

## BIBLIOGRAPHY

- Abou-Arab, A. A., Ferial, M., Abu-Salem, and Esmat, A. 2011. Physicochemical properties of natural pigments (anthocyanin) extracted from Roselle calyces (*Hibiscus sabdariffa*). *Journal of American Science*, 7(7): 445-456.
- Adameic, J. and Marciniak, E.. 2004. Microencapsulation of oil/ matrix/ water system during spray drying process. *Proceedings of 14<sup>th</sup> International Drying Symposium*, 6: 2043-2050.
- Aishah, B., Nursabrina, M., Noriham, A., Norizzah, A. R., and Mohamad Shahrimi, H. 2013. Anthocyanins from *Hibiscus sabdariffa*, *Melastoma malabathricum* and *Ipomoea batatas* and its color properties. *International Food Research Journal*, 20(2): 827-834.
- Al-Ansary, A., Nagwa, Ottai, M. E. S., and El-Mergawi, R. A. 2016. Gamma irradiation effect on some morphological and chemical characters of Sudani and Masri Roselle varieties. *International Journal of ChemTech Research*, 9(3): 83-96.
- Ali, B.H., Al, Wabel N., and Blunden, G. Phytochemical, pharmacological and toxicological aspects of *Hibiscus sabdariffa L.*: a review. 2005. *Phytotherapy Research*, 19(5): 369-375.
- Amor, B., and Allaf, K. 2009. Impact of texturing using instant pressure drop treatment prior to solvent extraction of anthocyanins from Malaysian Roselle (*Hibiscus sabdariffa*). *Food Chemistry*, 115: 820-825.
- Ananga, A., Georgiev, V., Ochieng, J., Phills, B., and Tsolova, V. 2013. Production of anthocyanins in grape cell cultures: a potential source of raw material for pharmaceutical, food, and cosmetic industries. *Intech*, 11: 247-287.
- AOAC. 2005. *Official Methods of Analysis of the Association of Official Analytical Chemists*. Washington D.C.: AOAC, Inc
- Attahmid, N. F., Yusuf, H. M., and Ilyas, F. 2021. Spray Drying of Rosella (*Hibiscus sabdariffa L.*) Powder: Effect of Shelf Life on Physicochemical Properties and Cyanidin 3-O-glucoside. *IOP Conference Series: Earth and Environmental Science*, 755:1-6.
- Bakowska-Barczak A. 2005. Acylated anthocyanins as stable, natural food colorants – A review. *Poland Journal of Food Nutrition Science*, 55(2):107–116.

- Barnard H., Dooley, A. N., and Areshian, G. 2011. Chemical evidence for wine production around 4000 BCE in the Late Chalcolithic Near Eastern highlands. *Journal of Archaeol Science*, 38(5):977–998.
- Baysan, U., Zungur, B., Coşkun, N., Konuk, T., Dilara, Balçık, E., Sahin-Nadeem, H., and Koç, M.. 2021. The effect of coating material combination and encapsulation method on propolis powder properties. *Powder Technology*, 384:332-341.
- Boeing, J. S., Barizão, E. O., E, Silva B.C., Montanher, P. F., de Cinque Almeida V, Visentainer, J. V. 2014. Evaluation of solvent effect on the extraction of phenolic compounds and antioxidant capacities from the berries: application of principal component analysis. *Chemistry Central Journal*, 8(1):1-9.
- Burin, V. M., Rossa, P. N., Ferreira-Lima, N. E., Hillmann, M. C. R. and Boirdignon-Luiz, M. T. 2011. Anthocyanins: optimization of extraction from Cabernet Sauvignon grapes, microencapsulation and stability in soft drink. *International Jouurnal of Food Science and Technology*, 46:186–193
- Cevallos-Casals, B. A., and Cisneros-Zevallos L. 2003. Stoichiometric and kinetic studies of phenolic antioxidants from Andean purple corn and red-fleshed sweet potato. *Journal of Agriculture Food Chemistry*, 51(11):3313–3319.
- Choiriyah, N. A. 2017. Extraction of the anthocyanin and phenolic compound of purple roselle calyxes using various solvents. *Darussalam Nutrition Journal*, 1(1): 16-21.
- Chu, B., Wilkin, J., House, M., Roleska, M., and Lemos, A. 2016. Effect of Sucrose on Thermal and pH Stability of *Clitoria ternatea* Extract. *International Journal of Food Processing Technology*, 3:11-17.
- Chung, C., Rojanasasithara, T., Mutilangi, W., McClements, David. 2015. Enhanced stability of anthoeyanin-based color in model beverage systems through whey protein isolate complexation. *Food Research International*, 76: 1-8.
- Cid-Ortega, S. and Guerrero-Beltrán, J.. 2020. Microencapsulation of *Hibiscus sabdariffa* (Roselle) Extracts by Spray Drying Using Maltodextrin and Gum Arabic as Carriers. *Journal of Food Research* 9(5): 53-66
- Cui, Roy. 2022. *Roselle – UF IFAS Gardening Solutions*. Florida: UNT Digital Library
- Dai, J., and Mumper, R. J. 2010. Plant phenolics: Extraction, analysis and their antioxidant and anticancer properties. *Molecules*, 15(10): 7313–7352.

- Deepa, N., C. Kaur, B. George, B. Singh, and H.C. Kapoor. 2007. Antioxidant constituents in some sweet pepper (*Capsicum annuum L.*) genotypes during maturity. *Journal of Food Science and Technology*, 40: 121-129.
- Dominguez-Niño, A., Cantú-Lozano, D., Ragazzo-Sánchez, J. A., Andrade-González, I., and Luna-Solano, G. 2018. Energy requirements and production cost of the spray drying process of cheese whey. *Drying Technology*, 36(5): 597–608.
- Dubey, R., T. C., Tsami, and Rao, B, 2009. Microencapsulation technology and preparation. *Journal of Devence Science*, 59(1): 82-95.
- Ekici, L., Simsek, Z., Ozturk, I., Sagdic, O., and Yetim, H.. 2014. Effects of Temperature, Time, and pH on the Stability of Anthocyanin Extracts: Prediction of Total Anthocyanin Content Using Nonlinear Models. *Food Analytical Methods*, 7(6): 1328–1336.
- Ergezer, H., Kara, Y., and Özünlü, O.. 2018. Production of Bone Broth Powder with Spray Drying Using Three Different Carrier Agents. *Korean journal for food science of animal resources*. 38(6):1273-1285.
- Wete, E., Sio, S., and Kia, K. 2019. Antioxidant activity, moisture content, ph value and total phenolic beef jerky curing using rosella extract (*Hibiscus sabdariffa Linn*). *Journal of Animal Science*, 4(4):56-59.
- Fuquay, J. W. 2011. *Encyclopedia of Dairy Sciences*. Cambridge: Academic Press
- Gautam, R. D. 2004. Sorrel—A lesser-known source of medicinal soft drink and food in India. *Indian Journal of Natural Products and Resources*, 3(5): 338-342.
- Gharsallaoui, A., Roudaut, G., Chambin, O., Voilley, A., and Saurel, R. 2007. Applications of spray-drying in microencapsulation of food ingredients: An overview. *Food Research International*, 40: 1107–1121.
- Gouin, S. 2004. Microencapsulation: Industrial appraisal of existing technologies and trends. *Trends in Food Science and Technology*, 15: 330–347.
- Gradinaru, G., C. G., Biliaderis, S., Kallithraka, P. Kefalas, and C., Garcia-Viguera. 2003. Thermal stability of *Hibiscus sabdariffa L.* anthocyanins in solution and in solid state: effect of copigmentation and glass transition. *Journal of Food Chemistry*, 83: 423-436.
- Hasna, T., Anandhito, R. B. K., Khasanah, L. U., Utami, R., and M. G. J. 2018. Effect of maltodextrin and whey combination as wall material on the

- characteristics of cinnamon (*Cinnamomum burmanii*) oleoresin microencapsule. *Agritech*, 38(3): 259-264.
- Hendrawati, T. Y., and Rahmawati, A. 2016. Effect of Solvent Ratio To Anthocyanin Content As A Natural Dye On Sweet Purple Potato Extraction (*Ipomoea batatas L. Poir*). *The 2nd International Multidisciplinary Conference*, 1(1):440-451.
- Heriadi, Z., and L., A. 2021. The effect of encapsulant type on physical and chemical characteristics of anthocyanin extract powder from red dragon fruit *Hylocereus polyrhizus*. *IOP Conference Series: Earth and Environmental Science*, 807:1-10.
- Horuz, E., Altan, A., and Maskan, M. 2012. Spray Drying and Process Optimization of Unclarified Pomegranate (*Punica granatum*) Juice. *Drying Technology: An International Journal*, 30:787-798.
- Hou, Z., Qin, P., Zhang, Y., Cui, S., and Ren, G. 2013. Identification of anthocyanins isolated from black rice (*Oryza sativa L.*) and their degradation kinetics. *Food Research International*, 50(2):691-697.
- Ibern-Gomez, M., Andres-Lacueva, Cristina, Lamuela-Raventós, Rosa M, and Waterhouse, Andrew. 2002. Rapid HPLC Analysis of Phenolic Compounds in Red Wines. *American Journal of Enology and Viticulture*, 53:218-221.
- Ibrahim, U. K., Ida, I. M., Ruzitah, and Mohd, S. 2011. The Effect of pH on Color Behavior of *Brassica oleracea* Anthocyanin. *Journal of Applied Sciences*, 11: 2406-2410.
- Idham, Z., Muhamad, I. I., and Sarmidi, M. R. 2012. Degradation kinetics and color stability of spray-dried encapsulated anthocyanins from *hibiscus sabdariffa l.* *Journal of Food Process Engineering*, 35(4): 522–542.
- Jaakola, L. 2013. New insights into the regulation of anthocyanin biosynthesis in fruits. *Trends Plant Science*, 18(9):477–483.
- Jing, P., and Giusti, M. M. 2005. Characterization of anthocyanin-rich waste from purple corncobs (*Zea mays L.*) and its application to color milk. *Journal of Agricultural and Food Chemistry*, 53(22): 8775–8781.
- Kalajahi, S. E. M., and Ghandiha, S. 2022. Optimization of spray drying parameters for encapsulation of Nettle (*Urtica dioica L.*) extract. *Lebensmittel-Wissenschaft und Technologie*, 158: 113-149.

- Katsumoto, Y., Fukuchi-Mizutani, M., and Fukui, Y. 2007. Engineering of the rose flavonoid biosynthetic pathway successfully generated blue-hued flowers accumulating delphinidin. *Plant Cell Physiol*, 48(11):1589–1600.
- Khoo, H. E., Azlan, A., Tang, S. T., and Lim, S. M. 2017. Anthocyanidins and anthocyanins: colored pigments as food, pharmaceutical ingredients, and the potential health benefits. *Food and Nutrition Research*, 61(1): 1-21.
- Kouakou, T. H., Konkon, N. G, Ayolié, K., Obouayeba, A. P., Abeda, Z. H., and Koné, M. 2015. Anthocyanin production in calyx and callus of Roselle (*Hibiscus sabdariffa L.*) and its impact on antioxidant activity. *Journal of Pharmacognosy and Phytochemistry*, 4(3): 9-15.
- Le-Tan, H., Tran, T., Tran, N., Tran, T. T., Huynh, T., Nguyen, T., Quang, P., and Le, V. 2017. Combination of whey protein and carbohydrate for microencapsulation of pumpkin (*Cucurbita spp.*) seed oil by spray-drying. *International Food Research Journal*, 24:1227-1232.
- Lema, A., Mahmud, N., Khandaker, M., and Abdulrahman, M. 2021. Roselle anthocyanin stability profile and its potential role in post-harvest deterioration: A review. *Plant Science Today*, 9(1): 1-13.
- Lestari, P., Wrasiati, L. P., and Suwariani, N. 2019. Karakteristik enkapsulan ekstrak pewarna fungsional bunga rosella (*Hibiscus sabdariffa L.*) pada perlakuan perbandingan kasein-maltodekstrin. *Jurnal Rekayasa Dan Manajemen Agroindustri*, 7(4): 509-520.
- Lestario, L. N., Raharjo, S., Suparmo, Hastuti, P. and Tranggono. 2004. Fractionation and identification of Java plum (*Syzygium cunini*) fruit extract. *Indonesian Food and Nutrition Progress*, 11: 41-47.
- Mahadevan, N., Shivali and P. Kamboj. 2009. *Hibiscus sabdariffa Linn.* - An overview. *Nat. Prod. Radiance*, 8(1): 77-83.
- Moser, P., Souza, R. T. D., and Nicoletti Telis, V. R. 2017. Spray drying of grape juice from hybrid CV. BRS Violeta: microencapsulation of anthocyanins using protein/maltodextrin blends as drying aids. *Journal of Food Processing and Preservation*, 41(1): 1-11.
- Nguyen, Q. D., Dang T. T., Nguyen T. V., Nguyen T. T., Nguyen N.N. 2021. Microencapsulation of roselle (*Hibiscus sabdariffa L.*) anthocyanins: Effects of drying conditions on some physicochemical properties and antioxidant activities of spray-dried powder. *Food Sci Nutr*, 10(1):191-203.

- Nielsen, S. R. and S. Holst. 2002. *Development in natural colourings in D. B. MacDougal (ed.), Colour in Food*. Cambridge: Woodhead Publishing Limited.
- Novita, P., Jan, C., Chandra, R., and Kristina, A. 2019. Pengaruh jenis dan konsentrasi enkapsulan dalam proses pembuatan serbuk antosianin dari kubis merah dan bunga telang. *Jurnal Teknologi Pangan dan Gizi*, 18(1): 1-9.
- Nining, N., Suwandi, S., and Wikarsa, S.. 2017. Pengeringan ekstrak bunga rosella (*Hibiscus sabdariffa L.*) melalui mikroenkapsulasi metode semprot kering dengan maltodekstrin. *Farmasains*, 4(2): 27-34.
- Oktavi, R. A., Cahyono, B., and Suzery, M. Enkapsulasi ekstrak antosianin dari bunga rosella (*Hibiscus sabdariffa L.*) dengan variasi penyalut. *Akta Kimindo*, 5(2): 86-101.
- Olechno, K., Basa, A., and Winnicka, K. 2021. Success depends on your backbone—about the use of polymers as essential materials forming orodispersible films. *Materials*, 14(17): 1-27.
- Oliveira, W. P., Souza, C. R. F., Kurozawa, L. E., and Park, K. L. 2010. Spray drying of food and herbal products. in *Spray Drying Technology*, eds. Woo, M. W., Mujumdar, A.S., and Daud, W.R.W., Singapore.
- Padzil, A., A. Aziz, Azni, and Muhamad, I. 2018. Physicochemical properties of encapsulated purple sweet potato extract; effect of maltodextrin concentration, and microwave drying power. *Malaysian Journal of Analytical Sciences*, 22:612-618.
- Palupi, N. W., Khasanah, L. U., and Anindito, R. B. K. 2014. Effect of the ratio of the combination of maltodextrin, carrageenan and whey on the characteristics of the natural dye microencapsulated teak leaves (*Tectona grandis L. f.*). *Journal of Food Technology Applications*, 3(3): 121-129.
- Pertiwi, R. B., Hasbullah, U. H. A., and Affandi, A. R. 2021. Copigmentation of anthocyanin extract from Parijoto fruit (*Medinilla speciosa*) and its stability at different temperatures and heating durations. *Indonesian Food and Nutrition Progress*, 18(2): 50-59.
- Pudziuvelyte, L., Markska, M., Sosnowska, K., Winnicka, K., Morkuniene, R., and Bernatoniene, J. 2020. Freeze-drying technique for microencapsulation of *elsholtzia ciliata* Ethanolic extract using different coating materials. *Molecules*, 25(9):2237.

- Purnomo, W., Khasanah, L. U., and Anandito, R. B. K. 2014. Pengaruh ratio kombinasi maltodekstrin, karagenan dan whey terhadap karakteristik mikroenkapsulan pewarna alami daun jati (*Tectona Grandis L. F.*). *Jurnal Aplikasi Teknologi Pangan*, 3(3): 99-107.
- Quan, W., He, W., Qie, X., Chen, Y., Zeng, M., Qin, F., Chen, J., & He, Z. 2020. Effects of  $\beta$ -cyclodextrin, whey protein, and soy protein on the thermal and storage stability of anthocyanins obtained from purple-fleshed sweet potatoes. *Food Chemistry*, 320: 1-9.
- Radzi, A. M., Razali, N., Ilyas, R. A., Sapuan, S. M. 2021. *Roselle Production, Processing, Products, and Biocomposites*. Amsterdam: Elsevier Science.
- Rivas-Gonzalo, J. 2003. *Analysis of Polyphenols*. Cambridge: Athenaeum Press, Ltd.
- Roobha, J., Marappan, S., Aravindhan, K. M. and Devi, P. S. 2011. The effect of light, temperature, pH on stability of anthocyanin pigments in *Musa acuminata* bract. *Research in Plant Biology*, 1:5-12.
- Rosaini, H., Halim, A., and Astuti, R. Mikroenkapsulasi pirazinamida menggunakan manitol dengan metode emulsifikasi penguapan pelarut. *Jurnal Farmasi Higea*, 10(1): 57-67.
- Sajda, S. A. 2021. Classifications, advantages, disadvantages, toxicity effects of natural and synthetic dyes: A review. *University of Thi-Qar Journal of Science*, 8(1): 130-135.
- Sari, D. K., Lestari, D., Khinanta, P., & Sahlan, M. 2020. Encapsulation Bioactive Compund Propolis With Carrageenan – Gum Arabic By Spray Drying. *Jurnal Integrasi Proses*, 9(1), 8–11.
- Septiani, A. H., Kusrahayu, and Legowo, A. M. 2013. The effect of additional skim milk in making the frozen yogurt with whey as the basic material ingredient to Total Acid, pH and Total Lactic Acid Bacteria. *Animal Agriculture Journal*, 2(1): 225.231
- Setiarto, R. H. B. 2021. *Bioteknologi Bakteri Asam Laktat Untuk Pengembangan Pangan Fungsional*. Jakarta: Guepedia
- Shruthi, V. H., Ramachandra, C. T., Nidoni, Udaykumar, Hiregoudar, Sharanakumar, Naik, Nagaraj, and Kurubar, Amayogi. 2016. Roselle (*Hibiscus Sabdariffa L.*) as a source of natural colour: A review. *Plant Archives*, 16: 515-522.

- Siregar, T., and Margareta, M.. 2019. Microencapsulation of Carotenoids from Red Melinjo (*Gnetum gnemon L.*) Peels Extract. *Journal of Physics: Conference Series*, 1351(1):1-10.
- Souza A. L., Hidalgo-Chávez, D. W., Pontes, S. M., Gomes, F. S., Cabral, L. M., Tonon, R. V. 2018. Microencapsulation by spray drying of a lycopene- rich tomato concentrate: characterization and stability. *Lebensmittel-Wissenschaft und Technologie*, 91:286–92.
- Stanciu, N., Oancea, A. M., Aprodu, I., Turturică, M., Barbu, V., and Ionită E. 2018. Investigations on binding mechanism of bioactives from elderberry (*Sambucus nigra L.*) by whey proteins for efficient microencapsulation. *Journal of Food English*, 223:197–207.
- Suzery, M., Lestari, S., Cahyono, B., 2010. Penentuan total antosianin dari kelopak bunga rosella (*Hibiscus sabdariffa L.*) dengan metode maserasi dan soxhletasi. *Jurnal Sains Dan Matematika*, 18: 1–6.
- Suzery, M., Nudin, B., Bima, D. N., and Cahyono, B. 2020. Effects of temperature and heating time on degradation and antioxidant activity of anthocyanin from roselle petals (*Hibiscus sabdariffa L.*). *International Journal of Science, Technology & Management*, 1(4): 228-236.
- Syafi'i, F., Wijaya, C. H., and Nurtama, B. 2016. Optimization process production powder of oleoresin pepper (*Piper nigrum*) by process of emulsification and microencapsulation. *Agritech*, 36(2): 128-136.
- Tavakolifar, F., Givianrad, Mohammad Hadi, and Saber-Tehrani, Mohammad. 2016. Extraction of anthocyanins from *Hibiscus sabdariffa* and assessment of its antioxidant properties in extra virgin olive oil. *Frenius Environment Bulletin*, 25:3709-3713.
- Tonfack L.B., Bernadac A., Youmbi E., Mbouapouognigni V.P., Ngueguim M., Akoa A. 2009. Impact of organic and inorganic fertilizers on tomato vigor, yield and fruit composition under tropical andosol soil conditions. *Fruits*, 64:167–177.
- Vardin, H., and Yasar, M. 2012. Optimization of pomegranate (*Punica granatum L.*) juice spray-drying as affected by temperature and maltodextrin content. *International Journal of Food Science & Technology*, 47(1):167–176
- Wahyuningsih, S., Wulandari, L., Wartono, M. W., Munawaroh, H., and Ramelan, A. H. 2017. The effect of ph and color stability of anthocyanin on food colorant. *IOP Conference Series: Materials Science and Engineering* 193: 1-9.

Winarti S. dan Firdaus A., 2010. Stabilitas Warna Merah Ekstrak Bunga Rosela Untuk Pewarna Makanan Dan Minuman. *Jurnal Teknologi Pertanian*, 11:87-93.

Wiriani, Dessy, Elisa, Julianti, and Sinaga, Hotnida. 2020. Karakteristik Fisikokimia Mikroenkapsulan Antosianin Dari Limbah Cair Pengolahan Pati Ubi Jalar Ungu (Physicochemical Characteristics Of Anthocyanin Microencapsulant From Wastewater Of Purple Sweet Potato Starch Processing). *Jurnal Teknologi dan Industri Hasil Pertanian*, 25:98-109.

Wu, H. Y., Yang, K. M., and Chiang, P. Y. 2018. Roselle Anthocyanins: Antioxidant Properties and Stability to Heat and pH. *Molecules*, 23(6):1357.

Yinbin, L. I., Wu, L., Weng, M., Tang, B., Lai, P., and Chen, J.. 2018. Effect of different encapsulating agent combinations on physicochemical properties and stability of microcapsules loaded with phenolics of plum (*Prunus salicina lindl.*). *Powder Technology*, 340:459-464.

Ying, D., Schwander, S., Weerakkody, R., Sanguansri, L., Gantenbein-Demarchi, C., and Augustin, M.A. 2013. Microencapsulated *Lactobacillus rhamnosus* GG in whey protein and resistant starch matrices: Probiotic survival in fruit juice. *Journal of Functional Foods*, 5(1): 98-105.

Zhang, B., Zheng, L., Liang, S., Lu, Y., Zheng, J., Zhang, G., Li, W. and Jiang, H.. 2022. Encapsulation of Capsaicin in Whey Protein and OSA-Modified Starch Using Spray-Drying: Physicochemical Properties and Its Stability. *Foods*, 11:612.