

## DAFTAR PUSTAKA

- Agral, O., Fatimawalai, Yamlean, P., & Supriati, H. S. (2013). Formulasi dan uji kelayakan sediaan krim anti inflamasi getah tanaman patah tulang ( *Euphorbia tirucalli L.* ). *Formulasi Krim Inflamasi*, 2(3), 5–7.
- Aisah, S., Utami, P. I., & Genatrika, E. (2018). The Effectiveness of Ointment of Patah Tulang Stem's ( *Euphorbia Tirucalli* ) Ethanol Extract for Burn Wound Healing on White Rats ( *Rattus Norvegicus* ). *IOP Conference Series: Materials Science and Engineering*, 288, 12055. <https://doi.org/10.1088/1757-899X/288/1/012055>
- Arum Desi Pratiwi, R. R. (2015). The Influence of Clove Bud Extract ( *Syzygium aromaticum* ) on Epithelization Thickness of Incisions Wound in the White Rat ( *Rattus novergicus* ) Wistar Strain, 2(September), 135–143.
- Attinger, C. E., Janis, J. E., Steinberg, J., Schwartz, J., Al-Attar, A., & Couch, K. (2006). Clinical approach to wounds: Débridement and wound bed preparation including the use of dressings and wound-healing adjuvants. *Plastic and Reconstructive Surgery*, 117(7 SUPPL.), 72–109. <https://doi.org/10.1097/01.prs.0000225470.42514.8f>
- Augustin, H. G., Kozian, D. H., & Johnson, R. C. (1994). Differentiation of endothelial cells: Analysis of the constitutive and activated endothelial cell phenotypes. *BioEssays*, 16(12), 901–906. <https://doi.org/10.1002/bies.950161208>
- Ayu, I., Puspita, L., Damriyasa, I. M., & Dada, I. K. A. (2013). Bioaktivitas Ekstrak Daun Tapak Dara ( *Catharanthus Roseus* ) Terhadap Periode Epitelisasi Dalam Proses Penyembuhan Luka Pada Tikus Wistar. *Indonesia Medicus Veterinus*, 2(1), 58–75.
- Bakta, I. M. (2006). Efek ekstrak daun pegagan (*Centella asiatica*) dalam mempercepat penyembuhan luka terkontaminasi pada tikus putih ( *Rattus novergicus* ) galur wistar, 9–10.
- Borregaard, N. (2010). Neutrophils, from Marrow to Microbes. *Immunity*, 33(5), 657–670. <https://doi.org/10.1016/j.immuni.2010.11.011>
- Broughton, G., Janis, J. E., & Attinger, C. E. (2006a). The Basic Science of Wound Healing. *Plastic and Reconstructive Surgery*, 117(SUPPLEMENT), 12S–34S. <https://doi.org/10.1097/01.prs.0000225430.42531.c2>
- G., Janis, J. E., & Attinger, C. E. (2006b). Wound Healing: An Overview. *Plastic and Reconstructive Surgery*, 117(SUPPLEMENT), 1e–1e-S. <https://doi.org/10.1097/01.prs.0000222562.60260.f9>



- Campos, A. C. L., Groth, A. K., & Branco, A. B. (2008). Assessment and nutritional aspects of wound healing. *Current Opinion in Clinical Nutrition and Metabolic Care*, 11(3), 281–288. <https://doi.org/10.1097/MCO.0b013e3282fbd35a>
- Childs, D. R., & Murthy, A. S. (2017). Overview of Wound Healing and Management. *Surgical Clinics of North America*, 97(1), 189–207. <https://doi.org/10.1016/j.suc.2016.08.013>
- Clark, R. A. F. (1993). Regulation of fibroplasia in cutaneous wound repair. *American Journal of the Medical Sciences*, 306(1), 42–48. <https://doi.org/10.1097/00000441-199307000-00011>
- de Oliveira, S., Rosowski, E. E., & Huttenlocher, A. (2016). Neutrophil migration in infection and wound repair: going forward in reverse. *Nat Rev Immunol*, 16(6), 378–391. <https://doi.org/10.1038/nri.2016.49.Neutrophil>
- Eckert, R. L., & Rorke, E. A. (1989). Molecular biology of keratinocyte differentiation. *Environmental Health Perspectives*, 80, 109–116. <https://doi.org/10.1289/ehp.8980109>
- Enoch, S., & Leaper, D. J. (2005). Basic science of wound healing. *Surgery (Oxford)*, 23(2), 37–42. <https://doi.org/10.1383/surg.23.2.37.60352>
- Fuchs, E., & Cleveland, D. W. (1998). A Structural Scaffolding of Intermediate in Health and Disease. *Science*, 279(1998), 514–519. <https://doi.org/10.1126/science.279.5350.514>
- Futosi, K., Fodor, S., & Mócsai, A. (2013). Neutrophil cell surface receptors and their intracellular signal transduction pathways. *International Immunopharmacology*, 17(3), 638–650. <https://doi.org/10.1016/j.intimp.2013.06.034>
- Greenhalgh, D. G. (1998). The role of apoptosis in wound healing. *The International Journal of Biochemistry & Cell Biology*, 30(9), 1019–1030. [https://doi.org/10.1016/S1357-2725\(98\)00058-2](https://doi.org/10.1016/S1357-2725(98)00058-2)
- Grinnell, F. (1992). Wound repair , keratinocyte activation and integrin modulation, 5, 1–5.
- Gupta, N., Vishnoi, G., Wal, A., & Wal, P. (2013). Medicinal Value of Euphorbia Tirucalli. *Systematic Reviews in Pharmacy*, 4(1), 40. <https://doi.org/10.4103/0975-8453.135843>
- Heng, M. C. Y. (2011). Wound healing in adult skin: aiming for perfect regeneration.
- Kwiatkowska, E., & Kubez, P. (2013). Neutrophil recruitment and function in tissue repair and inflammation, 13, 159–157.
- Lamberti, E., Handajani, J., Susilowati, H., Kedokteran, F., Institut, G.,



- Kesehatan, I., ... Mada, G. (2014). Ekspresi COX-2 dan Jumlah Neutrofil Fase Inflamasi pada Proses Penyembuhan Luka Setelah Pemberian Sistemik Ekstrak Etanolik Rosela (*Hibiscus sabdariffa*) (studi in vivo pada Tikus Wistar) Universitas Gadjah Mada Yogyakarta melalui surat di Dusun Bulusari D. *Maj Ked Gi. J.*, 21(1), 13–19.
- Lapidot, T., & Kollet, O. (2002). The essential roles of the chemokine SDF-1 and its receptor CXCR4 in human stem cell homing and repopulation of transplanted immune-deficient NOD/SCID and NOD/SCID/B2mnullmice. *Leukemia*, 16(10), 1992–2003. <https://doi.org/10.1038/sj.leu.2402684>
- Lazarus, G. S., Diane, M., Knighton, D. R., David, J., Rodeheaver, G., & Robson, M. C. (2015). Definitions and Guidelines for Assessment of wounds and evaluation of healing.
- Li, J., Chen, J., & Kirsner, R. (2007). Pathophysiology of acute wound healing. *Clinics in Dermatology*, 25(1), 9–18. <https://doi.org/10.1016/j.clindermatol.2006.09.007>
- Mali, P. Y., & Panchal, S. S. (2017). *Euphorbia tirucalli L.: Review on morphology, medicinal uses, phytochemistry and pharmacological activities*. *Asian Pacific Journal of Tropical Biomedicine*, 7(7), 603–613. <https://doi.org/10.1016/j.apjtb.2017.06.002>
- Morasso, M. I., & Tomic-Canic, M. (2005). Epidermal stem cells: the cradle of epidermal determination, differentiation and wound healing. *Biology of the Cell*, 97(3), 173–183. <https://doi.org/10.1042/BC20040098>
- Murti, D. A., Salim, M. N., Sabri, M., Pendidikan, S., Hewan, D., Kedokteran, F., & Kuala, S. (2017). Efektifitas salep getah jarak pagar (*Jatropha curcas L*) pada fase epitelisasi penyembuhan luka sayat kulit mencit (*mus musculus*) dengan pewarnaan Masson trichrome, 1(3), 465–472.
- Mwine, T., & Damme, P. Van. (2011). *Euphorbia tirucalli L.(Euphorbiaceae): the miracle tree: current status of available knowledge*. *Scientific Research and Essays*, 6(23), 4905–4914. <https://doi.org/10.1021/bk-2013-1127.ch001>
- Oike, Y., Ito, Y., Maekawa, H., Morisada, T., Kubota, Y., Akao, M., ... Suda, T. (2004). Angiopoietin-related growth factor (AGF) promotes angiogenesis. *Blood*, 103(10), 3760–3765. <https://doi.org/10.1182/blood-2003-04-1272>
- Orwa. (2009). *Euphorbia tirucalli L . Database*, 0, 1–5.



Rector, I., Stojadinovic, O., Yin, N. C., Ramirez, H., Nusbaum, A. G., a, A., ... Tomic-Canic, M. (2014). Epithelialization in Wound Healing: A Comprehensive Review. *Advances in Wound Care*, 3(7), 61–64. <https://doi.org/10.1089/wound.2013.0473>

F., Mustoe, T. A., Altrock, B. W., Deuel, T. F., & Thomason, A.

- (1991). Role of Platelet-Derived Growth Factor in Wound Healing, 326, 319–326.
- Pierce, G. F., Vande Berg, J., Rudolph, R., Tarpley, J., & Mustoe, T. A. (1991). Platelet-derived growth factor-BB and transforming growth factor beta 1 selectively modulate glycosaminoglycans, collagen, and myofibroblasts in excisional wounds. *The American Journal of Pathology*, 138(3), 629–646. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/1886289/>&tool=pmcentrez&rendertype=abstract
- Prasetyono, T. O. H. (2009). General concept of wound healing, revisited. *Medical Journal of Indonesia*, 18(3), 208–216. <https://doi.org/10.13181/mji.v18i3.364>
- Puti, I., Sabirin, R., Maskoen, A. M., & Hernowo, B. S. (2011). Peran Ekstrak Etanol Topikal Daun Mengkudu ( Morinda citrifolia L .) pada Penyembuhan Luka Ditinjau dari Imunoekspresi CD34 dan Kolagen pada Tikus Galur Wistar Role of Noni ( Morinda citrifolia L .) Leaf Ethanolic Extract Topical Application on Wound Heal, 45(4), 226–233.
- Qomariah, S., Lisdiana, & Wulan. (2014). Efektifitas salep ekstrak batang patah tulang (Euphorbia tirucallii) pada penyembuhan luka sayat tikus putih (Rattus norvegicus), 3(2), 79–86.
- Ramasasty, S. S. (2005). Acute wounds. *Clinics in Plastic Surgery*, 32(2), 195–208. <https://doi.org/10.1016/j.cps.2004.12.001>
- Robson, M. C. (2001). Wound healing: biologic features and approaches to maximum healing trajectories. *Curr Prob Surg* 2001:38; 61-148. *Current Problems in Surgery*, 38(2), 72–141. <https://doi.org/10.1067/j.cpsurg.2008.10.004>
- Sabale, P., Bhimani, B., Prajapati, C., & Sabalea, V. (2012). An overview of medicinal plants as wound healers. *Journal of Applied Pharmaceutical Science*, 2(11), 143–150. <https://doi.org/10.7324/JAPS.2012.21127>
- Schilling, J. A. (1976). Wound healing. *Surgical Clinics of North America*, 56(4), 859–874. [https://doi.org/10.1016/S0039-6109\(16\)40983-7](https://doi.org/10.1016/S0039-6109(16)40983-7)
- Schwarzenberger, P., Huang, W., Ye, P., Oliver, P., Manuel, M., Zhang, Z., ... Kolls, J. K. (2000). Requirement of Endogenous Stem Cell Factor and Granulocyte-Colony-Stimulating Factor for IL-17-Mediated Granulopoiesis. *The Journal of Immunology*, 164(9), 4783–4789. <https://doi.org/10.4049/jimmunol.164.9.4783>
-  Banchereau, J., & Pascual, V. (2013). Neutrophil come of age in inflammation, 31(9), 1713–1723. <https://doi.org/10.1109/TMI.2012.2196707>. Separate
- Young, A., & McNaught, C. E. (2017). The physiology of wound

- healing. *Surgery (United Kingdom)*, 35(9), 473–477. <https://doi.org/10.1016/j.mpsur.2017.06.004>
- Sørensen, L. T. (2012). Wound healing and infection in surgery: The pathophysiological impact of smoking, smoking cessation, and nicotine replacement therapy: A systematic review. *Annals of Surgery*, 255(6), 1069–1079. <https://doi.org/10.1097/SLA.0b013e31824f632d>
- Strong, C. D. G., Wertz, P. W., Wang, C., Yang, F., Meltzer, P. S., Andl, T., ... Segre, J. A. (2006). Lipid defect underlies selective skin barrier impairment of an epidermal-specific deletion of Gata-3. *Journal of Cell Biology*, 175(4), 661–670. <https://doi.org/10.1083/jcb.200605057>
- Susanti, G. (2017). Efek Anti Inflamasi Ekstrak Daun Binahong [ Anredera cordifolia ( Ten .) Steenis ] Topikal terhadap Jumlah PMN Neutrofil pada Tikus Jantan Sprague Dawley. *Jurnal Kesehatan*, VIII(3), 351–357.
- Swain, S. S., & Dudey, D. (2013). Research and Reviews : Journal of Pharmacognosy and Phytochemistry Anti-dengue Medicinal Plants : A Mini Review ., 1(2), 5–9.
- Takeshita, S., Zheng, L. P., Brogi, E., Kearney, M., Pu, L. Q., Bunting, S., ... Isner, J. M. (1994). Therapeutic angiogenesis. A single intraarterial bolus of vascular endothelial growth factor augments revascularization in a rabbit ischemic hind limb model. *Journal of Clinical Investigation*, 93(2), 662–670. <https://doi.org/10.1172/JCI117018>
- Tomic-Canic, M., Komine, M., Freedberg, I. M., & Blumenberg, M. (1998). Epidermal signal transduction and transcription factor activation in activated keratinocytes. *Journal of Dermatological Science*, 17(3), 167–181. [https://doi.org/10.1016/S0923-1811\(98\)00016-4](https://doi.org/10.1016/S0923-1811(98)00016-4)
- Velnar, T., Bailey, T., & Smrkolj, V. (2009). The Wound Healing Process : an Overview of the Cellular and Molecular Mechanisms. *The Journal of International Medical Research*, 37(5), 1528–1542. <https://doi.org/10.1177/147323000903700531>
- Wallis, S., Lloyd, S., Wise, I., Ireland, G., Tom, P., & Garrod, D. (2000). The  $\alpha$ -Isoform of Protein Kinase C Is Involved in Signaling the Response of Desmosomes to Wounding in Cultured Epithelial Cells, 11(March), 1077–1092.
- Werner, S., & Grose, R. (2003). Regulation of Wound Healing by Growth Factors and Cytokines, 835–870.



Witte, M. B., & Barbul, A. (1997). General Principles of Wound Healing. *Surgical Clinics of North America*, 77(3), 509–528. [https://doi.org/10.1016/S0039-6109\(05\)70566-1](https://doi.org/10.1016/S0039-6109(05)70566-1)



Optimization Software:  
[www.balesio.com](http://www.balesio.com)

## **Uji Statistik**

**Efek pemberian ekstrak batang patah tulang (*euphorbia tirucalli*) terhadap neutrophil, epitelisasi dan kolagen pada tikus putih**

**Kelompok Neutrophil hari ke-3, 7 dan 14  
Kruskal-Wallis Test**

**Ranks**

	Kelompok	N	Mean Rank
Neutrophil1	KP (Bioplacenton)	3	6.33
	KN (Nacmc)	3	8.00
	Ept 10%	3	5.67
	Ept 20%	3	6.00
	Total	12	
Neutrophil2	KP (Bioplacenton)	3	7.67
	KN (Nacmc)	3	7.33
	Ept 10%	3	5.50
	Ept 20%	3	5.50
	Total	12	
Neutrophil3	KP (Bioplacenton)	3	6.50
	KN (Nacmc)	3	6.50
	Ept 10%	3	6.50
	Ept 20%	3	6.50
	Total	12	

**Test Statistics<sup>a,b</sup>**

	Neutrophil1	Neutrophil2	Neutrophil3
Chi-Square	.864	2.212	.000
df	3	3	3
Asymp. Sig.	.834	.530	1.000

a. Kruskal Wallis Test

b. Grouping Variable: Kelompok



## Kelompok Epitelisasi hari ke-3, 7 dan 14

### Kruskal-Wallis Test

Ranks

	Kelompok	N	Mean Rank
Epitelisasi1	KP (Bioplacenton)	3	7.00
	KN (Nacmc)	3	7.00
	Ept 10%	3	5.00
	Ept 20%	3	7.00
	Total	12	
Epitelisasi2	KP (Bioplacenton)	3	5.00
	KN (Nacmc)	3	5.67
	Ept 10%	3	6.67
	Ept 20%	3	8.67
	Total	12	
Epitelisasi3	KP (Bioplacenton)	3	6.17
	KN (Nacmc)	3	6.17
	Ept 10%	3	6.83
	Ept 20%	3	6.83
	Total	12	

Test Statistics<sup>a,b</sup>

	Epitelisasi1	Epitelisasi2	Epitelisasi3
Chi-Square	.943	1.984	.147
df	3	3	3
Asymp. Sig.	.815	.576	.986

a. Kruskal Wallis Test

b. Grouping Variable: Kelompok



Optimization Software:  
[www.balesio.com](http://www.balesio.com)

## Kelompok Kolagen hari ke-3, 7 dan 14

### Kruskal-Wallis Test

Ranks

	Kelompok	N	Mean Rank
Kolagen1	KP (Bioplacenton)	3	6.50
	KN (Nacmc)	3	6.50
	Ept 10%	3	6.50
	Ept 20%	3	6.50
	Total	12	
Kolagen2	KP (Bioplacenton)	3	5.50
	KN (Nacmc)	3	5.50
	Ept 10%	3	7.33
	Ept 20%	3	7.67
	Total	12	
kolagen3	KP (Bioplacenton)	3	6.50
	KN (Nacmc)	3	4.17
	Ept 10%	3	7.67
	Ept 20%	3	7.67
	Total	12	

Test Statistics<sup>a,b</sup>

	Kolagen1	Kolagen2	kolagen3
Chi-Square	.000	2.212	2.200
df	3	3	3
Asymp. Sig.	1.000	.530	.532



llis Test  
variable: Kelompok

## Lampiran 1. Tanaman Patah Tulang



Gambar 2. Tanaman Patah Tulang



## 2. Ekstrak Patah Tulang

Optimization Software:  
[www.balesio.com](http://www.balesio.com)



Gambar 3. Ekstrak Patah Tulang



Optimization Software:  
[www.balesio.com](http://www.balesio.com)

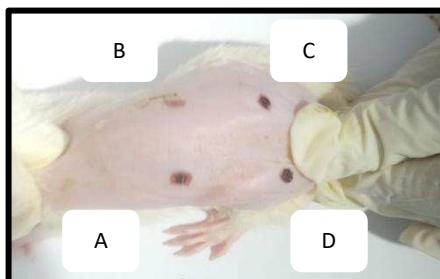
### Lampiran 3. Hewan coba



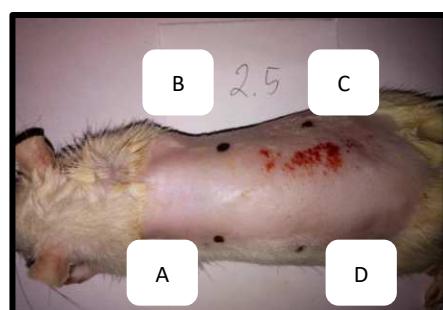
Gambar 3. Punggung tikus yang diberi perlakuan



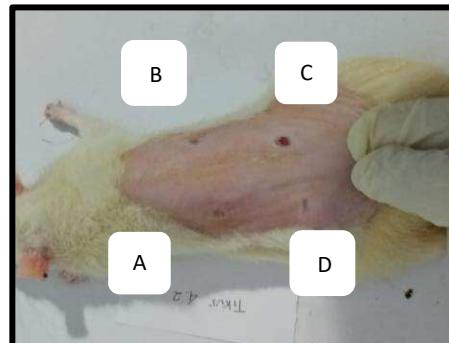
Gambarnya dilengkapi dengan tulisan "Hewan Coba".



Gambar 5. Model Perlukaan Luka Tikus Pada Hari ke-3 (A) Ekstrak Patah Tulang 10%, (B) Ekstrak Patah Tulang 20%, (C) Kontrol Negatif dan (D) Kontrol Positif



Gambar 6. Model Perlukaan Luka Tikus Pada Hari ke-7 (A) Ekstrak Patah Tulang 10%, (B) Ekstrak Patah Tulang 20%, (C) Kontrol Negatif dan (D) Kontrol Positif



Gambar 7. Model Perlukaan Luka Tikus Pada Hari ke-14 (A) Ekstrak Patah Tulang 10%, (B) Ekstrak Patah Tulang 20%, (C) Kontrol Negatif dan (D) Kontrol Positif



**KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI  
UNIVERSITAS HASANUDDIN  
SEKOLAH PASCASARJANA**

Sekretariat lantai 3 Jl. Perintis Kemerdekaan KM. 10 Makassar, 90245

---

**SURAT KETERANGAN JURNAL**

Yang bertanda tangan di bawah ini menerangkan bahwa:

Judul Penelitian : Efek Pemberian Ekstrak Batang Patah Tulang (Euphorbia Tirucalli) terhadap Neutrophil, Epitelisasi dan Kolagen pada Penyembuhan Luka Tikus Putih

Penulis : Muhammad Asri

NIM : P1502216003

Program Studi : Biomedik

Naskah tersebut telah memenuhi syarat Jurnal Ilmiah Seri Ilmu Kesehatan, dan layak diterbitkan oleh Sekolah Pascasarjana Universitas Hasanuddin Makassar.

Makassar, 26 February 2019

a.n Dekan,  
Wakil Dekan Bidang Akademik  
dan Publikasi Ilmiah

  
**Prof. Dr. Ir. Laode Asrul, M.P.**  
NIP. 19630307 198812 1 001

Setelah ditandatangani, Silahkan digandakan/*Fotocopy*



Optimization Software:  
[www.balesio.com](http://www.balesio.com)



**KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI  
UNIVERSITAS HASANUDDIN  
SEKOLAH PASCASARJANA**

Kampus Unhas Tamalanrea, Jl. Perintis Kemerdekaan Km. 10  
Telp. (0411) 585034, 585036 Fax. (0411) 585868 Makassar 90245  
<http://pasca.unhas.ac.id>

**LEMBAR PERSETUJUAN ARTIKEL JURNAL  
PROGRAM MAGISTER (S2) PPS UNHAS**

**Judul Artikel** : Efek pemberian ekstrak batang patah tulang (*Euphorbia Tirucalli*) terhadap neutrophil, epitelisasi dan kolagen pada penyembuhan luka tikus putih

**Nama Mahasiswa** : Muhammad Asri

**NIM** : P1502216003

**Program Studi** : Biomedik

**Email** : muhasri777@gmail.com

**No. Telp/HP** : 085343985278

Menyetujui nama pembimbing dicantumkan dalam Artikel tersebut  
dan menyetujui untuk dimuat dalam e-Jurnal PPs Unhas

**Pembimbing 1**

dr. M. Aryadi Arsyad, M.Biomed.Sc., Ph.D

**Pembimbing 2**

Tgl. Persetujuan : 28 Desember 2018

Tgl. Persetujuan: 28 Desember 2018

Makassar, Desember 2018

Ketua Program Studi

Dr.dr. Andi Mardiah Tahir, Sp.OG (K)





**KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI  
UNIVERSITAS HASANUDDIN  
SEKOLAH PASCASARJANA**

Kampus Unhas Tamalanrea, Jl. Perintis Kemerdekaan Km. 10  
Telp. (0411) 585034, 585036 Fax. (0411) 585868 Makassar 90245  
<http://pasca.unhas.ac.id>

**SURAT PERNYATAAN**

Yang bertandatangan di bawah ini menyatakan bahwa naskah jurnal hasil penelitian dengan judul:  
“Efek pemberian ekstrak batang patah tulang (*Euphorbia Tirucalli*) terhadap neutrophil, epitelisasi  
dan kolagen pada penyembuhan luka tikus putih”

Anggota Penulis:

- 1 Muhammad Asri
- 2
- 3

Belum pernah dipublikasikan dalam jurnal nasional maupun internasional atau dalam prosiding manapun, dan tidak sedang atau akan diajukan untuk publikasi di jurnal atau prosiding manapun sebelum ada keputusan dari Editor Jurnal Pascasarjana Univeritas Hasanuddin

Makassar, 28 Desember 2018  
Penulis untuk korespondensi

Muhammad Asri

Menyetujui,

Pembimbing I

dr. M. Aryadi Arsyad, M.Biomed.Sc., Ph.D Yulia Yusrini Djabir, S.Si., M.BM.Sc., M.Si., Ph.D., Apt

Pembimbing II

Catatan: Bila artikel ilmiah merupakan bagian dari Tesis/Dissertasi, maka tulisan tersebut harus  
setuju oleh pembimbing/supervisor.



Optimization Software:  
[www.balesio.com](http://www.balesio.com)