	0.0683	0.0843
Wi=(w2-w1)/w1	1	6.0741	7.2500	8.5484	9.7619	11.3571	13.4138
	2	6.8704	6.9667	7.8548	9.2121	10.8985	13.8286
	3	6.5184	7.6327	8.2352	9.4792	11.1586	13.9686
mean		6.4876	7.2831	8.2128	9.4844	11.1381	13.7370
SD		0.3990	0.3342	0.3473	0.2749	0.2300	0.2885

Table 11D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of low molecular weight chitosan films prepared from 1% lactic acid.

LL1(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0065	0.0063	0.0062	0.0062	0.0065	0.0065
	2	0.0065	0.0064	0.0064	0.0063	0.0065	0.0065
	3	0.0066	0.0064	0.0063	0.0063	0.0066	0.0066
W2(at t)	1	0.0672	0.0717	0.0795	0.1202	0.1361	0.1413
	2	0.0659	0.0761	0.0831	0.1206	0.1357	0.1382
	3	0.0699	0.0766	0.0820	0.1199	0.1384	0.1423
W2-W1	1	0.0607	0.0654	0.0733	0.1140	0.1296	0.1348
	2	0.0594	0.0697	0.0767	0.1143	0.1292	0.1317
	3	0.0633	0.0702	0.0757	0.1136	0.1318	0.1357
mean		0.0611	0.0685	0.0753	0.1140	0.1302	0.1340
Wi=(w2-w1)/w1	1	9.3412	10.3829	11.8229	18.3809	19.9326	20.7368
	2	9.1349	10.8926	11.9913	18.1454	19.8747	20.2543
	3	9.5898	10.9763	12.0182	18.0391	19.9692	20.5537
mean		9.3553	10.7506	11.9441	18.1885	19.9255	20.5149
SD		0.2278	0.3212	0.1058	0.1749	0.0476	0.2436
LL1(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0066	0.0062	0.0064	0.0062	0.0063	0.0064
	2	0.0065	0.0064	0.0063	0.0061	0.0063	0.0065
	3	0.0066	0.0063	0.0063	0.0063	0.0064	0.0065
W2(at t)	1	0.0655	0.0737	0.0828	0.0904	0.0926	0.1023
	2	0.0601	0.0742	0.0790	0.0863	0.0929	0.1034
	3	0.0601	0.0733	0.0804	0.0932	0.0960	0.1032
W2-W1	1	0.0589	0.0675	0.0764	0.0842	0.0863	0.0959
	2	0.0536	0.0678	0.0727	0.0802	0.0866	0.0969
	3	0.0535	0.0670	0.0741	0.0869	0.0896	0.0967
mean		0.0553	0.0674	0.0744	0.0838	0.0875	0.0965
Wi=(w2-w1)/w1	1	8.9313	10.8893	11.9324	13.5784	13.6959	14.9861
	2	8.2439	10.5864	11.5318	13.1446	13.7538	14.9071
	3	8.1064	10.6401	11.7656	13.7950	13.9945	14.8764
mean		8.4272	10.7053	11.7433	13.5060	13.8147	14.9232
SD		0.4419	0.1616	0.2012	0.3312	0.1584	0.0566

Table 12D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of low molecular weight chitosan films prepared from 2% lactic acid.

LL2(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0065	0.0065	0.0066	0.0065	0.0065	0.0065
	2	0.0066	0.0065	0.0064	0.0066	0.0066	0.0065
	3	0.0066	0.0064	0.0065	0.0065	0.0066	0.0066
W2(at t)	1	0.0358	0.0376	0.0424	0.0427	0.0448	0.0456
	2	0.0359	0.0397	0.0399	0.0453	0.0461	0.0455
	3	0.0345	0.0391	0.0427	0.0442	0.0451	0.0457
W2-W1	1	0.0293	0.0311	0.0358	0.0362	0.0383	0.0391
	2	0.0293	0.0332	0.0335	0.0387	0.0395	0.0390
	3	0.0279	0.0327	0.0362	0.0377	0.0385	0.0391
mean		0.0289	0.0323	0.0352	0.0375	0.0387	0.0391
Wi=(w2-w1)/w1	1	4.5147	4.7805	5.4277	5.5636	5.8865	6.0126
	2	4.4462	5.1111	5.2405	5.8702	5.9863	5.9983
	3	4.2289	5.1018	5.5672	5.7949	5.8258	5.9295
mean		4.3966	4.9978	5.4118	5.7429	5.8995	5.9801
SD		0.1492	0.1882	0.1639	0.1598	0.0810	0.0444
LL2(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0066	0.0065	0.0065	0.0065	0.0065	0.0065
	2	0.0067	0.0065	0.0066	0.0066	0.0065	0.0066
	3	0.0066	0.0066	0.0065	0.0066	0.0066	0.0066
W2(at t)	1	0.0382	0.0345	0.0360	0.0390	0.0389	0.0445
	2	0.0353	0.0370	0.0392	0.0397	0.0400	0.0410
	3	0.0335	0.0340	0.0383	0.0389	0.0415	0.0439
W2-W1	1	0.0316	0.0280	0.0295	0.0325	0.0324	0.0380
	2	0.0286	0.0305	0.0326	0.0331	0.0335	0.0344
	3	0.0269	0.0274	0.0318	0.0323	0.0349	0.0373
mean		0.0290	0.0287	0.0313	0.0326	0.0336	0.0366
Wi=(w2-w1)/w1	1	4.7910	4.3133	4.5333	4.9965	4.9866	5.8454
	2	4.2621	4.6902	4.9406	5.0212	5.1523	5.2048
	3	4.0732	4.1563	4.8939	4.8957	5.2844	5.6522
mean		4.3754	4.3866	4.7893	4.9711	5.1411	5.5675
SD		0.3721	0.2744	0.2229	0.0665	0.1492	0.3286

Table 13D Data of swelling index value in deionized water (DI) and artificial saliva (AS medium molecular weight chitosan films prepared from 1% acetic acid.

MA1(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0060	0.0062	0.0062	0.0062	0.0062	0.0062
	2	0.0061	0.0060	0.0060	0.0063	0.0062	0.0062
	3	0.0060	0.0062	0.0061	0.0061	0.0062	0.0063
W2(at t)	1	0.0718	0.0865	0.1359	0.1564	0.1899	0.3076
	2	0.0708	0.0791	0.1350	0.1605	0.1993	0.3145
	3	0.0719	0.0868	0.1388	0.1571	0.1935	0.3379
W2-W1	1	0.0658	0.0803	0.1297	0.1502	0.1837	0.3014
	2	0.0647	0.0731	0.1290	0.1542	0.1931	0.3083
	3	0.0659	0.0806	0.1327	0.1510	0.1873	0.3316
mean		0.0655	0.0780	0.1305	0.1518	0.1880	0.3138
Wi=(w2-w1)/w1	1	10.9722	12.9444	20.9231	24.2273	29.6230	48.6163
	2	10.6111	12.1754	21.5000	24.4818	31.1429	49.7215
	3	10.9823	12.9984	21.7503	24.7529	30.2148	52.6369
mean		10.8552	12.7061	21.3911	24.4873	30.3269	50.3249
SD		0.2115	0.4604	0.4242	0.2628	0.7661	2.0771
MA1(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0060	0.0062	0.0062	0.0062	0.0062	0.0062
	2	0.0061	0.0063	0.0064	0.0063	0.0063	0.0062
	3	0.0062	0.0062	0.0062	0.0063	0.0061	0.0061
W2(at t)	1	0.0805	0.0866	0.1235	0.1586	0.1767	0.2355
	2	0.0791	0.0869	0.1245	0.1566	0.1723	0.2390
	3	0.0790	0.0898	0.1263	0.1556	0.1730	0.2378
W2-W1	1	0.0745	0.0804	0.1173	0.1524	0.1705	0.2293
	2	0.0730	0.0806	0.1181	0.1503	0.1660	0.2328
	3	0.0728	0.0836	0.1201	0.1493	0.1669	0.2317
mean		0.0735	0.0815	0.1185	0.1507	0.1678	0.2313
Wi=(w2-w1)/w1	1	12.4188	12.9681	18.9251	24.5882	27.4935	36.9888
	2	11.9742	12.7962	18.4561	23.8627	26.3452	37.5445
	3	11.7412	13.4844	19.3767	23.6941	27.3645	37.9778
mean		12.0447	13.0829	18.9193	24.0483	27.0677	37.5037
SD		0.3443	0.3582	0.4603	0.4751	0.6290	0.4958

Table 14D Data of swelling index value in deionized water (DI) and artificial saliva (AS) medium molecular weight chitosan films prepared from 2% acetic acid.

MA2(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0060	0.0063	0.0062	0.0063	0.0062	0.0062
	2	0.0061	0.0062	0.0063	0.0062	0.0061	0.0061
	3	0.0061	0.0062	0.0061	0.0062	0.0062	0.0062
W2(at t)	1	0.0552	0.0798	0.1196	0.1543	0.1819	0.2906
	2	0.0660	0.0816	0.1313	0.1506	0.1762	0.2888
	3	0.0603	0.0801	0.1219	0.1477	0.1792	0.2911
W2-W1	1	0.0492	0.0735	0.1134	0.1480	0.1757	0.2844
	2	0.0599	0.0754	0.1250	0.1444	0.1701	0.2827
	3	0.0542	0.0739	0.1158	0.1415	0.1730	0.2849
mean		0.0544	0.0743	0.1181	0.1446	0.1729	0.2840
Wi=(w2-w1)/w1	1	8.2000	11.6667	18.2857	23.4877	28.3358	45.8768
	2	9.8200	12.1667	19.8413	23.2857	27.8911	46.3423
	3	8.8773	11.9218	18.9828	22.8182	27.9052	45.9483
mean		8.9658	11.9184	19.0366	23.1972	28.0440	46.0558
SD		0.8136	0.2500	0.7792	0.3434	0.2528	0.2507
MA2(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0061	0.0063	0.0062	0.0063	0.0062	0.0062
	2	0.0062	0.0063	0.0063	0.0064	0.0061	0.0061
	3	0.0063	0.0062	0.0063	0.0062	0.0063	0.0062
W2(at t)	1	0.0590	0.0960	0.1293	0.1514	0.1674	0.2258
	2	0.0579	0.0980	0.1382	0.1674	0.1650	0.2194
	3	0.0595	0.0946	0.1289	0.1488	0.1719	0.2279
W2-W1	1	0.0529	0.0897	0.1231	0.1451	0.1612	0.2196
	2	0.0517	0.0917	0.1319	0.1610	0.1589	0.2133
	3	0.0532	0.0884	0.1226	0.1426	0.1656	0.2217
mean		0.0526	0.0899	0.1259	0.1496	0.1619	0.2182
Wi=(w2-w1)/w1	1	8.6667	14.2453	19.8500	23.0299	26.0000	35.4246
	2	8.3401	14.5614	20.9355	25.1618	26.0523	34.9737
	3	8.4523	14.2528	19.4671	23.0075	26.2799	35.7593
mean		8.4864	14.3532	20.0842	23.7331	26.1107	35.3859
SD		0.1659	0.1804	0.7617	1.2374	0.1488	0.3942

Table 15D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of medium molecular weight chitosan films prepared from 1% lactic acid.

ML1(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0061	0.0063	0.0064	0.0063	0.0066	0.0065
	2	0.0063	0.0064	0.0063	0.0065	0.0064	0.0063
	3	0.0060	0.0064	0.0065	0.0065	0.0065	0.0063
W2(at t)	1	0.0706	0.0756	0.0862	0.1252	0.1815	0.2619
	2	0.0676	0.0819	0.0925	0.1275	0.1721	0.2519
	3	0.0654	0.0826	0.0906	0.1296	0.1780	0.2515
W2-W1	1	0.0645	0.0693	0.0798	0.1189	0.1749	0.2554
	2	0.0613	0.0755	0.0862	0.1210	0.1657	0.2456
	3	0.0594	0.0762	0.0841	0.1231	0.1715	0.2452
mean		0.0617	0.0737	0.0834	0.1210	0.1707	0.2487
Wi=(w2-w1)/w1	1	10.5725	11.0000	12.4762	18.8657	26.4944	39.2863
	2	9.7377	11.7982	13.6844	18.6179	25.8978	38.9852
	3	9.8975	11.9054	12.9437	18.9327	26.3824	38.9267
mean		10.0692	11.5679	13.0348	18.8054	26.2582	39.0661
SD		0.4431	0.4947	0.6092	0.1658	0.3171	0.1930
ML1(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0061	0.0065	0.0064	0.0063	0.0066	0.0065
	2	0.0063	0.0064	0.0064	0.0065	0.0064	0.0064
	3	0.0061	0.0064	0.0065	0.0064	0.0066	0.0065
W2(at t)	1	0.0562	0.0702	0.0889	0.1064	0.1434	0.2071
	2	0.0597	0.0756	0.0831	0.1128	0.1431	0.2071
	3	0.0596	0.0702	0.0824	0.1087	0.1447	0.2114
W2-W1	1	0.0501	0.0637	0.0825	0.1001	0.1368	0.2006
	2	0.0534	0.0692	0.0767	0.1063	0.1367	0.2007
	3	0.0535	0.0638	0.0759	0.1023	0.1381	0.2049
mean		0.0523	0.0656	0.0784	0.1029	0.1372	0.2021
Wi=(w2-w1)/w1	1	8.2166	9.7969	12.8873	15.8834	20.7335	30.8633
	2	8.4694	10.8153	11.9859	16.3611	21.3527	31.3652
	3	8.7632	9.9672	11.6761	15.9772	20.9239	31.5266
mean		8.4831	10.1931	12.1831	16.0739	21.0034	31.2517
SD		0.2736	0.5455	0.6292	0.2531	0.3172	0.3459

Table 16D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of medium molecular weight chitosan films prepared from 2% lactic acid.

ML2(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0068	0.0069	0.0066	0.0068	0.0068	0.0069
	2	0.0066	0.0068	0.0066	0.0066	0.0069	0.0069
	3	0.0068	0.0068	0.0067	0.0067	0.0069	0.0068
W2(at t)	1	0.0397	0.0458	0.0466	0.0501	0.0543	0.0555
	2	0.0395	0.0463	0.0469	0.0499	0.0549	0.0552
	3	0.0412	0.0459	0.0469	0.0522	0.0544	0.0551
W2-W1	1	0.0329	0.0389	0.0400	0.0433	0.0475	0.0486
	2	0.0329	0.0395	0.0403	0.0433	0.0480	0.0483
	3	0.0344	0.0391	0.0402	0.0455	0.0475	0.0483
mean		0.0334	0.0392	0.0402	0.0440	0.0477	0.0484
Wi=(w2-w1)/w1	1	4.8338	5.6317	6.0574	6.3667	6.9865	7.0394
	2	4.9886	5.8137	6.1125	6.5573	6.9626	6.9976
	3	5.0563	5.7493	5.9997	6.7972	6.8775	7.1030
mean		4.9596	5.7316	6.0565	6.5737	6.9422	7.0467
SD		0.1141	0.0923	0.0564	0.2157	0.0573	0.0531
ML2(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0068	0.0069	0.0068	0.0068	0.0068	0.0069
	2	0.0069	0.0068	0.0068	0.0067	0.0066	0.0068
	3	0.0069	0.0069	0.0067	0.0067	0.0069	0.0068
W2(at t)	1	0.0355	0.0396	0.0405	0.0416	0.0444	0.0483
	2	0.0384	0.0398	0.0407	0.0420	0.0447	0.0478
	3	0.0357	0.0391	0.0395	0.0434	0.0471	0.0494
W2-W1	1	0.0287	0.0327	0.0337	0.0348	0.0376	0.0414
	2	0.0315	0.0330	0.0339	0.0353	0.0381	0.0410
	3	0.0288	0.0322	0.0328	0.0367	0.0402	0.0426
mean		0.0297	0.0326	0.0335	0.0356	0.0386	0.0416
Wi=(w2-w1)/w1	1	4.2138	4.7414	4.9534	5.1215	5.5315	5.9957
	2	4.5714	4.8577	4.9885	5.2637	5.7725	6.0225
	3	4.1757	4.6637	4.8947	5.4757	5.8292	6.2669
mean		4.3203	4.7543	4.9455	5.2870	5.7111	6.0950
SD		0.2183	0.0976	0.0474	0.1782	0.1581	0.1494

Table 17D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of high molecular weight chitosan films prepared from 1% acetic acid.

HA1(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0064	0.0062	0.0062	0.0062	0.0062	0.0062
	2	0.0068	0.0065	0.0064	0.0063	0.0064	0.0064
	3	0.0066	0.0063	0.0065	0.0063	0.0064	0.0063
W2(at t)	1	0.0832	0.0984	0.1367	0.1613	0.2356	0.3526
	2	0.0890	0.1037	0.1455	0.1663	0.2445	0.3647
	3	0.0863	0.1002	0.1471	0.1687	0.2444	0.3599
W2-W1	1	0.0768	0.0922	0.1305	0.1551	0.2294	0.3464
	2	0.0822	0.0972	0.1391	0.1600	0.2381	0.3583
	3	0.0797	0.0939	0.1406	0.1624	0.2380	0.3536
mean		0.0796	0.0944	0.1367	0.1592	0.2352	0.3528
Wi=(w2-w1)/w1	1	12.0000	14.8698	21.0441	25.0145	36.9983	55.8751
	2	12.0909	14.9508	21.7331	25.3979	37.2107	55.9817
	3	12.0685	14.8985	21.6373	25.7754	37.1875	56.1226
mean		12.0531	14.9064	21.4715	25.3959	37.1322	55.9931
SD		0.0474	0.0411	0.3732	0.3805	0.1165	0.1241
HA1(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0059	0.0062	0.0064	0.0065	0.0062	0.0063
	2	0.0062	0.0064	0.0064	0.0063	0.0065	0.0064
	3	0.0062	0.0065	0.0063	0.0065	0.0064	0.0065
W2(at t)	1	0.0698	0.0891	0.1185	0.1493	0.1960	0.3146
	2	0.0746	0.0895	0.1260	0.1440	0.2027	0.3221
	3	0.0743	0.0911	0.1226	0.1504	0.2036	0.3263
W2-W1	1	0.0639	0.0829	0.1121	0.1428	0.1898	0.3083
	2	0.0684	0.0831	0.1196	0.1377	0.1962	0.3157
	3	0.0681	0.0846	0.1163	0.1439	0.1972	0.3198
mean		0.0668	0.0835	0.1160	0.1414	0.1944	0.3146
Wi=(w2-w1)/w1	1	10.8368	13.3774	17.5192	21.9639	30.6145	48.9349
	2	11.0277	12.9819	18.6941	21.8528	30.1923	49.3225
	3	10.9884	13.0189	18.4549	22.1382	30.8158	49.1989
mean		10.9510	13.1261	18.2227	21.9850	30.5409	49.1521
SD		0.1008	0.2184	0.6209	0.1439	0.3182	0.1980

Table 18D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of high molecular weight chitosan films prepared from 2% acetic acid.

HA2(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0062	0.0062	0.0062	0.0062	0.0062	0.0062
	2	0.0062	0.0061	0.0063	0.0064	0.0060	0.0064
	3	0.0063	0.0063	0.0063	0.0063	0.0061	0.0062
W2(at t)	1	0.0738	0.0895	0.1435	0.1604	0.2105	0.3131
	2	0.0754	0.0909	0.1361	0.1661	0.2063	0.3254
	3	0.0755	0.0925	0.1403	0.1616	0.2113	0.3161
W2-W1	1	0.0676	0.0833	0.1373	0.1542	0.2043	0.3069
	2	0.0692	0.0848	0.1298	0.1597	0.2003	0.3190
	3	0.0692	0.0862	0.1340	0.1553	0.2052	0.3099
mean		0.0687	0.0848	0.1337	0.1564	0.2033	0.3119
Wi=(w2-w1)/w1	1	10.9107	13.4426	22.1500	24.8710	32.9565	49.4941
	2	11.1636	13.9048	20.6000	24.9516	33.3824	49.8434
	3	10.9864	13.6868	21.2669	24.6563	33.6341	49.9839
mean		11.0202	13.6781	21.3390	24.8263	33.3243	49.7738
SD		0.1298	0.2312	0.7775	0.1526	0.3425	0.2522
HA2(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0064	0.0066	0.0064	0.0063	0.0064	0.0064
	2	0.0063	0.0064	0.0066	0.0064	0.0063	0.0063
	3	0.0064	0.0065	0.0064	0.0065	0.0065	0.0063
W2(at t)	1	0.0700	0.0791	0.1255	0.1419	0.1914	0.2745
	2	0.0755	0.0820	0.1272	0.1424	0.1916	0.2742
	3	0.0738	0.0847	0.1248	0.1486	0.1990	0.3162
W2-W1	1	0.0636	0.0725	0.1191	0.1356	0.1850	0.2681
	2	0.0692	0.0756	0.1206	0.1360	0.1853	0.2679
	3	0.0674	0.0782	0.1184	0.1421	0.1925	0.3099
mean		0.0667	0.0754	0.1194	0.1379	0.1876	0.2820
Wi=(w2-w1)/w1	1	9.9410	10.9821	18.6169	21.5159	28.9112	41.8962
	2	10.9796	11.8169	18.2767	21.2540	29.4125	42.5220
	3	10.5338	12.0315	18.4966	21.8554	29.6163	42.8119
mean		10.4848	11.6102	18.4634	21.5418	29.3133	42.4100
SD		0.5210	0.5544	0.1725	0.3015	0.3629	0.4680

Table 19D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of high molecular weight chitosan films prepared from 1% lactic acid.

HL1(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0068	0.0066	0.0068	0.0066	0.0065	0.0065
	2	0.0065	0.0067	0.0067	0.0068	0.0066	0.0065
	3	0.0067	0.0066	0.0067	0.0066	0.0066	0.0066
W2(at t)	1	0.0988	0.1048	0.1427	0.1568	0.1968	0.2985
	2	0.0904	0.1045	0.1458	0.1645	0.1979	0.3011
	3	0.0946	0.1026	0.1453	0.1576	0.2003	0.3165
W2-W1	1	0.0920	0.0982	0.1359	0.1502	0.1903	0.2920
	2	0.0839	0.0978	0.1391	0.1577	0.1913	0.2946
	3	0.0879	0.0960	0.1386	0.1510	0.1937	0.3099
mean		0.0879	0.0973	0.1379	0.1529	0.1918	0.2988
Wi=(w2-w1)/w1	1	13.5313	14.8842	19.9868	22.7500	29.2843	44.9269
	2	12.9086	14.5915	20.7641	23.1863	28.9878	45.3231
	3	13.1236	14.5413	20.6818	22.8824	29.3442	45.2279
mean		13.1878	14.6723	20.4776	22.9396	29.2054	45.1593
SD		0.3163	0.1852	0.4270	0.2237	0.1908	0.2068
HL1(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0068	0.0068	0.0068	0.0066	0.0065	0.0067
	2	0.0065	0.0067	0.0065	0.0068	0.0065	0.0067
	3	0.0066	0.0066	0.0068	0.0067	0.0066	0.0066
W2(at t)	1	0.0942	0.1071	0.1401	0.1474	0.1699	0.2671
	2	0.0849	0.1023	0.1328	0.1506	0.1681	0.2691
	3	0.0889	0.0998	0.1370	0.1472	0.1733	0.3165
W2-W1	1	0.0874	0.1003	0.1333	0.1408	0.1634	0.2604
	2	0.0784	0.0956	0.1263	0.1438	0.1616	0.2624
	3	0.0823	0.0932	0.1302	0.1405	0.1667	0.3099
mean		0.0827	0.0964	0.1299	0.1417	0.1639	0.2776
Wi=(w2-w1)/w1	1	12.8519	14.7500	19.5968	21.3323	25.1333	38.8665
	2	12.0556	14.2673	19.4244	21.1471	24.8627	39.1625
	3	12.4625	14.1225	19.1519	20.9627	25.2538	39.2850
mean		12.4567	14.3799	19.3910	21.1474	25.0833	39.1047
SD		0.3982	0.3286	0.2243	0.1848	0.2003	0.2152

Table 20D Data of swelling index value in deionized water (DI) and artificial saliva (AS) of high molecular weight chitosan films prepared from 1% lactic acid.

HL2(DI)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0068	0.0069	0.0068	0.0069	0.0068	0.0068
	2	0.0068	0.0069	0.0067	0.0068	0.0069	0.0066
	3	0.0069	0.0067	0.0069	0.0068	0.0069	0.0068
W2(at t)	1	0.0429	0.0478	0.0523	0.0560	0.0608	0.0614
	2	0.0442	0.0471	0.0532	0.0571	0.0621	0.0603
	3	0.0445	0.0471	0.0541	0.0582	0.0614	0.3167
W2-W1	1	0.0361	0.0409	0.0455	0.0491	0.0540	0.0546
	2	0.0374	0.0402	0.0465	0.0503	0.0552	0.0537
	3	0.0376	0.0404	0.0472	0.0514	0.0545	0.3099
mean		0.0370	0.0405	0.0464	0.0503	0.0546	0.1394
Wi=(w2-w1)/w1	1	5.3042	5.9293	6.6939	7.1168	7.9385	8.0223
	2	5.5000	5.8295	6.9455	7.3923	7.9969	8.1399
	3	5.4545	6.0262	6.8469	7.5562	7.8981	8.3046
mean		5.4196	5.9283	6.8288	7.3551	7.9445	8.1556
SD		0.1025	0.0984	0.1268	0.2220	0.0497	0.1418
HL2(AS)	Sample	2min	5min	10min	15min	30min	60min
W1(at t=0)	1	0.0069	0.0069	0.0071	0.0069	0.0071	0.0068
	2	0.0068	0.0070	0.0072	0.0072	0.0069	0.0070
	3	0.0070	0.0071	0.0069	0.0070	0.0069	0.0069
W2(at t)	1	0.0395	0.0430	0.0485	0.0501	0.0534	0.0534
	2	0.0406	0.0442	0.0503	0.0527	0.0517	0.0556
	3	0.0392	0.0434	0.0485	0.0504	0.0528	0.3168
W2-W1	1	0.0326	0.0361	0.0414	0.0432	0.0463	0.0466
	2	0.0338	0.0372	0.0431	0.0455	0.0448	0.0486
	3	0.0322	0.0363	0.0416	0.0434	0.0459	0.3099
mean		0.0329	0.0365	0.0420	0.0440	0.0457	0.1350
Wi=(w2-w1)/w1	1	4.7312	5.2319	5.8371	6.2544	6.5255	6.8589
	2	4.9635	5.3162	5.9845	6.3238	6.4941	6.9398
	3	4.6043	5.1172	6.0283	6.1981	6.6569	6.9975
mean		4.7663	5.2218	5.9500	6.2588	6.5588	6.9321
SD		0.1822	0.0999	0.1002	0.0630	0.0864	0.0696

Table 21D The mucoadhesive force data of prepared free films

	Mucoadhesive force (N/mm^2)							
	Sample number							
Formulas	1	2	3	4	5	Mean	SD	%CV
S0	5.1478	5.2501	5.0362	5.5309	5.3624	5.2655	0.19	3.63
SC1	5.6435	6.3083	6.0003	6.2236	6.0837	6.0519	0.26	4.26
SC2	7.5191	7.2941	7.7411	7.6038	7.4032	7.5123	0.17	2.31
H0	3.6725	3.9432	3.8498	4.0497	3.6287	3.8288	0.18	4.65
HC1	5.4724	5.1787	5.7045	5.3358	5.5653	5.4513	0.20	3.73
HC2	6.6241	7.0838	6.7394	6.8634	6.9942	6.8610	0.19	2.71
LA1	1.3172	1.5100	1.4201	1.5619	1.2386	1.4096	0.13	9.46
LA2	0.3557	0.4466	0.3008	0.4193	0.3443	0.3734	0.06	15.78
LL1	1.4730	1.7369	1.3915	1.6421	1.7599	1.6007	0.16	10.15
LL2	0.5310	0.6462	0.5836	0.4739	0.5988	0.5667	0.07	11.68
MA1	8.7126	8.9016	9.3073	8.2605	8.7694	8.7903	0.38	4.28
MA2	2.0518	2.2871	2.1060	2.7477	1.9391	2.2263	0.32	14.26
ML1	7.5028	7.2198	7.7697	7.4499	7.8119	7.5508	0.24	3.23
ML2	1.4068	1.2945	1.6327	1.4645	1.7457	1.5088	0.18	11.94
HA1	9.5852	9.7192	9.4531	9.0807	9.2541	9.4185	0.26	2.71
HA2	3.2440	3.3511	3.5530	3.1018	3.4699	3.3440	0.18	5.35
HL1	9.0927	8.7905	8.9334	9.2602	8.5208	8.9195	0.28	3.18
HL2	2.9194	2.9944	2.8564	2.7386	2.8831	2.8784	0.09	3.26

Table22D Mucoadhesive time data of prepared free films

	Mucoadhesive time (hour)							
	Sample number							
Formulas	1	2	3	4	5	Mean	SD	%CV
S0	5.5161	5.6917	5.1597	5.4247	5.5389	5.4662	0.20	3.59
SC1	3.8803	3.6167	3.9853	4.1811	3.4544	3.8236	0.29	7.58
SC2	2.9447	2.8356	2.8039	2.9781	2.9258	2.8976	0.07	2.57
H0	2.1175	1.9056	1.8328	2.0117	1.6892	1.9113	0.16	8.60
HC1	4.2683	4.0478	4.4581	4.1772	4.5450	4.2993	0.20	4.72
HC2	6.8511	6.5356	6.9642	6.2900	7.4961	6.8274	0.46	6.71
LA1	3.3992	3.0383	3.2625	3.5067	3.3100	3.3033	0.17	5.30
LA2	0.6494	0.7072	0.5903	0.7139	0.6708	0.6663	0.05	7.51
LL1	2.6906	2.7844	2.5828	2.6556	2.7297	2.6886	0.08	2.83
LL2	0.5667	0.5483	0.5875	0.5422	0.5544	0.5598	0.02	3.20
MA1	9.6225	8.9081	9.4828	9.3958	9.4336	9.3686	0.27	2.90
MA2	4.0650	3.8944	4.1597	3.8478	4.0522	4.0038	0.13	3.23
ML1	7.4328	7.1894	7.2308	7.3111	7.0964	7.2521	0.13	1.75
ML2	3.2575	3.3425	3.1872	3.3247	3.2658	3.2756	0.06	1.88
HA1	6.2664	6.4181	6.0992	6.2792	6.3786	6.2883	0.12	1.97
HA2	3.1319	3.3050	3.1858	3.2608	3.2172	3.2202	0.07	2.07
HL1	4.9603	4.8422	4.7194	4.9906	4.8814	4.8788	0.11	2.19
HL2	2.3950	2.4661	2.2806	2.4953	2.3744	2.4023	0.08	3.51

Table 23D The water repellent and mucoadhesive properties of monolayered and bilayered films of MA1 ,ML1 and HC2 containing *Garcinia mangostana* extract.

		Water repellent time(hr)								
		Sample No.								
	Formulas	1	2	3	4	5	6	Mean	SD	%CV
monolayer	MA1	*	*	*	*	*	*	*	0	0
	ML1	8.167	8.200	8.083	7.920	8.100	7.833	8.051	0.144	1.79
	HC2	1.550	1.633	1.450	1.467	1.583	1.533	1.536	0.069	4.51
bilayer	MA1	*	*	*	*	*	*	*	0	0
	ML1	20.250	20.366	20.333	20.216	20.400	20.300	20.311	0.070	0.34
	HCM2	5.867	6.167	5.783	6.233	6.333	5.917	6.050	0.223	3.69

* means over 24 hr.

Table 24D The cumulative amount and percentage release of mangostin from MA1 film containing *Garcinia mangostana* extract.

	cumulative amount release (mcg)					cumulative percentage release *H16				
Time	A1	A2	A3	A4	Mean	A1	A2	A3	A4	Mean
10	147.1909	134.6735	139.4471	142.6338	140.9863	31.5623	28.8782	29.9018	30.5851	30.2319
20	196.8795	179.2755	183.5116	188.8004	187.1167	42.2171	38.4423	39.3506	40.4847	40.1237
30	215.2807	189.0552	222.0242	226.9177	213.3195	46.1629	40.5393	47.6089	48.6582	45.7424
45	230.0633	212.0381	223.2176	239.7173	226.2591	49.3328	45.4676	47.8648	51.4029	48.5170
60	244.0553	228.7977	237.2243	266.5230	244.1501	52.3331	49.0614	50.8683	57.1508	52.3534
120	263.1461	266.0739	268.8253	297.2129	273.8146	56.4267	57.0545	57.6445	63.7317	58.7144
180	289.2056	274.9352	289.8007	324.0453	294.4967	62.0147	58.9547	62.1423	69.4854	63.1493
240	302.8016	298.4072	303.3278	350.2092	313.6865	64.9301	63.9878	65.0430	75.0958	67.2642
300	313.7478	310.3639	337.0520	367.6486	332.2031	67.2773	66.5517	72.2745	78.8353	71.2347
360	334.8214	326.8931	362.0158	380.1743	350.9761	71.7962	70.0961	77.6275	81.5212	75.2602
480	338.9699	342.8052	372.1265	404.9744	364.7190	72.6857	73.5081	79.7955	86.8392	78.2071
600	351.3309	353.0405	386.1975	403.3804	373.4873	75.3363	75.7029	82.8128	86.4974	80.0873
720	371.4949	369.3371	395.2431	416.9290	388.2510	79.6601	79.1974	84.7525	89.4026	83.2531

unt of mangostin = 466.35/film

Table 25D The cumulative amount and percentage release of mangostin from ML1 film containing *Garcinia mangostana* extract.

	cumulative amount release (mcg)					cumulative percentage release *				
Time	L1	L2	L3	L4	Mean	L1	L2	L3	L4	Mean
10	220.1570	250.9478	253.1700	242.5812	241.7140	46.4525	52.9493	53.4182	51.1839	51.0010
20	256.8787	267.7144	300.9937	270.4093	273.9990	54.2007	56.4870	63.5088	57.0556	57.8130
30	268.4944	266.5339	327.7863	283.6700	286.6211	56.6516	56.2379	69.1620	59.8536	60.4763
45	286.4811	266.3010	342.5027	287.8386	295.7809	60.4467	56.1888	72.2671	60.7331	62.4089
60	273.9806	270.7559	330.5295	291.6464	291.7281	57.8091	57.1287	69.7408	61.5366	61.5538
120	268.4946	262.3892	322.9893	274.2681	282.0353	56.6516	55.3634	68.1498	57.8698	59.5086
180	285.6501	272.5333	337.2744	296.5212	297.9948	60.2714	57.5038	71.1640	62.5651	62.8761
240	285.4329	277.5585	354.8398	300.6701	304.6253	60.2255	58.5641	74.8702	63.4405	64.2751
300	291.5885	282.2959	368.5820	302.5259	311.2481	61.5243	59.5636	77.7698	63.8321	65.6725
360	294.3608	281.5510	375.9587	305.5650	314.3589	62.1093	59.4065	79.3262	64.4734	66.3288
480	292.6172	276.6723	353.3896	298.8635	305.3856	61.7414	58.3771	74.5642	63.0594	64.4355
600	296.3902	276.8627	366.0398	298.9678	309.5651	62.5375	58.4172	77.2334	63.0814	65.3174
720	303.4654	278.8546	375.9491	308.9064	316.7938	64.0303	58.8375	79.3242	65.1784	66.8426

nt of mangostin = 473.94/film

Table 26D The cumulative amount and percentage release of mangostin from HC2 film containing *Garcinia mangostana* extract.

	cumulative amount release (mcg)					cumulative percentage release *				
Time	C1	C2	C3	C4	Mean	C1	C2	C3	C4	Mean
10	10.7833	9.9758	9.0051	11.0978	10.2155	2.2396	2.0719	1.8703	2.3049	2.1217
20	38.9201	22.8591	31.3149	34.8151	31.9773	8.0834	4.7477	6.5039	7.2308	6.6415
30	32.7997	41.9196	32.2374	32.7064	34.9158	6.8123	8.7064	6.6955	6.7929	7.2518
45	45.2934	41.2586	40.5504	49.9120	44.2536	9.4071	8.5691	8.4220	10.3664	9.1912
60	62.5148	69.2378	63.1442	61.8360	64.1832	12.9839	14.3802	13.1146	12.8429	13.3304
120	102.6549	95.1139	96.4052	100.6021	98.6941	21.3207	19.7545	20.0227	20.8944	20.4981
180	137.3158	141.1022	137.2325	151.4220	141.7681	28.5195	29.3059	28.5022	31.4493	29.4442
240	164.5337	162.9948	166.6496	180.0863	168.5661	34.1725	33.8529	34.6119	37.4026	35.0100
300	187.6903	183.9069	189.7158	186.2741	186.8968	38.9820	38.1962	39.4026	38.6878	38.8171
360	214.5761	219.4099	214.9951	213.5946	215.6439	44.5659	45.5699	44.6530	44.3621	44.7877
480	245.5751	247.9385	244.3227	241.5636	244.8500	51.0042	51.4951	50.7441	50.1711	50.8536
600	280.4202	289.5751	287.4343	284.2406	285.4175	58.2413	60.1427	59.6981	59.0348	59.2792
720	285.1362	274.4196	286.1648	279.0230	281.1859	59.2208	56.9950	59.4344	57.9511	58.4003

mount of mangostin = 481.48/film

Table 27D Amount of mangostin containing in mucoadhesive film in stability test at initial time.

Stability test data : At initial time(t=0)

Formulas	MA1			ML1			HC2		
Sample No.	Peak area ratio	conc (mcg/ml)	Amount (mcg)	Peak area ratio	conc (mcg/ml)	Amount (mcg)	Peak area ratio	conc (mcg/ml)	Amount (mcg)
1	1.8024	19.0390	475.9757	1.7973	18.9852	474.6291	1.8287	19.3164	482.9111
2	1.7641	18.6354	465.8851	1.8208	19.2333	480.8333	1.7890	18.8976	472.4412
3	1.7312	18.2880	457.1994	1.7660	18.6547	466.3683	1.8521	19.5636	489.0910
Mean	1.7659	18.6541	466.3534	1.7947	18.9577	473.9436	1.8233	19.2592	481.4811
SD	0.0356	0.3759	9.3969	0.0275	0.2903	7.2568	0.0319	0.3367	8.4165
%CV	2.02	2.01	2.01	1.53	1.53	1.53	1.75	1.75	1.75

Table 28D Amount of mangostin containing in mucoadhesive film in stability test at first month.

tability test data : At the first month (t=1)

Formulas	MA1			ML1			HC2		
Sample No.	Peak area ratio	conc (mcg/ml)	Amount (mcg)	Peak area ratio	conc (mcg/ml)	Amount (mcg)	Peak area ratio	conc (mcg/ml)	Amount (mcg)
1	1.7540	18.4339	460.8468	1.7250	18.1264	453.1603	1.8240	19.1768	479.4205
2	1.7834	18.7466	468.6642	1.7728	18.6342	465.8557	1.7775	18.6836	467.0895
3	1.6983	17.8429	446.0726	1.8056	18.9820	474.5494	1.8032	18.9567	473.9181
Mean	1.7452	18.3411	458.5279	1.7678	18.5809	464.5218	1.8016	18.9390	473.4760
SD	0.0432	0.4589	11.4729	0.0405	0.4303	10.7567	0.0233	0.2471	6.1773
%CV	2.48	2.50	2.50	2.29	2.32	2.32	1.29	1.30	1.30

Table 29D Amount of mangostin containing in mucoadhesive film in stability test at the second month.

Stability test data : At the second month(t=2)

Formulas	MA1			ML1			HC2		
Sample No.	Peak area ratio	conc (mcg/ml)	Amount (mcg)	Peak area ratio	conc (mcg/ml)	Amount (mcg)	Peak area ratio	conc (mcg/ml)	Amount (mcg)
1	1.6128	17.3832	434.5805	1.6745	18.0551	451.3777	1.7235	18.5905	464.7624
2	1.6973	18.3043	457.6080	1.6916	18.2423	456.0581	1.6810	18.1270	453.1761
3	1.6091	17.3419	433.5482	1.7252	18.6082	465.2043	1.7700	19.0971	477.4274
Mean	1.6397	17.6765	441.9122	1.6971	18.3019	457.5467	1.7249	18.6049	465.1220
SD	0.0499	0.5441	13.6027	0.0258	0.2813	7.0324	0.0445	0.4852	12.1297
%CV	3.04	3.08	3.08	1.52	1.54	1.54	2.58	2.61	2.61

Table 30D Amount of mangostin containing in mucoadhesive film in stability test at the third month.

Stability test data : At the third month(t=3)

Formulas	MA1			ML1			HC2		
Sample No.	Peak area ratio	conc (mcg/ml)	Amount (mcg)	Peak area ratio	conc (mcg/ml)	Amount (mcg)	Peak area ratio	conc (mcg/ml)	Amount (mcg)
1	1.5914	16.7150	417.8760	1.6387	17.2178	430.4459	1.7478	18.3787	459.4684
2	1.6277	17.1008	427.5188	1.7450	18.3491	458.7281	1.6901	17.7646	444.1141
3	1.6561	17.4032	435.0798	1.7200	18.0828	452.0697	1.7854	18.7783	469.4576
Mean	1.6251	17.0730	426.8249	1.7012	17.8832	447.0812	1.7411	18.3072	457.6800
SD	0.0324	0.3449	8.6229	0.0556	0.5915	14.7863	0.0480	0.5106	12.7661
%CV	2.00	2.02	2.02	3.27	3.31	3.31	2.76	2.79	2.79

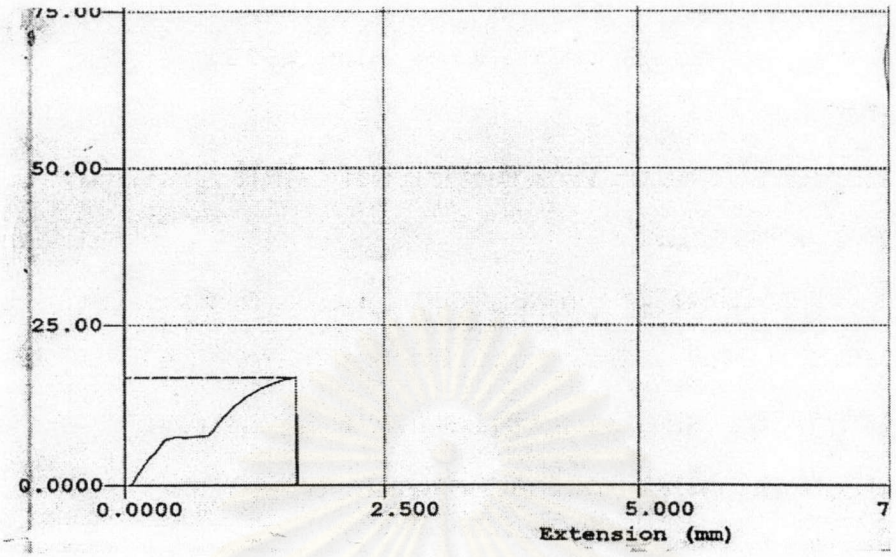

Figure 1D The stress-strain curve of SCMC films.

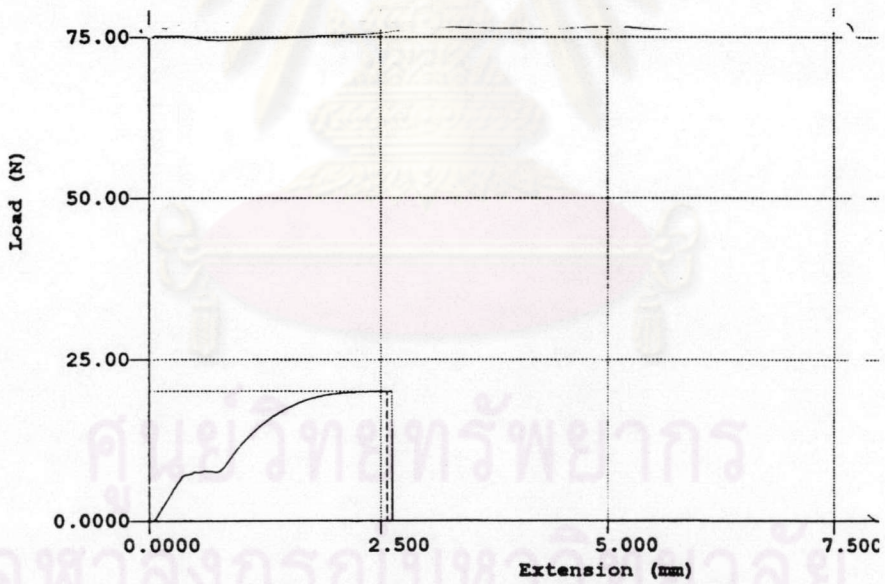

Figure 2D The stress-strain curve of SCMC combined with CP934 films.

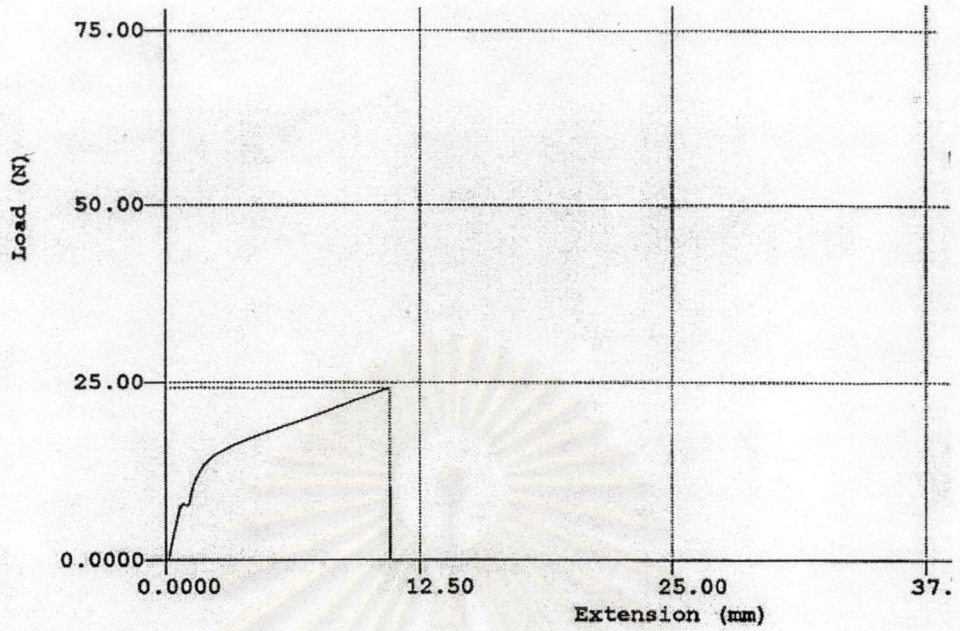

Figure 3D The stress–strain curve of HPMC films

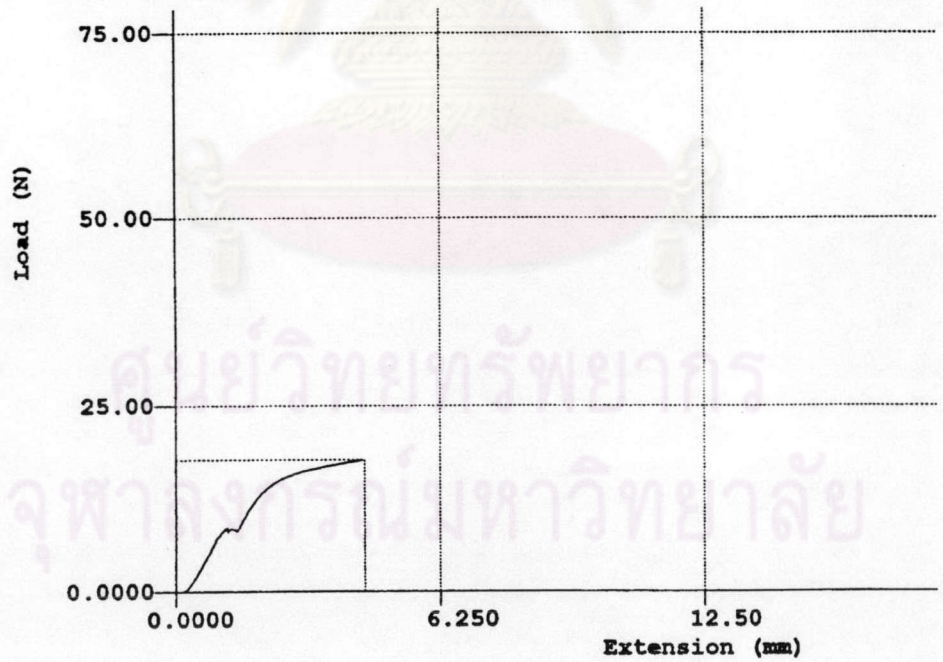

Figure 4D: The stress–strain curve of HPMC Combined with CP934 films.

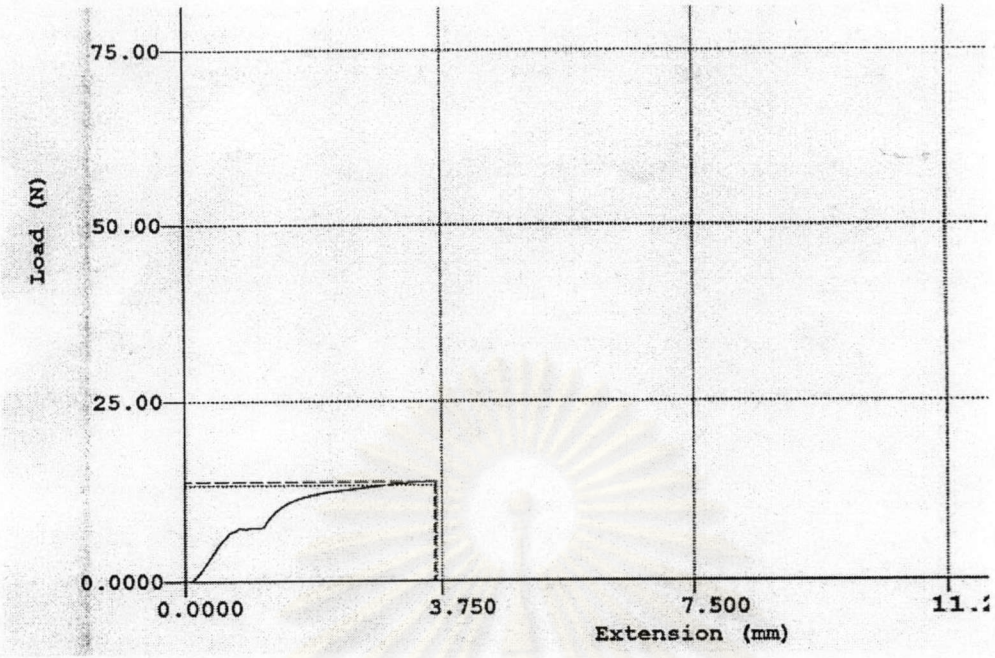

Figure 5D The stress–strain curve of chitosan acetate films.

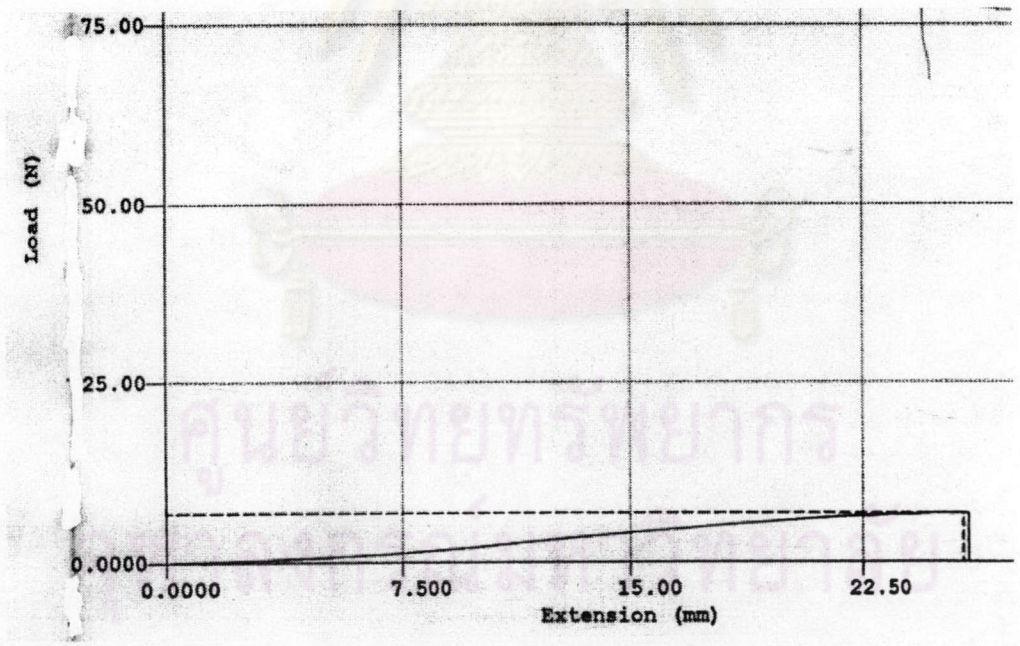

Figure 6D The stress–strain curve of chitosan lactate films.

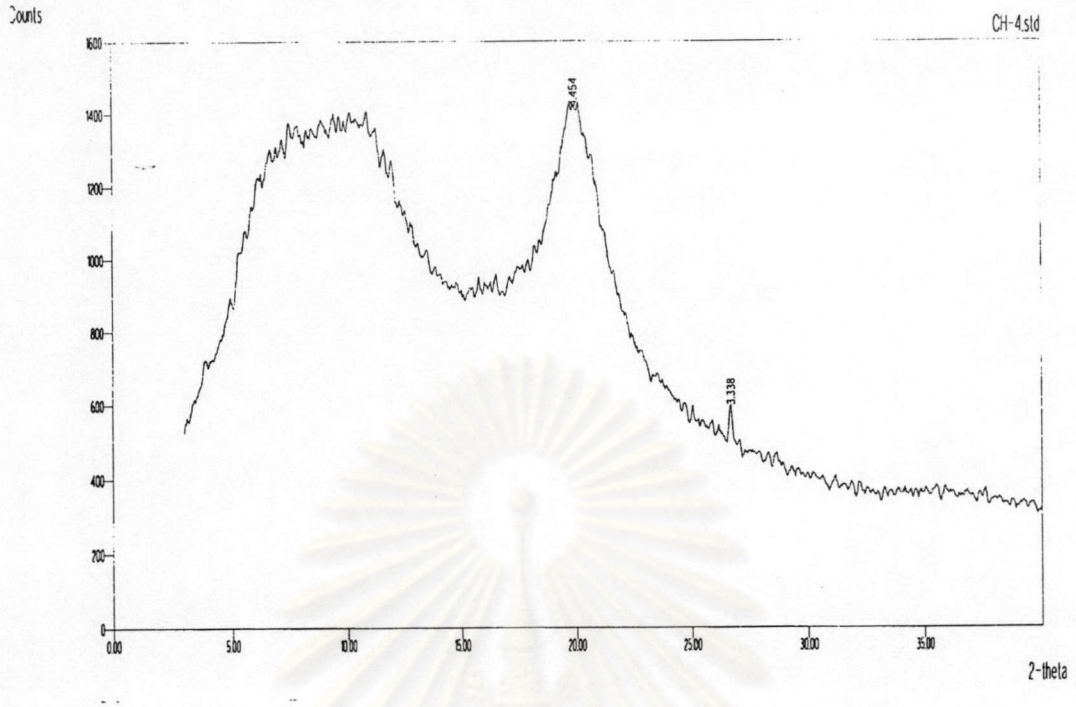

Figure 7D The x – ray diffractogram of chitosan flake.

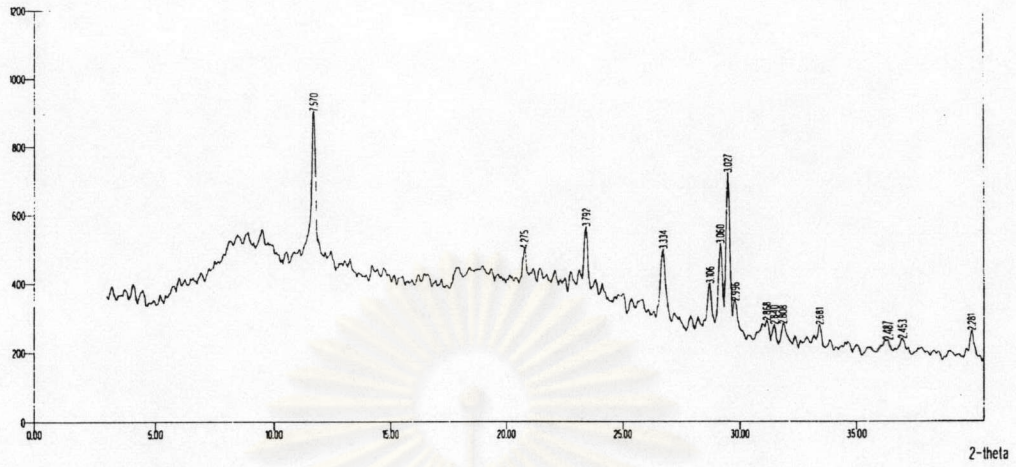

Figure 8D The x-ray diffractogram of MA1 free film.

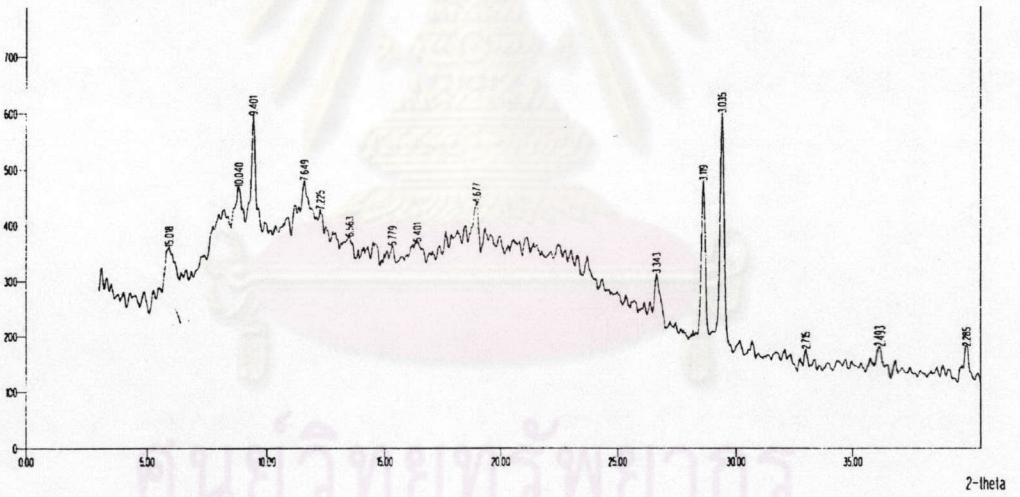

Figure 9D The x-ray diffractogram of MA1 Containing *Garcinia mangostana* Extract.

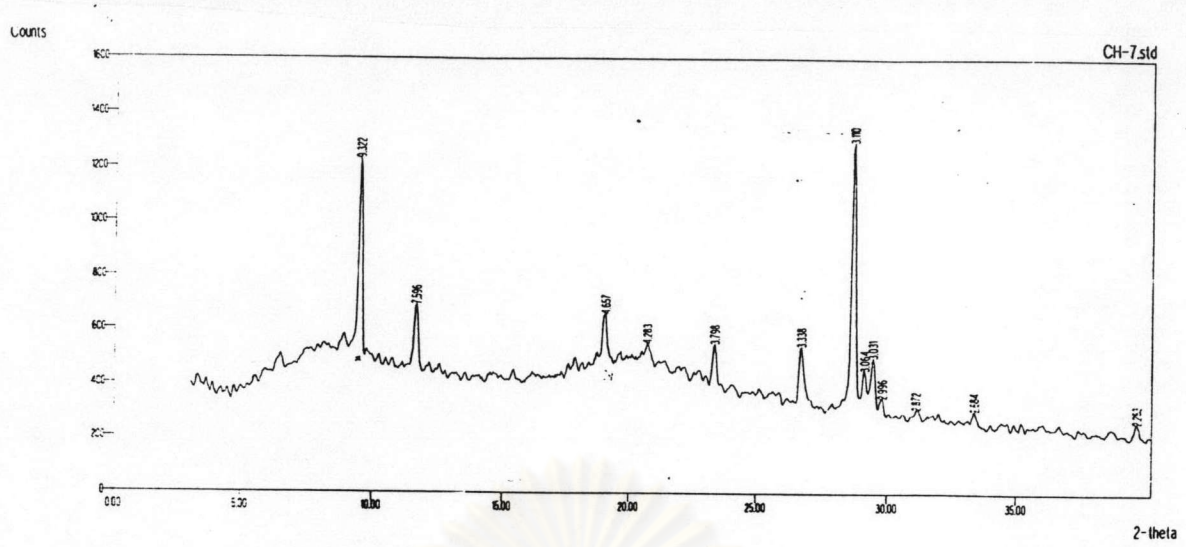

Figure 10D The x–ray diffractogram of ML1 free film.

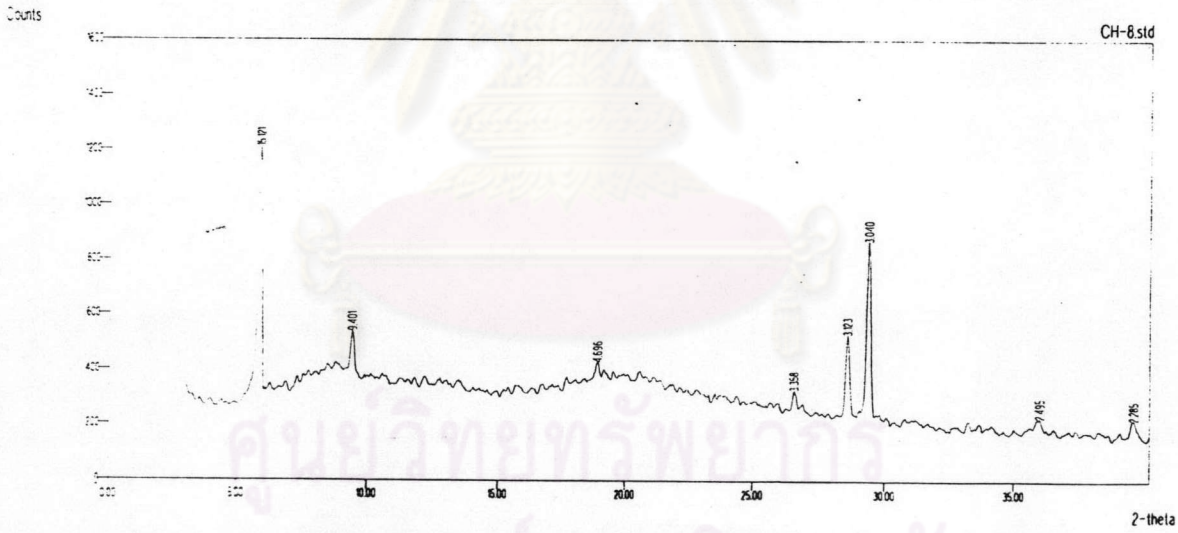

Figure 11D The x–ray diffractogram of ML1 film containing Garcinia mangostana extract.

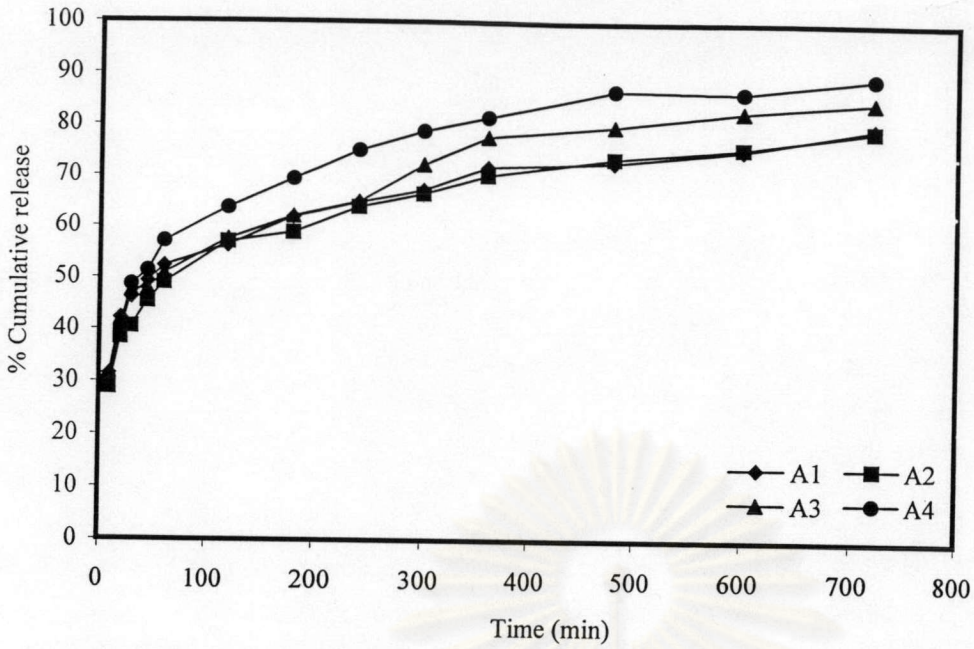

Figure12D The zero order plot of the release of mangostin from MA1 films containing *Garcinia mangostana* extract.

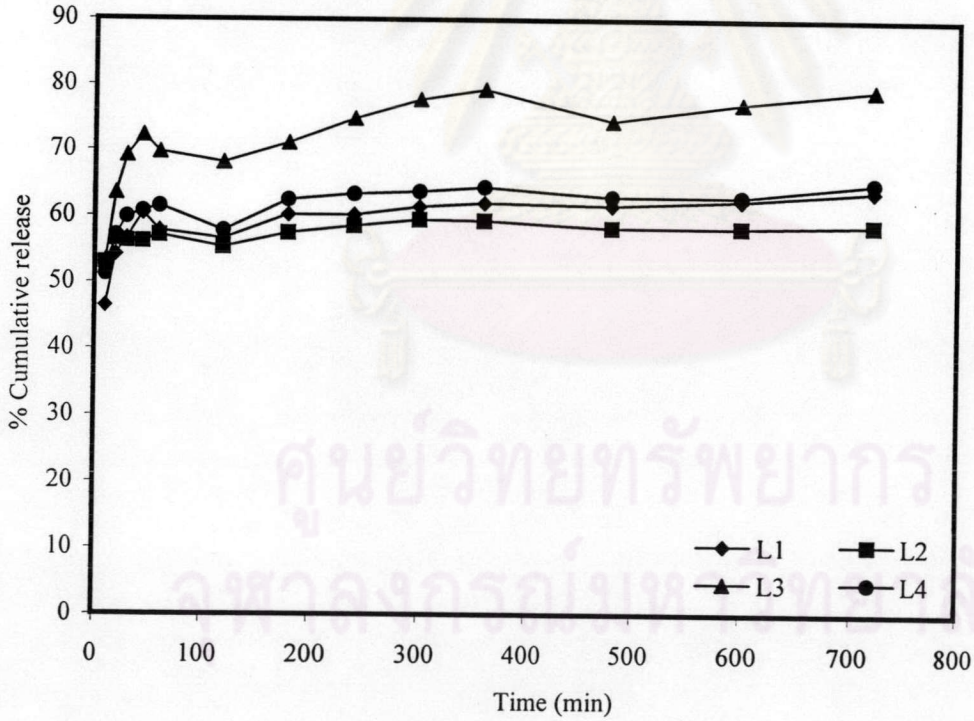

Figure13D The zero order plot of the release of mangostin from ML1 film containing *Garcinia mangostana* extract.

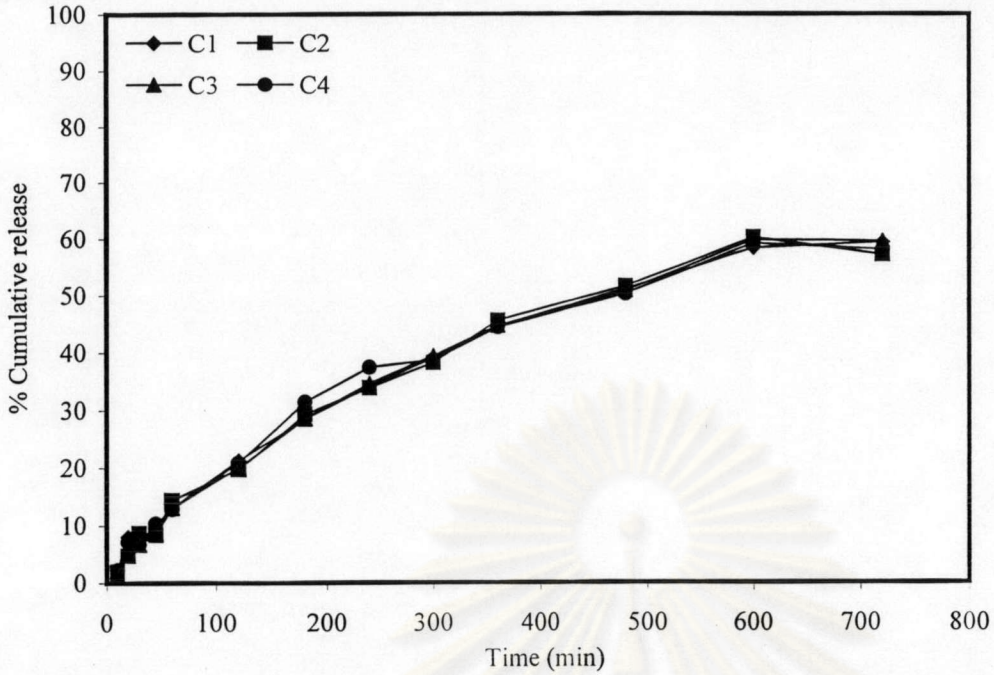

Figure 14D The zero order plot of the release of mangostin from HC2 films containing *Garcinia mangostana* extract.

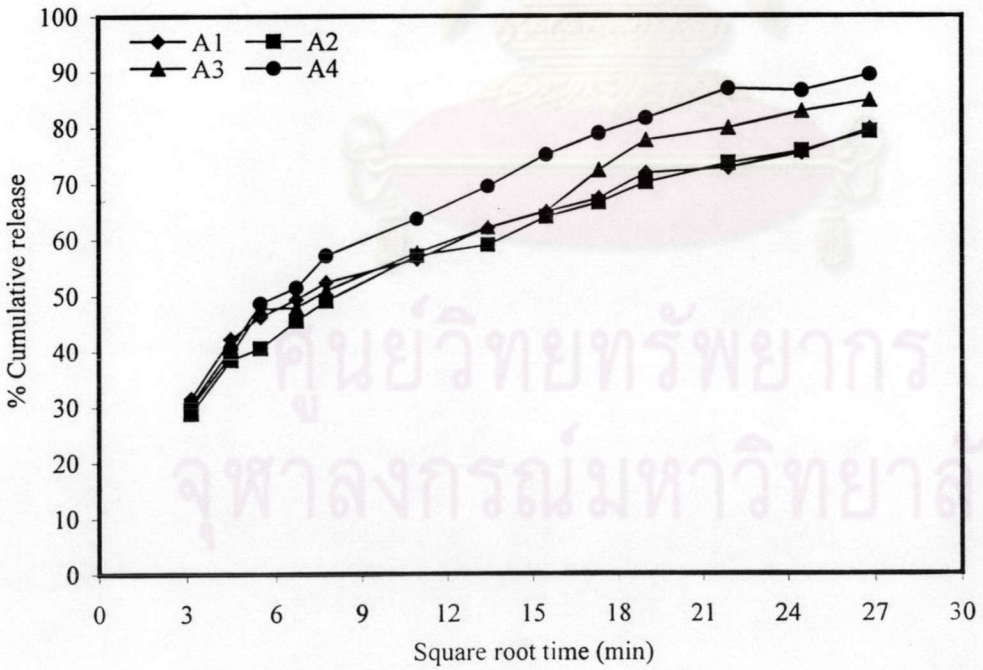

Figure15D The Higuchi plot of the release of mangostin from MA1 films containing *Garcinia mangostana* extract.

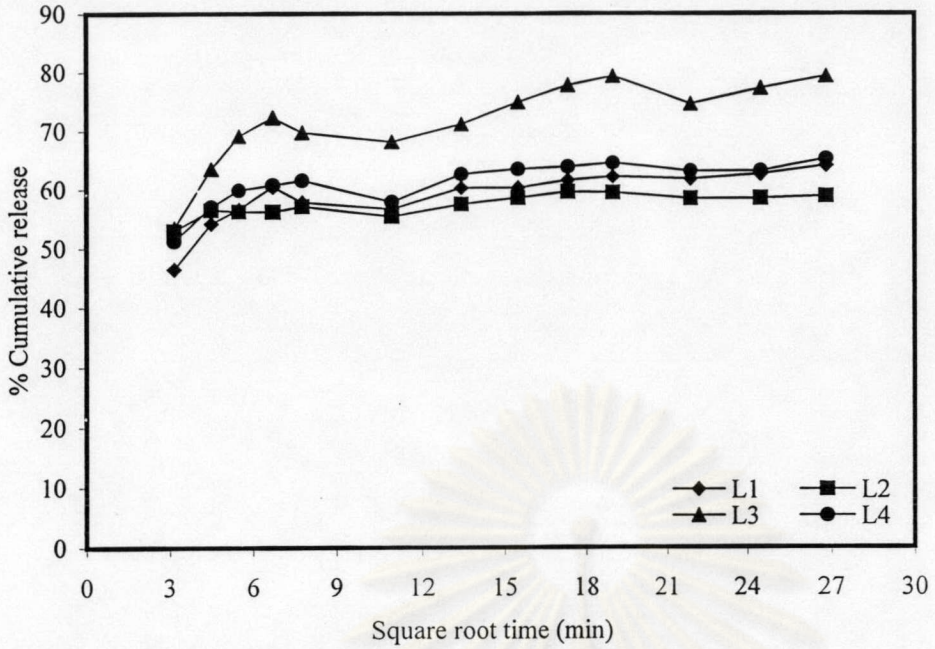

Figure16D The Higuchi plot of the release of mangostin from ML1 films containing *Garcinia mangostana* extract.

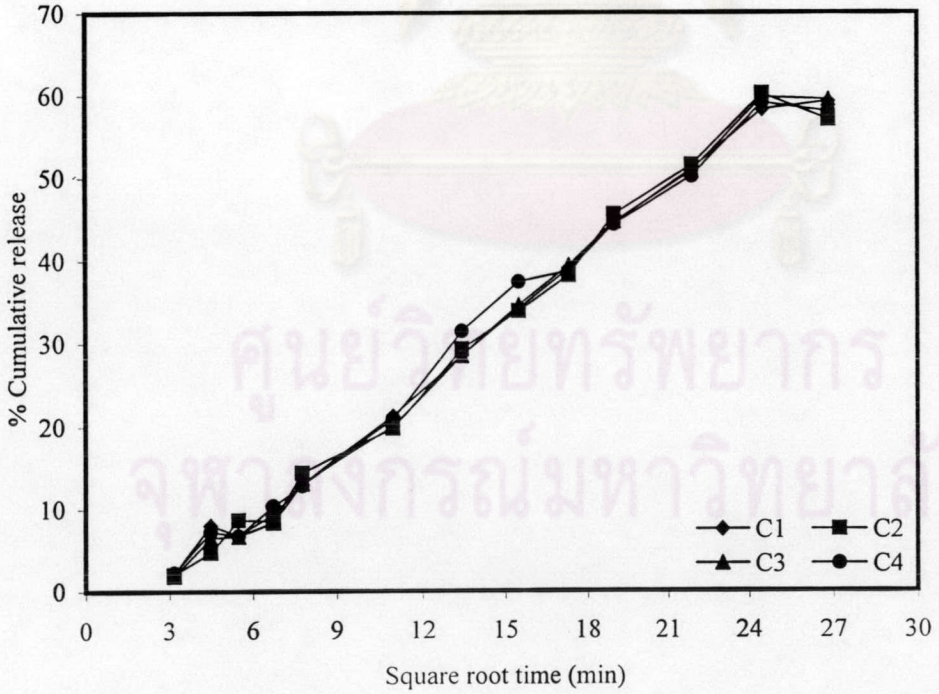

Figure17D The Higuchi plot of the release of mangostin from HC2 films containing *Garcinia mangostana* extract.

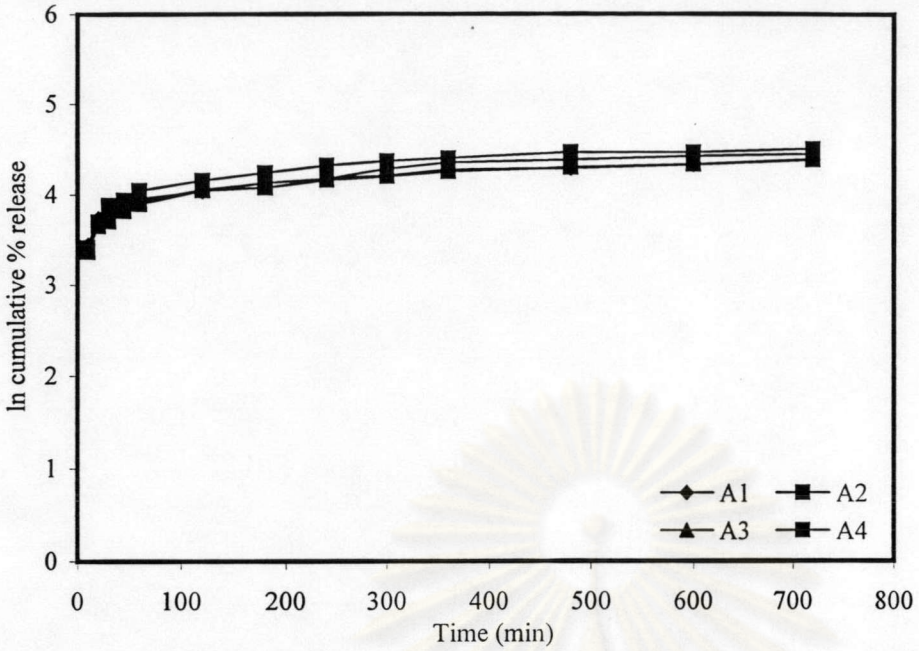

Figure18D The first order plot of the release of mangostin from MA1 films containing *Garcinia mangostana* extract.

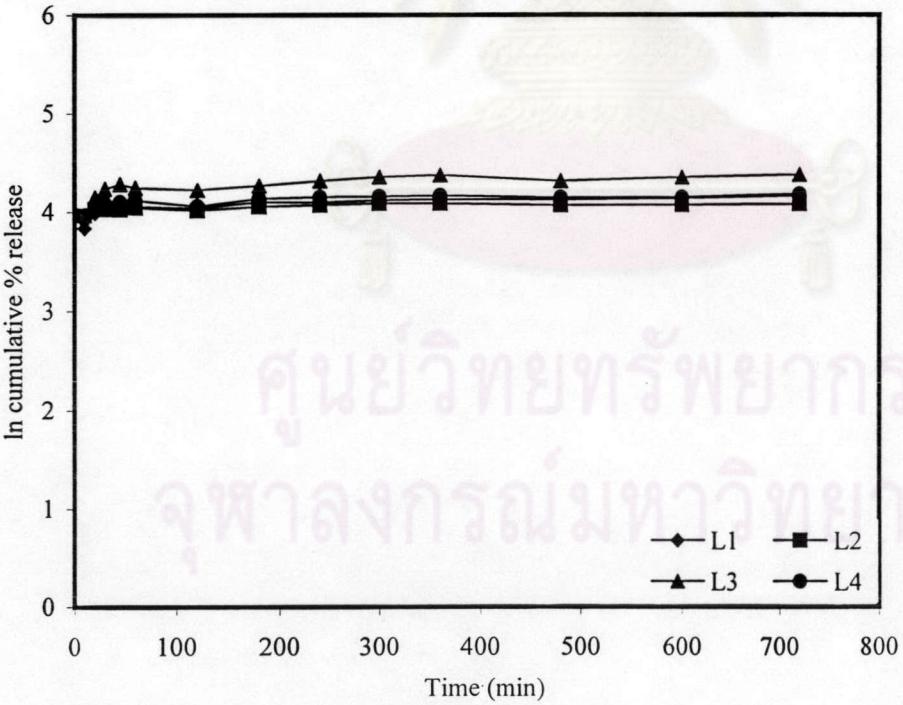

Figure 19D The first order plot of the release of mangostin from ML1 films containing *Garcinia mangostana* extract.

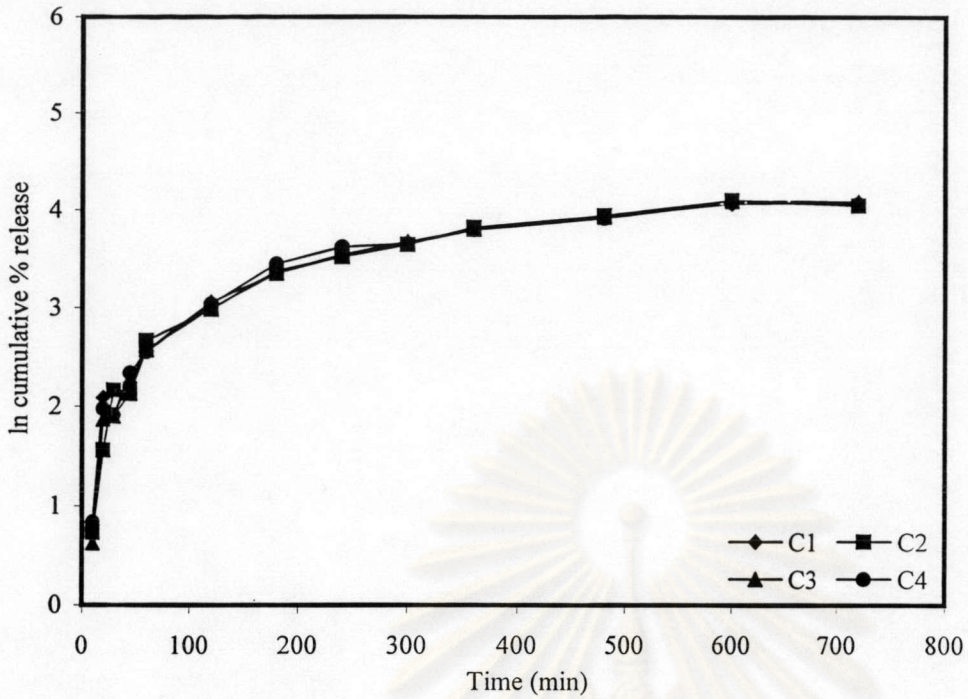

Figure 20D The first order plot of the release of mangostin from HC2 films containing *Garcinia mangostana* extract.

APPENDIX E
STATISTICAL ANALYSIS DATA

Table 1E Test of statistics on the the ultimate tensile strength of prepared free films by ONE-WAY ANOVA.

Source of variation	DF	Sum of Square	Mean Square	Fcal	F
Total	89.00	36580.14			
TMT	17.00	36501.55	2147.15	1967.20	1.79
Error	72.00	78.59	1.09		

TMT = treatment

Table 2E Test of statistics on the the percentage elongation at break of prepared free films by ONE-WAY ANOVA.

Source of variation	DF	Sum of Square	Mean Square	Fcal	F
Total	89.00	12270.86			
TMT	17.00	12264.23	721.43	7834.55	1.79
Error	72.00	6.63	0.09		

TMT = treatment

Table 3E John Tukey' s honestly significant difference test of the ultimate tensile strength of prepared free films.

TMT	MEAN	SC1	SC2	H0	HC1	HC2	LA1	LA2	LL1	LL2	MA1	MA2	ML1	ML2	HA1	HA2	HL1	HL2
S0	41.124	15.714	27.222	19.291	8.623	12.560	2.468	-0.199	-32.770	-37.538	10.164	7.979	-20.754	-34.102	16.677	14.953	-9.573	-30.252
SC1	56.838		11.509	3.577	-7.091	-3.154	-13.246	-15.912	-48.484	-53.251	-5.550	-7.735	-36.467	-49.816	0.963	-0.761	-25.286	-45.966
SC2	68.347			-7.931	-18.599	-14.663	-24.755	-27.421	-59.992	-64.760	-17.058	-19.244	-47.976	-61.325	-10.546	-12.270	-36.795	-57.475
H0	60.415				-10.668	-6.731	-16.823	-19.490	-52.061	-56.829	-9.127	-11.312	-40.045	-53.393	-2.614	-4.338	-28.864	-49.543
HC1	49.748					3.936	-6.156	-8.822	-41.393	-46.161	1.541	-0.645	-29.377	-42.725	8.054	6.330	-18.196	-38.875
HC2	53.684						-10.092	-12.758	-45.330	-50.097	-2.396	-4.581	-33.313	-46.662	4.117	2.393	-22.132	-42.812
LA1	43.592							-2.186	-35.238	-40.005	7.697	5.511	-23.221	-36.570	14.209	12.485	-12.040	-32.720
LA2	40.926								-32.571	-37.339	10.363	8.177	-20.555	-33.904	16.875	15.152	-9.374	-30.053
LL1	8.354									-4.768	42.934	40.749	12.016	-1.332	49.447	47.723	23.197	2.518
LL2	3.587										47.702	45.516	16.784	3.435	54.214	52.491	27.965	7.286
MA1	51.288											-2.186	-30.918	-44.266	6.513	4.789	-19.737	-40.416
MA2	49.103												-28.732	-42.081	8.698	6.974	-17.551	-38.231
ML1	20.371													-13.349	37.430	35.707	11.181	-9.498
ML2	7.022														50.779	49.055	24.530	3.850
HA1	57.801															-1.724	-26.249	-46.929
HA2	56.077																-24.525	-45.205
HL1	31.552																	-20.680
HL2	10.872																	

H.S.D = 2.3968

under line means non significant

Table 4E John Tukey' s honestly significant difference test of the percentage elongation at break of prepared free films.

TMT	MEAN	SC1	SC2	H0	HC1	HC2	LA1	LA2	LL1	LL2	MA1	MA2	ML1	ML2	HA1	HA2	HL1	HL2
S0	1.442	1.148	*0.650*	10.342	4.179	2.085	6.188	*6.022*	22.648	31.173	4.254	3.417	25.496	34.555	1.155	1.068	17.349	28.525
SC1	2.590		*-0.498*	9.194	3.031	0.937	5.040	4.874	21.500	30.025	3.106	2.269	24.348	33.406	*0.007*	*-0.081*	16.201	27.377
SC2	2.092			9.692	3.529	1.435	5.538	5.372	21.998	30.523	3.604	2.767	24.846	33.904	0.505	0.417	16.699	27.875
H0	11.784				-6.163	-8.257	-4.154	-4.320	12.306	20.831	-6.088	-6.925	15.154	24.213	-9.187	-9.274	7.007	18.183
HC1	5.622					-2.094	2.008	1.843	18.469	26.993	*0.075*	*-0.762*	21.317	30.375	-3.024	-3.112	13.170	24.345
HC2	3.527						4.103	3.937	20.563	29.088	2.169	1.332	23.411	32.469	-0.930	*-1.018*	15.264	26.440
LA1	7.630							*-0.837*	16.460	24.985	-1.934	-2.771	19.308	28.367	-5.033	-5.120	11.161	22.337
LA2	7.465								16.626	25.150	-1.768	-2.605	19.474	28.532	-4.867	-4.955	11.327	22.502
LL1	24.091									8.524	-18.394	-19.231	2.848	*11.906*	-21.493	-21.581	-5.299	5.876
LL2	32.615										-26.918	-27.756	-5.676	3.382	-30.017	-30.105	-13.824	-2.648
MA1	5.697											*-0.837*	21.242	30.300	-3.099	-3.187	13.095	24.270
MA2	4.859												22.079	31.138	-2.262	-2.349	13.932	25.108
ML1	26.939													9.058	-24.341	-24.429	-8.147	3.028
ML2	35.997														-33.399	-33.487	-17.205	-6.030
HA1	2.598															*-0.088*	16.194	27.369
HA2	2.510																16.282	27.457
HL1	18.792																	11.176
HL2	29.967																	

H.S.D. = 0.6962

under line means non significant

Table 5E Test of statistics on the the mucoadhesive force of prepared free films by ONE-WAY ANOVA.

Source of variation	DF	Sum of Square	Mean Square	Fcal	F
Total	89.00	796.31			
TMT	17.00	793.06	46.65	1032.02	1.79
Error	72.00	3.25	0.05		

TMT = treatment

Table 6E Test of statistics on the mucoadhesive time of prepared free films by ONE-WAY ANOVA.

Source of variation	DF	Sum of Square	Mean Square	Fcal	F
Total	89.00	452.46			
TMT	17.00	450.08	26.48	801.82	1.79
Error	72.00	2.38	0.03		

TMT = treatment

Table7E John Tukey' s honestly significant difference test of the mucoadhesive force of prepared free films.

TMT	MEAN	SC1	SC2	H0	HC1	HC2	LA1	LA2	LL1	LL2	MA1	MA2	ML1	ML2	HA1	HA2	HL1	HL2
S0	5.265	0.786	2.247	-1.437	*0.186*	1.595	-3.856	-4.892	-3.665	-4.699	3.525	-3.039	2.285	-3.757	4.153	-1.921	3.654	-2.387
SC1	6.052		1.460	-2.223	-0.601	0.809	-4.642	-5.679	-4.451	-5.485	2.738	-3.826	1.499	-4.543	3.367	-2.708	2.868	-3.173
SC2	7.512			-3.683	-2.061	-0.651	-6.103	-7.139	-5.912	-6.946	1.278	-5.286	*0.039*	-6.003	1.906	-4.168	1.407	-4.634
H0	3.829				1.623	3.032	-2.419	-3.455	-2.228	-3.262	4.961	-1.602	3.722	-2.320	5.590	*-0.485*	5.091	-0.950
HC1	5.451					1.410	-4.042	-5.078	-3.851	-4.885	3.339	-3.225	2.099	-3.943	3.967	-2.107	3.468	-2.573
HC2	6.861						-5.451	-6.488	-5.260	-6.294	1.929	-4.635	0.690	-5.352	2.557	-3.517	2.059	-3.983
LA1	1.410							-6.564	*0.191*	-0.843	7.381	0.817	6.141	*0.099*	8.009	1.934	7.510	1.469
LA2	0.373								1.227	*0.193*	8.417	1.853	7.177	1.135	9.045	2.971	8.546	2.505
LL1	1.601									-1.034	7.190	0.626	5.950	*-0.092*	7.818	1.743	7.319	1.278
LL2	0.567										8.224	1.660	6.984	0.942	8.852	2.777	8.353	2.312
MA1	8.790											-6.564	-1.239	-7.281	0.628	-5.446	*0.129*	-5.912
MA2	2.226												5.324	-0.718	7.192	1.118	6.693	0.652
ML1	7.551													-6.042	1.868	-4.207	1.369	-4.672
ML2	1.509														7.910	1.835	7.411	1.370
HA1	9.418															-6.074	-0.499	-6.540
HA2	3.344																5.576	-0.466
HL1	8.920																	-6.041
HL2	2.878																	

H.S.D = 0.48775

underlined means nonsignificant

Table 8E John Tukey' s honestly significant difference test of the mucoadhesive time of prepared free films.

TMT	MEAN	SC1	SC2	H0	HC1	HC2	LA1	LA2	LL1	LL2	MA1	MA2	ML1	ML2	HA1	HA2	HL1	HL2
S0	5.466	-1.643	-2.569	-3.555	-1.167	1.361	-2.163	-4.800	-2.778	-4.906	3.902	-1.462	1.786	-2.191	0.822	-2.246	-0.587	-3.064
SC1	3.824		-0.926	-1.912	0.476	3.004	-0.520	-3.157	-1.135	-3.264	5.545	*0.180*	3.429	-0.548	2.465	-0.603	1.055	-1.421
SC2	2.898			-0.986	1.402	3.930	*0.406*	-2.231	*-0.209*	-2.338	6.471	1.106	4.355	0.378	3.391	*0.323*	1.981	-0.495
H0	1.911				2.388	4.916	1.392	-1.245	0.777	-1.352	7.457	2.093	5.341	1.364	4.377	1.309	2.967	0.491
HC1	4.299					2.528	-0.996	-3.633	-1.611	-3.739	5.069	*-0.295*	2.953	-1.024	1.989	-1.079	0.579	-1.897
HC2	6.827						-3.524	-6.161	-4.139	-6.268	2.541	-2.824	0.425	-3.552	-0.539	-3.607	-1.949	-4.425
LA1	3.303							-5.365	-0.615	-2.744	6.065	0.701	3.949	*-0.028*	2.985	*-0.083*	1.575	-0.901
LA2	0.666								2.022	*-0.107*	8.702	3.338	6.586	2.609	5.622	2.554	4.212	1.736
LL1	2.689									-2.129	6.680	1.315	4.564	*0.587*	3.600	0.532	2.190	*-0.286*
LL2	0.560										8.809	3.444	6.692	2.716	5.728	2.660	4.319	1.842
MA1	9.369											-5.365	-2.116	-6.093	-3.080	-6.148	-4.490	-6.966
MA2	4.004												3.248	-0.728	2.284	-0.784	0.875	-1.602
ML1	7.252													-3.977	-0.964	-4.032	-2.373	-4.850
ML2	3.276														3.013	*-0.055*	1.603	-0.873
HA1	6.288															-3.068	-1.410	-3.886
HA2	3.220																1.659	-0.818
HL1	4.879																	-2.477
HL2	2.402																	

H.S.D = 0.41689

underlined means non significant

Table 9E Test of statistics on the water repellent and mucoadhesive properties of MA1,ML1 and HC2 films containing *Garcinia mangostana* extract by ONE-WAY ANOVA.

Source of variation	DF	Sum of Square	Mean Square	Fcal	F
Total	23.00	1159.90			
TMT	3.00	1159.50	386.50	19239.52	3.10
Error	20.00	0.40	0.02		

TMT= Treatment

Table 10E John Tukey' s honestly significant difference test of the water repellant and mucoadhesive properties of MA1,ML1 and HC2 films containing *Garcinia mangostana* extract.

TMT	MEAN	ML1(bi)	HC2(mono)	HC(bi)
ML1(mono)	8.051	12.260	-6.515	-2.001
ML1(bi)	20.311		-18.775	-14.261
HC2(mono)	1.536			4.514
HC2(bi)	6.050			

H.S.D = 0.2169

Table 11E Test of statistics on the release rate (Higuchi model) of mangostin from MA1,ML1 and HC2 films containing *Garcinia mangostana* extract in35% v/v ETOH:Isotonic phosphate buffer by ONE-WAY ANOVA.

Source of variation	DF	Sum of Square	Mean Square	Fcal	Ftable
Total	11.00	22.69			
TMT	2.00	7.74	3.87	2.33	4.26
Error	9.00	14.96	1.66		

TMT= Treatment

VITA

Miss Piyaphak Hiranras was born on September 20, 1973 in Bangkok, Thailand. She graduated the Bachelor Degree of Pharmacy from the Faculty of Pharmaceutical Sciences , Chulalongkorn University in 1996. She worked at the Government of Pharmaceutical Organization. She entered the Master's Degree Program in Pharmacy at Chulalongkorn University in 2000.