

## V. KESIMPULAN DAN SARAN

### 5.1. Kesimpulan

- a. Penggunaan HCl 1,6 ml (1M) selama proses *Mildly Acidic Dry Heat Treatment* (MADHT) pada partikel pati jagung dapat menurunkan ukuran partikel pati jagung sebesar 57,83% (d SP1 = 9,698  $\mu\text{m}$ ) dari pati *Native*, Sedangkan penggunaan HCl 2 ml (1M) menyebabkan partikel pati teragregasi.
- b. Semakin tinggi kadar HCl yang digunakan dalam proses MADHT akan merusak rangkaian material kristalin, sehingga pati bersifat semakin amorf.
- c. Hasil pengujian CI susu Almond menunjukkan tidak adanya perbedaan nyata antar perlakuan *emulsifier* yang berbeda, dan adanya perbedaan nyata antar konsentrasi *emulsifier*. Namun penggunaan SP1 dengan konsentrasi 0,5% menunjukkan kestabilan emulsi yang baik dibandingkan jenis *emulsifier* lain pada hari ke-1. Semua jenis *emulsifier* menunjukkan penurunan kemampuan emulsifikasi pada hari ke-3.
- d. Hasil pengujian Viskositas menunjukkan tidak adanya perbedaan nyata viskositas antar *emulsifier* yang berbeda.

### 5.2. Saran

Partikel pati jagung yang dihasilkan masih memiliki diameter kisaran ukuran mikrometer ( $\mu\text{m}$ ), dengan *yields* yang masih rendah, dan dapat mengalami agregasi. Perlu dilakukan penelitian lebih lanjut untuk didapati proses produksi partikel pati jagung dengan kisaran ukuran diameter  $<100$  nm, *yields* yang tinggi, dan meminimalisir terjadinya agregasi.

## VI. DAFTAR PUSTAKA

- Alozie, Y.E., and Udofia, S.U. (2015). Nutritional and Sensory Properties of Almond Seed Milk. *Journal of Dairy and Food Sciences*, 10(2), 117-12.
- Andhika D.r., Anindya, A.L., Tanuwijaya, V.V., dan Rachmawati, H. (2018, Desember). Teknik Pengamatan Sampel Biologi dan Non- Konduktif menggunakan *Scanning Electrone Microscopy*. Dalam *Seminar National Instrumental: Kontrol dan Otomasi* (DOI: 10.5614/sniko.2018.8). SNIKO Pub.
- Berryman, C.E., A.G. Preston, W. Karmally, R.J. Deckelbaum, and P.M. Kris-Eitherton. 2011. Effects of Almond Consumption on the Reduction of LDL Cholesterol : A Discussion of Potential Mechanisms and Future Research Directions. *Nutrition Reviews*, 69: 171-185.
- Berton-Carabin, Carabin, C., dan Schroeen, K. (2015). Pickering Emulsions for Food Applications: Background, Trends, and Challenges. *Annual Review of Food Science and Technology*, 6(1), 263-297.
- Bunaciu, A.A., Udristoiu, E.G., and Aboul-Enein, H.Y. (2015). X-Ray Diffraction: Instrumentation and Applications. *Critical Reviews in Analytical Chemistry*, 45(4), 289-299.
- Burton, G.W., and K.U. Ingold. 1989. Vitamin E as an In-Vitro and In-Vivo Antioxidant, *Annals of the Newyork Academy of Sciences*. 570: 7-22.
- Chalupa, S.K., Long, C.J., Bohrer, B.M. (2018). Nutrient Density and Nutritional Value of Milk and Plant-based milk Alternatives. *International Dairy Journal*, 1(87). 84-92
- Cho, Y.J., D.M. Kim, I.H. Song, J.Y. Choi, S.W. Jin, B.J. Kim, J.W. Jeong, C.E. Jang, K. Chu, dan C.M. Chung. 2018. An Oligomide Particle as a Pickering Emulsion Stabilizer,

*Polymers* 10(10):1071.

- Choi, H. D., Hong, J. S., Pyo, S. M., Ko, E., Shin. H. Y., Kim, J. Y. (2020). Starch Nanoparticles Produced via Acidic Dry Heat Treatment as A Stabilizer for A Pickering Emulsion: Influence of The Physical Properties of Particles. *Carbohydrate Polymers*, 239(1), 1-7.
- Corre-bordes, D.L.E., Bras, J., Dufresne, A. 2010. Starch Nano particles: A Review. *Biomacromolecules*, 11, 1139-1153.
- Das, A., Chaudhur, U.R., and Chakrabort, R. (2012). Cereal Based Functional Food of Indian Subcontinent: A Review. *Journal of Food Science Technology*, 49(6), 665-672
- Dickinson, E. (2010). Food Emulsions and Foams: Stabilization by Particles, *Current Opinion in Colloid and Interface Science*, 15(1), 40-49
- Dickinson, E., (2013). Stabilising Emulsion-Based Colloidal Structures with Mixed Food Ingredients, *Journal of the Science of Food and Agriculture*, 93(4), 710-721.
- Hosseini, A., Jafari, S.M., Mirzaei, H., Asghari, A., and Akhavan, S. (2015). Application of Image Processing to Assess Emulsion Stability and Emulsification Properties of Arabic Gum. *Carbohydrate polymer*, DOI: <http://dx.doi.org/10.1016/j.carbpol.2015.03.020>
- Jane, J. (2006). Current Understanding on Starch Granule Structures. *Journal of Applied Glycoscience*, 53(3), 205-213
- Kundu, P., Dhankhar, J., and Sharma, A. (2018). Development of Non-Dairy Milk Alternative using Soymilk and Almond Milk. *Current Research in Nutrition and Food Science*, 6(1), 203-210.
- Lomer, M.C.E., Parkes, G.C., Sanderson, J.D. (2008). Review Article: Lactose Intolerance in Clinical Practice: Myths and Realities. *Ailmen Pharmacol*, 27(2), 93-103.

- Li, C., Li, Y., Sun, P., and Yang, C. (2013). Pickering Emulsions Stabilized by Native Starch Granules. *Colloids and Surface A: Physicochemical and Engineering Aspect*, 431, 142-149.
- Liu, H., Yu, L., Xie, F., Chen, L. (2006). Gelatinization of Cornstarch With Different Amylose/Amylopectin Content. *Carbohydrate Polymers*, 65, 357-363.
- Liu, H., Xie, F., Yu, L., Chen, L., and Li, L. (2009). Thermal Processing of Starch-based Polymers, *Progress in Polymer Science*, 34 (12), 1348-1368.
- Liu, Y., Xie, H., Shi, M. (2016). Effect of Ethanol-Water Solution on the Crystallization of short chain amylose from potato starch. *J. Starch*, 68: 683-690
- Mandalari, G., Nueno-Palop, C., Bisignano, G., Wickham, M.S.J., and Narbad, A. (2008). Potential Prebiotic Properties of Almond Seeds. *Applied Environmental Microbiology*, 74(14), 4264-4270.
- Marefati, A. (2018). *Starch Pickering Emulsions: Process and Encapsulation Stability*, PhD Dissertation, Department of Food Technology, Lund University, Sweden.
- McClements, D.J., and Gunmus, C.E. (2016). Natural Emulsifiers-biosurfactant, Phospholipids, Biopolymers, and Colloidal Particles: Molecular and Physicochemical Basis of Functional Performances. *Advances in Colloid and Interface Science*, 234, 3-26
- Miskeen, S., Park, E.Y., and Kim, J.Y. (2019). Controlled Fragmentation of Starch into Nanoparticles using a Dry Heating Treatment under Mildly Acidic Conditions. *International Journal of Biological Macromolecules*, 123, 810-816
- Nor'Aishah binti Hasan. 2012. Almond Milk Production and Study of Quality Characteristics, *Journal of Academia*. 2, 1-8

- Ogawa, T., Samoto, M., and Takahashi, K. (2000). Soybean Allergens and Hypoallergenic Soybean Products. *Journal of Nutrition Science Vitaminol*, 4, 271-279.
- Partridge, D., Lloyd, A., Rhodes, M., Walker, A.N., Johnstone, A.M., and Campbell, B.J. (2019). Food AdditivesL Assessing the Impact of Exposure to Permitted Emulsifiers on Bowel and Metabolic Helath. *Nutrition Bulletin*, 44, 329-349.
- Park, E.Y., Kim, M.J., Cho, M., Lee, J.H., and Kim, J.Y. (2016) Production of Starch Nanoparticles using Normal Maize Starch via Heat-Moisture Treatment Under Mildly Acidic Conditions and Homogenization, *Carbohydrate polymer*, 151, 274-282.
- Putaux, J.L., Boisseau, S. M., Momaaur, T., and Dufresne, A. (2003) nanocrystals resulting from the disruption of waxy maize starch granuls by acid hydrolysis. *Biomacromolecules*, 4(5), 1198-1202.
- Rahman, A.M. (2007). Mempelajari Karakteristik Kimia dan Fisik Tepung Tapioka dan Mocal (Modifi ed Cassava Flour) sebagai Penyalut Kacang pada Produk Kacang Salut, *Skripsi, Fakultas Teknologi Pertanian. Institut Pertanian Bogor, Bogor*.
- Rayner, M., A. Timgren, M. Sjoo, dan P. Dejmek. 2012. Quinoa Starch Granules: A Candidate for Stabilising Food-grade Pickering Emulsions, *Journal of the Science of Food and Agriculture* 92(9), 1841-1847
- Rayner, M., Marku, D., Eriikson, M, Sjoo, M., Dejmek, P., and Wahlgren, M. (2014). Biomass-based Particles for the Formulation of Pickering Type Emulsions in Food and Topical Applications, *Colloids and Surface*, <http://dx.doi.org/doi:10.1016/j.colsurfa.2014.03.053>
- Restu, W.K., Sampora, Y., Meliana, Y., dan Haryono, A. 2015. Effect of Accelerated Stability Test on Characteristics of Emulsion Systems with Chitosan as a Stabilizer. *Procedia Chemistry*, 16, 171-176

- Sathe, S. Wolf, W.J., Roux, K.H., and Teuber, S.S. (2002) Biochemical Characterization of Amandin, the Major Storage Protein in Almond (*Prunus dulcis* L.). *Journal of Agricultural and Food Chemistry*, 50(15).
- Sethi, S. Tyagi, S.K., Anurag, R.K. (2016). Plant based Milk Alternatives an Emerging Segment of Functional Beverages: A Review. *Journal of Food Science Technology*, DOI: 10.1007/s13197-016-2328-3.
- Siqueira, G., Bras, J., and Dufresne, A. (2008). Cellulose Whiskers Versus Microfibrils: Influence of the Nature of the Nanoparticle and its Surface Functionalization on the Thermal and Mechanical Properties of Nanocomposites, *Biomacromolecules*, 10 (2), 425-432
- Song, X., Pei, Y., Qiao, M., dan Ma, F. (2015). Preparation and Characterization of Pickering Emulsions Stabilized by Hydrophobic Starch Particles. *Food Hydrocolloids*, 45, 256-263
- Sono, R., Sakamoto, S., Hamaguchi, S., Tabayashi, C., Kim, S., Koh, S., and Horiike, M. (2002). Heat Deterioration of Phospholipids Isolations and Identification of New Thermally Deteriorated Products from Soybean Lecithin. *Journal Oleo Sci*, 51(3), 191-202
- Tchokalova, S., Denkov, N., Ivanov, I., and Marinov, R. (2004). Evaluation of Short-Term and Long-Term Stability of Emulsions by Centrifugations and NMR. *Bulgarian Journal of Physics*, 31, 96-110.
- Todica, M., Nagy, E.M., Niculaescu, C., Stan, O., Cioica, N., and Pop, C.V. (2016). XRD Investigation of Some Thermal Degraded Starch Based Materials. *Journal of Spectroscopy*, 1-6
- Valencia, F.D.C., Hernandez, M., Guamis, B., Feragut, V. (2013). Comparing the Effects of Ultra High Pressure Homogenization and Conventional Thermal Treatments on the Microbiological, Physical, and Chemical Quality of Almond Beverages. *Journal of Food Sciences*, 78(2), 199-205.

- Yang, Y., Fang, Z., Chen, X., Zhang, W., Xie, Y., Chen, Y., Liu, Z., and Yuan, W. (2017). An Overview of Pickering Emulsion: Solid-Particle Materials, Classification, Morphology, and Applications. *Frontiers in Pharmacology*, 8(287), 1-20.
- Zhu, F. (2019). Starch Based Pickering Emulsions: Fabrication, Properties, and Applications. *Trends in Food Science and Technology*, 85, 129-137