



BAB V

KESIMPULAN DAN SARAN

5.1 Kesimpulan

Berdasarkan hasil penelitian, kesimpulan yang dapat ditarik antara lain:

1. Semakin tinggi aktivitas enzim, maka konsentrasi glukosa, galaktosa, oligosakarida cenderung meningkat.
2. Semakin lama waktu reaksi, maka konsentrasi glukosa cenderung meningkat. Sedangkan, semakin lama waktu reaksi, maka konsentrasi galaktosa dan oligosakarida cenderung fluktuatif.

5.2 Saran

Penelitian ini perlu dikembangkan lebih lanjut karena mempunyai manfaat dalam bidang pangan dan kesehatan. Adapun perkembangan yang dibutuhkan adalah :

1. Variasi waktu yang diperbanyak agar didapatkan waktu maksimal untuk perolehan kadar oligosakarida.
2. Adanya alat penunjang yang lebih mempermudah analisa oligosakarida.
3. Dibutuhkan standar masing-masing jenis oligosakarida.

DAFTAR PUSTAKA



1. Food an Agriculture Organization of the United Nations. Milk and Milk Products : s.n., Vol. www.fao.org. diakses Maret 2017.
2. **A, Petherick.** 2016, Milk Consumption Around the World., Vol. www.milkgenomics.org. diakses Maret 2017.
3. Milk: Nurturing Asian Tiger. s.l. : Weekly Indo Perspective, Vols. www.cimb-principal.com. diakses April 2017.
4. **K, Triananda.** Orang Indonesia Banyak yang Alami Intoleransi Laktosa. Vol. www.beritasatu.com. diakses April 2017.
5. **H, Shukla.** Lactose Intolerance in Health and Disease. s.l. : Nutrition & Food Science, 1997, Vol. 36. 357-364.
6. Kenali Intoleransi Laktosa Lebih lanjut. s.l. : Badan POM RI, 2008, Vol. 9. 1-12.
7. Statistics by Country for Lactose Intolerance. 2003, Vol. www.cureresearh.com. diakses April 2017.
8. Produksi Susu Segar Menurut Provinsi. Vol. www.bps.go.id. diakses April 2017.
9. **J, Hemmaratchirakul; P, Jaturapiree; S, Prueksasri; S, Wichienchot.** Production of galactooligosaccharide by β -galactosidase from *Lactobacillus pentosus* var. *plantarum* BFP32. s.l. : International Food Resaerch, 2015, Vol. 22. 2550-2557.
10. **Vera, C; Guerrero, C; Conejeros, R; Illanes, A.** s.l. 2012, Synthesis of Galactooligosaccharides by β -Galactosidases from *Aspergillus Oryzae* Using Partially Dissolved and Supersaturated Solution of Lactose. : Enzyme and Microbial Technology, Vol. 50. 188-194.
11. **Rodriguez, Barbara et al.** s.l. 2014, Galactooligosaccharides formation during enzymatic hydrolysis of lactose: Towards a prebiotic-enriched milk. Food Chemistry, Vol. 145. 388-394.
12. **Li, Wei et al.** 2010, Synthesis of oligosaccharides with lactose and N-acetylglucosamine as substrates by using b-D-galactosidase from *Bacillus circulans*. Vol. 231. 55-63.
13. **Beatriz, P B and et.al.** Production of Lactulose Oligosaccharides by Isomerisation of Transgalactosylated.
14. **Jogersen, F et al.** s.l. : Appl Microbiol Biotechnol, 2001, High-efficiency synthesis of oligosaccharides with a truncated β -galactosidase from *Bifidobacterium bifidum*. Vol. 57. 647-652.

15. **Palai, Tapas et al.** s.l. 2012, Kinetics and design relation for enzymatic conversion of lactose into galacto-oligosaccharides using commercial grade b-galactosidase. : Journal of Bioscience and Bioengineering, Vol. 114. 418-423.
16. **Aburto , C and et.al.** s.l. 2016 Simultaneous Synthesis and Purification (SSP) of Galactooligosaccharides in Batch Operation. : Food science and technology, , Vol. 72. 81-89.
17. **Roy, D et al.** s.l. 2002, Galacto-oligosaccharide production by *Bifidobacterium infantis* RW-8120 using response surface methodology. : Journal of Industrial Microbiology & Biotechnology, Vol. 29. 281-285.
18. **Otieno, D O.** s.l. 2010, Synthesis of β -Galactooligosaccharides from Lactose Using Microbial β -Galactosidases.: Food Science and Food Safety, Vol. 9. 471-482.
19. **Chockchaisawasdee, Suwimo et al.** 2005, Synthesis of Galacto-oligosaccharide From Lactose Using h-Galactosidase From *Kluyveromyces lactis*: Studies on Batch and Continuous UF Membrane-Fitted Bioreactors. Vol. 89. 4.
20. **Jost, R.** s.l. Milk and Dairy product. : Wiley-VCH Verlag GmbH & Co, 2012, Vol. 23. 316-371.
21. **Pereira, C P.** s.l. 2013.Milk Nutritional Composition and Its Role in Human health. : Nutrition.
22. **Ainsworth, P.** 1996 Chemistry in the Kitchen: Milk and Milk Products I., Vol. 2. 27-30.
23. **Sarkar, S.** Nutritional Aspects of Breast Milk. s.l. : Nutrition & Food Science, 2004, Vol. 34. 151-155.
24. **Muehlhoff, E; Bennett A; McMahon, D;**. Milk and Dairy Product in Human Nutrition. Rome : Food and Agriculture of Thr United Nations, 2013. 103-183.
26. **Sarkar, S.** Cultured Milk products for Lactose-Intolerant recipients. s.l. : Nutrition & Food Science, 2006, Vol. 36. 357-364.
27. **K. Nithianantham, S; Palaniappan, L;**. s.l. Physicochemical Studies on Some Disaccharides (Sucrose, Lactose, Maltose) in Aqueous Media at 298.15 : Chemical Science Transactions, Vol. 2. 35-40.
28. **Zadow, J G.** s.l. 1984, Lactose:Properties and Uses.: Journal of Dairy Science, Vol. 67. 2654-2679.
29. **Swennen, K; Courtin, C M; Delcour, J A;**. s.l. Non-digestible Oligosaccharides with Prebiotic Properties.: Food Science dan Nutrition, 2006, Vol. 1.

30. **Sangwan, V; Tomar, S K; Singh, R.R.B; Singh, A K; Ali, B.** s.l. Galactooligosaccharides: Novel Components of Designer Foods. : Journal of Food Science, 2011, Vol. 76. 103-111.
31. **Lamsal, B P.** s.l. Production, Health Aspects and Potential Food Uses of Dairy Prebiotic Galactooligosaccharides. : Society of Chemical Industry, 2012.
32. **Wichienchot, S; Hemmaratchirakul, J; Jaturapiree, P; Pruksasri, S.** s.l. Evaluating Prebiotic Property of Galactooligosaccharide Produced by Lactobacillus pentosus var. plantarum BFP32 in Fecal Batch Culture. : International Food Research Journal, 2016, Vol. 25. 2241-2248.
33. **Leusen, E v; Torringa, E; Groenink, P; Kortleve, P; Geene, R; Schoterman, M; Klarenbeek, B.** Industrial Applications of Galactooligosaccharides. s.l. : John Wiley & Sons, 2014.
34. **Smith.** Organic Chemistry.
35. **Illanes, C; Vera, C; Wilson, L;** s.l. Enzymatic Production of Galacto-Oligosaccharides.: Lactose-Derived Prebiotics, 2016. 111-189.
36. **Osman, A.** 2016. Synthesis of Prebiotic Galacto-Oligosaccharides: Science and Technology, Probiotics, Prebiotics, and Synbiotics. 135-154.
37. **Vishwanatha, K S. Karmataka** , Acid Protease from *Aspergillus oryzae*: Structure-Stability and Enhancement of the Activity by Physical,Chemical and Molecular Biological Approaches.: University of Mysore, 2009.
38. **Benoit, I, et al., et al.** The Ecological Genomics of Fungi Chapter: 4 Aspergilli and Biomass-Degrading Fungi. s.l. : John Wiley & Sons, 2014. 63-87.
39. **Rank, C and et.al.** s.l. Comparative Chemistry of *Aspergillus oryzae* (RIB40) and *A. flavus* (NRRL 3357). : Metabolites, Vol. 2. 39-56.
40. **Lee, B D and et.al.** s.l. *Aspergillus oryzae* as Prebiotic in Poultry-A Review.: International Journal of Poultry Science, 2006, Vol. 5. 1-3.
41. **Rokas, A.** A.,*Aspergillus*. Current Biology, Vol. 23, 5.
42. **Colinas, B R and et.al.** s.l. Galactooligosaccharides Formation During Enzymatic Hydrolysis of Lactose: Towards a Prebiotic-Enriched Milk.: Food Chemistry. 388-394.
43. **Landry, C R and et.al.** Ecological and evolutionary genomics of *Saccharomyces Cerevisiae*. s.l. : Molecular Biology, 2006, Vol. 15. 575-591.
44. **Forsburg, S L** The Yeast *Saccharomyces Cerevisiae* and *Schizosacharomyces Pombe*:Models for Cell Biology Research.. s.l. : Gravitational and Space Biology, 2005, Vol. 18. 3-10.

45. Kovacevic, M Morphological and Physiological Characteristics of the Yeast *Saccharomyces Cerevisiae* Cells Differing in the Life Span.. Zagreb :University of Zagreb, 2015.
46. Ahmad , R Z. 2005 Pemanfaatan Khamir *Saccharomyces Cerevisiae* untuk Ternak., Vol. 15. 49-55.
47. Copeland, A R. Enzymes:A Practical Introduction to Structure,Mechanism, and Data Analysis. New York : John Wiley & Sons, 2000. 1-10.
49. Sumardjo, D. Pengantar Kimia. Jakarta : Penerbit Buku Kedokteran EGC, 2009. 389-421.
50. Mader, S S. Biology. New York : Mc-Graw Hill, 2001. 102-105.
51. Material Safety Data Sheet Beta-Galactosidase. bioWORLD. [Online]
52. Material Safety Data Sheet Lactose, monohydrate MSDS. ScienceLab.com. [Online]
53. Material Safety Data Sheet 2-Nitrophenyl D-galactopyranoside. bioWORLD. [Online]
54. Material Safety Data Sheet (D)(+)-galactose MSDS. ScienceLab.com. [Online]
55. Material Safety Data Sheet Dextrose anhydrous MSDS. ScienceLab.com. [Online]