REFERENCES

Al-Sofi M.A.K., Hassan A.M., Mustafa G.M., Dalvi A.G.I., Kither M.N.M. *(1998)* Nanofiltration as a means of achieving higher TBT of >=120 degrees C in MSF. Desalination 118 (1–3), 123–129.

Al-Sofi M.A.K. *(2001)* Seawater desalination—SWCC experience and vision. Desalination 135 (1–3), 121–139.

Anne C.O., Trebouet D., Jaouen P., Quemeneur F. *(2001)* Nanofiltration of seawater: fractionation of mono and multi-valent catios. Desalination 140: 67-77.

Baker R.W. *(2000)* "Membrane transport theory" and " Reverse osmosis" in Membrane technology and applications. Mc Graw-Hill. 2000.

Bartels, Craig R. and Wilf, Mark *(2001)* Selective Color Removal Nanofiltration Membrane for the 7 MGD Irvine Ranch Water Treatment Project; Hydranautics .

Bian R., Yamamoto K., Watanabe Y. *(2000)* The effect of shear rate on controlling the concentration polarization and membrane fouling. Desalination 131: 225-236.

Blatt W.F., S.M. Robinson, H.J. Bixler *(1968)* Anal. Biochem 26: 151.

Bowen W.R., et al *(1997)* Characterisation of nanofiltration membranes for predictive purpose - use of salts, uncharged solutes, and atomic force microscopy. J Membr Sci 126:91-105.

Bowen W.R., Mohammad A.W. *(1998)* A theoretical basis for specifying nanofiltration membranes - dye/salt/water streams. Desalination 117:257-264.

Comb L. *(1991)* Using nanofiltration in beverage production. Beverage Industry 3.

Dutre, G. Tragardh *(1994)* Macrosolute–microsolute separation by ultrafiltration: a review of diafiltration processes and applications, Desalination 95: 227–267.

Eert Vellenga, Gun Trägådh *(1998)* Nanofiltration of combined salt and sugar solutions: coupling between retentions Desalination 120 :211-220.

From blacktop to desktop. *(1997)* Five technologies changing public works. American City & County v112 p44+ September.

Hassan A.M., Al-So. M.A.K., Al-Amoudi A.S., Jamaluddin A.T.M., Farooque, A.M., Rowaili A., Dalvi A.G.I., Kither N.M., Mustafa G.M., Al-Tisan, I.A.R. *(1998)*. A new approach to thermal seawater desalination processes using nanofiltration membranes (Part 1). Desalination 118 (1–3), 35–51.

Hassan A.M., Farooque A.M., Jamaluddin A.T.M., Al-Amoudi A.S., Al-So. M.A.K., Al-Rubaian A.F., Kither N.M., Al-Tisan I.A.R., Rowaili A. *(2000)*. A demonstration plant based on the new NF-SWRO process. Desalination 131 (1–3), 157–171.

Kamada T., Nakajima M., Nabetani H., Saglam N. and Satoshi *(2002)* Availability of membrane technology for purifying and concentrating oligosaccharides. European Food Research and Technology.

Kanchanapoom T., Kasai R., Picheansoonthon C., Yamasaki K. *(2001)*. Megastigmane, aliphatic alcohol and benzoxazinoid glycosides from *Acanthus ebracteatus*. Phytochemistry 58: 811–817.

Katchalsky A. and. Curran P. F *(1965)* Nonequilibrium thermodynamics in biophysics, Harvard University press. Cambridge, pp. 113-126.

Kedem A. and Katchalsky A. *(1963)* Permeability of composite membranes: Part 1. Electric current, volume flow and flow of solute through membrane, Trans. Faraday Soc 59 1918.

Kimura S. and Sourirajan S. *(1967)* AIChEJ 13: 497-503.

Koyuncu I., Topacik D. *(2003)*. Effects of operating conditions on the salt rejection of nanofiltration membranes in reactive dye/salt mixtures Separation and Purification Technology 33: 283-294.

Kunstadter P., Eric C., Bird F. and Sabhasri S., *(1992)* Man in the Mangroves, The Socio-economic Situation of Human Settlements in Mangrove Forests. Health and sanitation among mangrove dwellers in Thailand by Puckprink Sangdee, The United Nations University press

Lakshrninayanina *(1969)* Transport phenomena in Membranes, Academic press, New York and London, pp. 129-347.

Masathien C., Siripong P. *(1991)*. In Vitro immunopotentiating effect(s) of *Acanthus ebracteatus* Valh. Roots on human lymphocytes. J Med Techno Assoc Thailand 15:97-103.

Mohammad A. W., Lim Ying Pei and A. Amir H. Kadhum *(2002)* Characterization and identification of rejection mechanisms in nanofiltration membranes using extended Nernst-Planck model, Clean Technologies and Environmental Policy 4(3): 151-156.

Murakami, A.; Kondo, A.; Nakamura, Y.; Ohigashi, H.; Koshimizu, K. *(1993)*. Biosci. Biotech. Biochem. 57: 1971–1973.

Picha P, Siripong P., Kupradinun P. Rienkijakarn M and Jariyawattanasak T. *(1994)* Characterization of antitumor activity of *Acanthus ebracteatus* Valh. Abstract of 3rd National Cancer, Ambassador Hotel. October 1994

Ratanatamskul C., Yamamoto K. *(1998)* Low-pressure reverse osmosis as a process for treatment of anionic pollutants in water environment. Environ Eng and Policy 1: 103–107.

Ratanatamskul C., Yamamoto K. *(1998)* Low-pressure reverse osmosis as a process for treatment of anionic pollutants in water environment. Environ Eng Policy 1:103-107.

Rojanapo, W.; Tepsuwan, A.; Siripong, P. *(1990)*. Basic Life Sci. 52:447–452.

Samhaber W. M., Krenn K., Raab T. and Schwaiger H. *(2001)* Field test results of a Nanofiltration application for separating almost saturated brine solutions of the vacuum salt production. ECCE – Nürnberg 26 – 28 June 2001.

Sanya Hokputsa, Stephen E. Harding, Kari Inngjerdingen, Kornelia Jumel,Terje E. Michaelsen, Thomas Heinze, Andreas Koschellad and Berit S. Paulsen (2004) Bioactive polysaccharides from the stems of the Thai medicinal plant Acanthus ebracteatus: their chemical and physical features. Carbohydrate Research 339: 753–762

Siripong P., Kupradinun P., Piyaviriyagul S., Tunsakal S., Sukarayodhin S., Udomsupayabal U., Laisuparin P., Kanivichaporn N., Woongsamran T., Sirapong (*2001*). Chronic toxicity of *Acanthus ebracteatus* Vahl. in rats. Bull. Dept. Med. Sci. Th. 43(4); 193-204.

Spiegler K.S. and Kedem O., (1966). Thermodynamic of hyperfiltration (reverse osmosis) : Criteria for efficient membranes, Desalination, 1: 311-326.

Tiwawech D., Siripong P., Kupradinun P., et al. *(1993)*. Inhibition of diethylnotrosamine (DNE)-included hepatic foci by pre and post treatment with *Acanthus ebracteatus* Valh in rats. Thai Cancer journal 19:7-13.

Tsuru T et al. *(1991)* J Chem Eng Jap 24 : 511–524.

Van der Bruggen, Vandecasteele C. *(2003)* Removal of pollutants from surface water and ground water by nanofiltration: overview of possible applications in the drinking water industry. Environmental Pollution 122: 435-445.

Vandanjon L., Jaouen P., Rossignol N., Quéméneur F., Robert J.-M. *(1999)*. Concentration and desalting by membrane processes of a natural pigment produced by the marine diatom *Haslea ostrearia* Simonsen Journal of Biotechnology 70: 393–402.

Wang X.L., Tsuru T., Nakao S. and Kimura S. *(1997)*. The electrostatic and steric-hindrance model for transport of charged solutes through nanofiltration membranes. J. of Membrance Sci 135: 19-32.

Wang X.L., Tsuru T., Nakao S., Kimura S. *(1995b)*.Evalution of pore structure and electrical properties of Namofiltration membranes. Chem Eng Jap 28: 186-192.

Wang X.L., Tsuru T., Togoh M., Nakao S. and Kimura S. *(1995a)*. Transport of organic electrolytes with electrostatic and steric-hindrance effects through nanofiltration membranes. J. Chem. Eng., Japan 28: 372.

Wang X.L., Zhang C., Ouyang P. *(2002)*. The possibility of separating saccharides from a NaCl solution by using nanofiltration in diafiltration mode. Journal of Membrane Science 204: 271–281.

Yu S., Gao C., Su H., Liu M. *(2001)*. Nanofiltration used for desalination and concentration in dye production Desalination 140: 97-100.

APPENDICES

APPENDIX A

CYTOTOXICITY ASSAY*

The initial aqueous extract, the concentrate, the permeate at concentration step and at diafiltration step were subjected to cytotoxic evaluation against KB (human epidermoid carcinoma) and HeLa (human cervical carcinoma) cell lines employing the colorimetric method.

3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyl-tetrazolium bromide (Sigma Chemical Co., USA) was dissolved in saline solution to make the concentration of 5 mg/ml as a stock solution. Cancer cell ($3x10^3$ cells) suspended in 100 µg/well of MEM medium containing 10% fetal calf serum (FCS, Gibco BRL, Life Technologies, NY, USA) were seeded onto 96-well culture plate (Costar, Corning Incorporated, NY 14831, USA) After 24h pre-incubation at 37°C in a humidified atmosphere of 5% CO_2/95% air to allow cells attachment, various concentrations of test solution (10 µl/well) were added and then incubated for 72 hours under above condition. At the end of the incubation, 10 µl of tetrazolium reagent was added into each well then incubated at 37°C for 3 hours. The supernatant was decanted and DMSO (100 µl/well) was added to allow formosan solubilization. The optical density (OD) of each wll was detected by a Microplate reader (Bio-Rad, Benchmark Microplate reader) at 550 nm and for correction at 595 nm. Each determination represents the average means of three replicates. The 50% inhibition concentration (IC_{50}) was determined by curve fitting.

* The cytotoxicity assay was performed at Natural Products Section, Research Division, National Cancer Institute, Bangkok, Thailand.

APPENDIX B

THE FITTING CURVE TO DETERMINE THE VALUE OF IC_{50} AGAINST CELL LINES

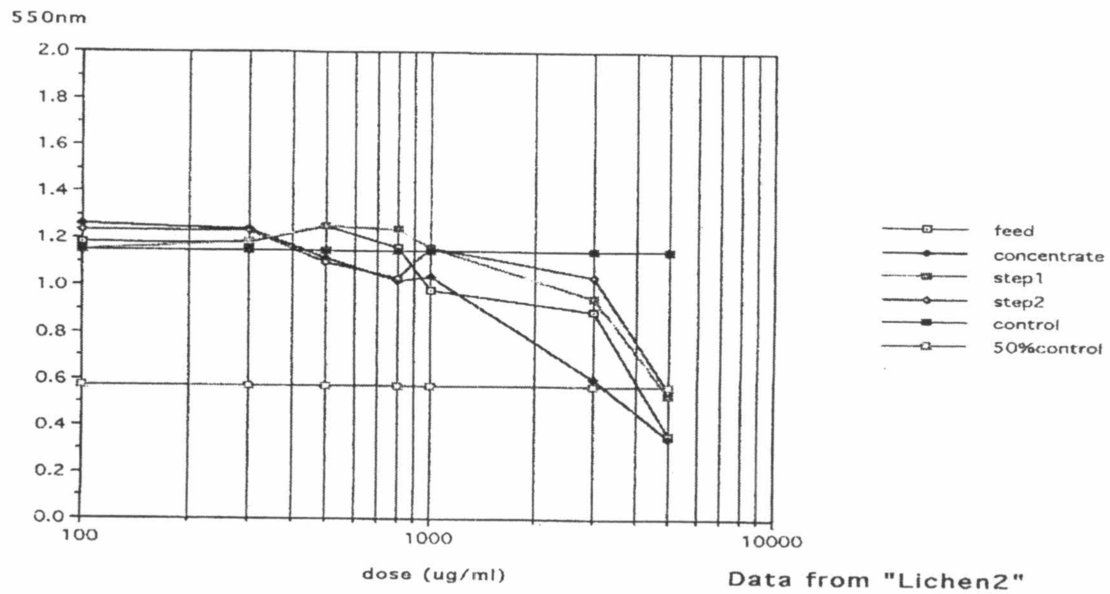

Figure B.1 The fitting curve for determination of value of IC_{50} against KB cell line. The feed is the initial aqueous extract and the permeate 1 and 2 are the permeate after the concentration and diafiltration step, respectively

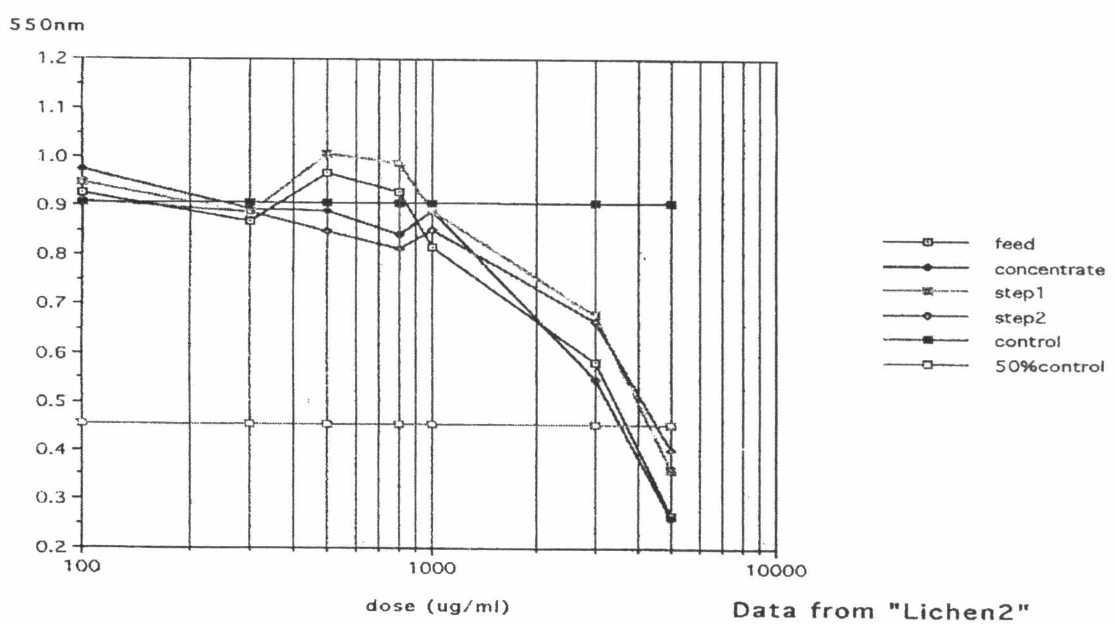

Figure B.2 The fitting curve for determination of the value of IC_{50} against HeLa cell line. The feed is the initial aqueous extract and the permeate 1 and 2 are the permeate after the concentration and diafiltration step, respectively.