

## BAB V KESIMPULAN DAN SARAN

### 5.1. Kesimpulan

1. Perbedaan konsentrasi molases memberikan pengaruh nyata terhadap kadar pigmen *Monascus purpureus* M9 pada angkak biji durian baik yang larut pada pelarut akuades maupun etanol 99,9%.
2. Kadar pigmen tertinggi didapatkan pada penambahan molases sebanyak 8%b/b baik untuk pigmen kuning, oranye dan merah.
3. Perbedaan konsentrasi molases memberikan pengaruh nyata terhadap nilai L, a\*,b\*, C dan °H bubuk angkak biji durian. Intensitas a\*, b\* dan C tertinggi didapatkan pada penambahan molases sebanyak 8%b/b sedangkan nilai L mengalami penurunan seiring bertambahnya konsentrasi molases dan nilai °H mengalami peningkatan.
4. Perbedaan konsentrasi molases memberikan pengaruh nyata terhadap profil pigmen yang dihasilkan oleh *Monascus purpureus* M9. Jenis pigmen larut etanol (8 *spot*) yang terdeteksi lebih beragam dibandingkan pigmen larut akuades (4 *spot*).

### 5.2 Saran

1. Perlu dilakukan penelitian lebih lanjut mengenai jenis pigmen yang terbentuk pada angkak biji durian dengan penambahan molases baik untuk pigmen larut akuades maupun etanol 99,9%.
2. Perlu dilakukan penelitian lebih lanjut mengenai aplikasi angkak biji durian dengan penambahan molases pada produk pengolahan pangan serta efeknya terhadap kesehatan.

## DAFTAR PUSTAKA

- Affandi, D.R., D. Praseptianga, F. S. Nirmala, B. Sigit Amanto, W. Atmaka. 2016. Physical and Chemical Characterization of Greater Yam (*Dioscorea alata*) and Jack Bean (*Canavalia ensiformis*) - Based Composite Flour, *IOP Conf. Series: Materials Science and Engineering*. 193: 1-8.
- Agboyibor, C., W.B.Kong, A.M.Zhang dan S.Q. Niu. 2019. Nutrition regulation for the production of *Monascus* red and yellow pigment with submerged fermentation by *Monascus purpureus*, *Biocatalysis and Agricultural Biotechnology*. 21:1-7
- Attokaran, M. 2011. *Natural Food Flavors and Colorants*. Iowa: Blackwell Publishing Ltd and Institute of Food Technologists.
- Babitha, S., C.R.Soccol dan A. Pandey. 2006. Jackfruit Seed – A Novel Substrate for the Production of *Monascus* Pigments through Solid-State Fermentation, *Food Technol. Biotechnol.* 44 (4): 465-471.
- Barragan, L.A.P. J.J.B.Figueroa, L.V.R. Duran, C.N.A.Gonzalez dan C. Hennigs. 2016. *Fermentative Production Methods (dalam Biotransformation of Agricultural Waste and By-Products, P.Poltronieri dan O.F.D'urso)*. Amsterdam: Elsevier.
- Bender, D. A. 2006. *Bender's Dictionary of Nutrition and Food Technology Eight Edition*. Boca Raton: CRC Press.
- Bennett, J.W dan M. Klich. 2009. *Mycotoxins (dalam Encyclopedia of Microbiology Third Edition, M. Schaechter)*. Cambridge: Academic Press.
- Bule, M., F. Khan dan K. Niaz. 2019. *Red Yeast Rice (Monascus purpureus) (dalam Nonvitamin and Nonmineral Nutritional Supplements, S. M. Nabavi dan A.S.Silva)*. London: Elsevier.
- Carvalho, J.C., Oishi, B.O., Woiciechowski, A.L., Pandey, A., Babitha, S. and Soccol, C.R. 2007. Effect of substrates on the production of *Monascus* biopigments by solid-state fermentation and pigment extraction using different solvents. *Indian Journal of Biotechnology* 6: 194-199.
- Clarke, M.A. 2003. *Syrups (dalam Encyclopedia of Food Sciences and Nutrition, Caballero B., L.C.Trugo dan P.M.Finglas)*. Cambridge: Academic Press

- Covey, C.L. 1992. Biomedical Sciences Basic Study, *Energy Research Abstracts*. 17(1): 369.
- Davis, D.J., C. Burlak dan N. P. Money. 2000. Osmotic Pressure of Fungal Compatible Osmolytes, *Mycol. Res.* 104 (7): 800–804
- Dufosse, L. 2009. Pigments, Microbial (dalam *Encyclopedia of Microbiology Third Edition*, M. Schaechter). Cambridge: Academic Press.
- FAO, 2009. *Agribusiness Handbook Sugar Beet White Sugar*. Roma: FAO
- Granados, J.J.Q., C.S.Sanchez dan R.M.B.Herrera. 2016. Rhum-Ron-Rum: Technology and Tradition (dalam *Encyclopedia of Food and Health*, B. Caballero, P.M. Finglas, dan F. Toldra). Oxford: Elsevier.
- Hajjaj, H., A. Klæbe, G. Goma, P. J. Blanc, E. Barbier, and J. Francois. 2000. Medium-Chain Fatty Acids Affect Citrinin Production in the Filamentous Fungus *Monascus ruber*, *Appl. Environmental Microbiol.*, 66 (3), 1120-1125.
- Hidayat, N., Wignyanto, S.Sumarsih, A.I.Putri. 2016. *Mikologi Industri*. Malang: UB Press.
- Hsieh, Y.H.P., S. Pao dan J. Li. 2008. *Traditional Chinese Fermented Food (dalam Handbook of Fermented Functional Foods Second Edition, E.R.Farnworth)*. Boca Raton: CRC Press
- <https://www.ncbi.nlm.nih.gov/nucore/HM188425.1> (20 Juli 2020).
- Juszlová, P., L. Martínková, and V. Kren. 1996. Secondary Metabolites of the Fungus *Monascus*: A Review, *J. Ind. Microbiol.*, 16, 163-170.
- Konika Minolta. 2020. Media Centre (L\*a\*b\*). <https://www5.konicaminolta.eu/fr/instruments-de-mesure/telechargement/poster.html> (26 Agustus 2020)
- McLellan, M.R., L.R. Lind dan R.W. Kime. 1995. Hue Angle Determinations and Statistical Analysis for Multi-quadrant Hunte L<sub>a</sub>,b Data, *Journal of food quality*. 18: 235-240
- Merck. 2020. 110130 Milipore Potato Dextrose Agar. [https://www.merckmillipore.com/ID/id/product/Potato-dextrose-agar,MDA\\_CHEM-110130#relations](https://www.merckmillipore.com/ID/id/product/Potato-dextrose-agar,MDA_CHEM-110130#relations) (3 September 2020)
- Miyake, T., I. Kono, N. Nozaki, dan H. Sammoto. 2008. Analysis of Pigment Compositions in Various *Monascus* Cultures. *Food Sci. Technol. Res.* 14 (2), 194–197.

- National Center of Biotechnology (NCBI). 2010. *Monascus purpureus* isolate M9 18S ribosomal RNA gene, complete sequence.
- Ng, T.B. 2004. *Fungi and Fermented Food (dalam Fungal Biotechnology in Agricultural, Food, and Environmental Applications, D.K.Aora, P.D.Bridge, D. Bhatnagar)*. New York: Marcel Dekker, Inc.
- Nimnoi, P. dan S. Lumyong. 2011. Improving Solid-State Fermentation of *Monascus purpureus* on Agricultural Products for Pigment Production, *Food Bioprocess Technol.* 4: 1384-1390
- Nimnoi, P., N. Pongsilp dan S. Lumyong. 2015. Utilization of Agro-Industrial Product for Increasing Red Pigment Production of *Monascus Purpureus* AHK12. *Chiang Mai J. Sci.* 42(2):331-338
- Nio, O. K. 2012. *Daftar Analisis Bahan Makanan*. Jakarta: Badan Penerbit Fakultas Kedokteran Universitas Indonesia.
- Ogbodo, U.E dan J. O. Ugwuanyi .2017. *Production, Use, and Prospects of Microbial Food Colorants (dalam Handbook of Food Bioengineering Volume 5; Microbial Production of Food Ingredients and Additives, A.M. Holban dan A.M. Grumezescu)*. London: Elsevier Inc
- Pan, T.M dan W.H. Hsu. 2014. *Monascus-Fermented Products (dalam Encyclopedia of Food Microbiology Second Edition, C.A. Batt dan M.L.Tortorello)*. London: Elsevier.
- Pathare, P.B., U. L. Opara dan F.A. Al-Said. 2013. Colour Measurement and Analysis in Fresh and Processed Foods: A Review, *Food Bioprocess Technol.* 6: 36-60
- Patnala, H.S., U. Kaliban, L. Gopalakrishnan, R.M.D. Rao dan D.S. Kumar. 2016. *Marine Fungal and Bacterial Isolates for Lipase Production: A Comparative Study (dalam Advances in Food and Nutrition Research Volume 78; , S.K.Kim dan F. Toldra)*. Cambridge: Elsevier Inc.
- Pattagul, P., R.Pinthong, A. Phianmongkhon dan N. Leksawasdi. 2007. Review of Angkak Production (*Monascus purpureus*), *Chiang Mai J. Sci.* 34(3): 319-328.
- Permana, D.R., S. Marzuki dan D. Tisnadjaja. 2004. Analisis Kualitas Produk Fermentasi Beras (Red Fermented Rice) dengan *Monascus purpureus* 3090, *Jurnal Biodiversitas.* 5(1):7-12.

- Pommerville, J.C. 2007. *Alcamo's Laboratory Fundamentals of Microbiology, 8<sup>th</sup> Edition*. Boston: Jones and Bartlett Publishers. p.293-295.
- Puspitadewi, S.R.D., I.Srianta, N. Kusumawati. 2016. Pola Produksi Pigmen *Monascus* oleh *Monascus Sp.* Kjr 2 pada Media Biji Durian Varietas Petruk melalui Fermentasi Padat, *Jurnal Teknologi Pangan dan Gizi*. 15 (1): 36-42
- Rahayu, E.S., Sardjono dan R.A. Samson. 2014. *Jamur Benang (Mold) pada Bahan Pangan*. Yogyakarta: Penerbit PT Kanisius
- Rahman, S. 2018. Eknologi Pengolahan Tepung dan Pati Biji-Bijiam Berbasis Tanaman Kayu
- Ristiarini, S., M.N. CahyantoRistiarini, S., M.N. Cahyanto, J. Widada, dan E.S. Rahayu. 2018. Pengaruh Penambahan Laurat dan Glisin terhadap Nilai Warna dan Kadar Sitrinin Angkak. *Agritech* 38(3): 320-329., J. Widada, dan E.S. Rahayu. 2018. Pengaruh Penambahan Laurat dan Glisin terhadap Nilai Warna dan Kadar Sitrinin Angkak. *Agritech* 38(3): 320-329.
- Ristiati, N.P. dan G.A.M.J. Parsandi. 2016. The Different Weight of Rice IR64 As Growth Media Toward Pigments Level Generated by *Monascus purpureus*. *Proceeding Of 3<sup>rd</sup> International Conference On Research, Implementation And Education Of Mathematics And Science*, Yogyakarta 16-17 Mei 2016. Hal. 65-72.
- Rochani, A., S. Yuniningsih dan Z. Ma'sum. 2016. Pengaruh Konsentrasi Gula Larutan Molases terhadap Kadar Etanol pada Proses Fermentasi, *Jurnal Reka Buana*. 1(1):43-48
- Runic, J.N dan K.E.O. Connor. 2013. *Advances in Applied Microbiology*. London: Elsevier
- Sistanto, E. Sulistyowati dan Yuwana. 2017. Pemanfaatan Limbah Biji Durian (*Durio zibethinus* Murr) sebagai Bahan Penstabil Es Krim Susu Sapi Perah, *Jurnal Sain Peternakan indonesia*. 12(1):9-23.
- Srianta, I, B. Hendrawan, N. Kusumawati dan P.J. Blanc. 2012. Study on Durian Seed as a New Substrate for Angkak Production, *International Food Research Journal*. 19(3):941-945.
- Srianta, I. dan Harijono. 2015. *Monascus*-fermented sorghum: pigments and monacolin K produced by *Monascus purpureus* on whole grain,

- dehulled grain and bran substrates, *International Food Research Journal*. 22(1):377-382
- Srianta, I., E. Zubaidah, T. Estiasih, M. Yamada dan Harijono. 2016. Comparison of *Monascus purpureus* growth, pigment production and composition on different cereal substrates with solid state fermentation, *J. Biocatalysis and Agricultural Biotechnology*.7: 181-186.
- Srianta, I., E. Zubaidah, T. Estiasih, Y. Iuchi, Harijono dan M. Yamada. 2017. Antioxidant activity of pigments derived from *Monascus purpureus*-fermented rice, corn, and sorghum, *International Food Research Journal*. 24(3):1186-1191.
- Srianta, I., I. Nugerahani dan S. Ristiarini. 2020 Separation and Analysis of *Monascus* Yellow Pigment Produced on Durian Seed Substrate, *Food research*. 4(4):1135-1139.
- Srianta, I., S. Ristiarini dan I. Nugerahani. 2019. Pigments Extraction from *Monascus*-Fermented Durian Seed, *International Conference on Food and Bio-Industry*, Bandung, 29-30 Juli 2019
- Sudarmadji, S., Bambang H., dan Suhardi. 2010. *Analisa Bahan Makanan dan Pertanian*. Yogyakarta: Penerbit Liberty.
- Tisnadjaja, D.T. 2006. *Bebas Kolesterol & Demam Berdarah dengan Angkak*. Jakarta: Penebar Swadaya
- Vandamme, E.J., dan J.L. Revuelta. 2016. *Industrial Biotechnology of Vitamins, Biopigments, and Antioxidants*. Weinheim: Wiley-VCH Verlag GmbH & Co. KGaA.
- Villano, D., C.G. Viguera dan P. Mena. 2016. *Colors: Health Effect (dalam Encyclopedia of Food and Health, B. Caballero, P.M. Finglas, dan F. Toldra)*. Oxford: Elsevier.
- Wahyono. 2009. Karakteristik Edible Film Berbahan Dasar Kulit dan Pati Biji Durian (*Durio* sp.) untuk Pengemasan Buah Strawberry, Skripsi, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Muhammadiyah Surakarta. <http://etd.eprints.ums.ac.id/3831/1/A420050124.PDF> (21 Juli 2020).