



KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
DIREKTORAT JENDERAL PENGUATAN RISET DAN PENGEMBANGAN
Jl. Jenderal Sudirman Pintu Satu Senayan Jakarta 10270
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SALINAN

KEPUTUSAN DIREKTUR JENDERAL PENGUATAN RISET DAN PENGEMBANGAN
KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
REPUBLIK INDONESIA

30/E/KPT/2018

TENTANG

PERINGKAT AKREDITASI JURNAL ILMIAH PERIODE II
TAHUN 2018

DIREKTUR JENDERAL PENGUATAN RISET DAN PENGEMBANGAN
KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI,

- Menimbang : a. bahwa dalam rangka melaksanakan ketentuan Pasal 6 ayat (5) Peraturan Menteri Riset, Teknologi dan Pendidikan Tinggi Nomor 9 Tahun 2018 tentang Akreditasi Jurnal Ilmiah, perlu menetapkan Peringkat Akreditasi Jurnal Ilmiah;
- b. bahwa berdasarkan hasil akreditasi jurnal ilmiah yang ditetapkan oleh Tim Akreditasi Jurnal Ilmiah Kementerian Riset, Teknologi, dan Pendidikan Tinggi pada tanggal 27 September 2018 dan 12 Oktober 2018, perlu menetapkan Peringkat Akreditasi Jurnal Ilmiah Periode II Tahun 2018;
- c. bahwa berdasarkan pertimbangan sebagaimana dimaksud pada huruf a dan huruf b, perlu menetapkan Keputusan Direktur Jenderal Penguatan Riset dan Pengembangan Kementerian Riset, Teknologi, dan Pendidikan Tinggi tentang Peringkat Akreditasi Jurnal Ilmiah Periode II Tahun 2018;
- Mengingat : 1. Undang-Undang Nomor 12 Tahun 2012 tentang Pendidikan Tinggi (Lembaran Negara Republik Indonesia Tahun 2012 Nomor 158, tambahan Lembaran Negara Republik Indonesia Nomor 5336);
2. Peraturan Pemerintah Nomor 4 Tahun 2014 tentang Penyelenggaraan Pendidikan dan Pengelolaan Perguruan Tinggi (Lembaran Negara Republik Indonesia Tahun 2014, Nomor 16, tambahan Lembaran Negara Republik Indonesia Nomor 5500);
3. Peraturan Presiden Nomor 13 Tahun 2015 tentang Kementerian Riset, Teknologi, dan Pendidikan Tinggi (Lembaran Negara Republik Indonesia Tahun 2015 Nomor 14);
4. Keputusan Presiden Nomor 121/P Tahun 2014 tentang Pembentukan Kementerian dan Pengangkatan Menteri Kabinet Kerja Periode Tahun 2014-2019;
5. Keputusan Presiden Nomor 99/M Tahun 2015 tentang Pemberhentian dan Pengangkatan Dari dan Dalam Jabatan Pimpinan Tinggi Madya di Lingkungan Kementerian Riset, Teknologi, dan Pendidikan Tinggi;

6. Peraturan Menteri Keuangan Republik Indonesia Nomor 49/PMK.02/2017 tentang Standar Biaya Masukan Tahun Anggaran 2018;
7. Peraturan Menteri Riset, Teknologi dan Pendidikan Tinggi Nomor 15 Tahun 2015 tentang Organisasi dan Tata Kerja Kementerian Riset, Teknologi dan Pendidikan Tinggi (Berita Negara Republik Indonesia Tahun 2015 Nomor 889);
8. Peraturan Menteri Riset, Teknologi, dan Pendidikan Tinggi Nomor 9 Tahun 2018 tentang Akreditasi Jurnal Ilmiah; (Berita Negara Republik Indonesia Tahun 2018 Nomor 428);

MEMUTUSKAN:

- Menetapkan : KEPUTUSAN DIREKTUR JENDERAL PENGUATAN RISET DAN PENGEMBANGAN KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI TENTANG PERINGKAT AKREDITASI JURNAL ILMIAH PERIODE II TAHUN 2018.
- KESATU : Menetapkan Peringkat Akreditasi Jurnal Ilmiah Periode II Tahun 2018 sebagaimana tercantum dalam Lampiran yang merupakan bagian yang tidak terpisahkan dari Keputusan Direktur Jenderal ini.
- KEDUA : Akreditasi Jurnal Ilmiah sebagaimana dimaksud dalam Diktum KESATU berlaku selama 5 (lima) tahun sejak dinilai baik oleh Tim Akreditasi Jurnal Ilmiah.
- KETIGA : Akreditasi Jurnal Ilmiah sebagaimana dimaksud dalam Diktum KESATU dapat mengajukan kembali kenaikan peringkat setelah menerbitkan minimal 1 (satu) nomor penerbitan.
- KEEMPAT : Setiap jurnal ilmiah wajib mencantumkan masa berlaku akreditasi dengan menuliskan tanggal penetapan dan tanggal akhir masa berlaku akreditasi.
- KELIMA : Apabila dikemudian hari ditemukan ketidaksesuaian dengan Pedoman Akreditasi Jurnal Ilmiah, maka status akreditasi jurnal ilmiah yang bersangkutan dapat dicabut atau diturunkan.
- KEENAM : Keputusan Direktur Jenderal ini mulai berlaku pada tanggal ditetapkan.

Ditetapkan di Jakarta
pada tanggal 24 Oktober 2018
DIREKTUR JENDERAL
PENGUATAN RISET DAN PENGEMBANGAN,

TTD.

MUHAMMAD DIMYATI
NIP 195912171984041001

Salinan sesuai dengan aslinya,
Direktorat Jenderal Penguatan Riset dan Pengembangan
Kementerian Riset, Teknologi, dan Pendidikan Tinggi
Kepala Bagian Hukum, Kerjasama, dan Layanan Informasi,

TTD.

Syarip Hidayat
NIP 197306101997031004

SALINAN
LAMPIRAN
KEPUTUSAN DIREKTUR JENDERAL
PENGUATAN RISET DAN PENGEMBANGAN
KEMENTERIAN RISET, TEKNOLOGI, DAN
PENDIDIKAN TINGGI
NOMOR 30/E/KPT/2018
TENTANG PERINGKAT AKREDITASI JURNAL
ILMIAH PERIODE II TAHUN 2018

PERINGKAT AKREDITASI JURNAL ILMIAH PERIODE II TAHUN 2018

Peringkat	No	Nama Jurnal	E-ISSN	Penerbit
Peringkat 1 (Satu)	1	Acta Medica Indonesiana	23382732	PB PAPDI (Perhimpunan Dokter Spesialis Penyakit Dalam Indonesia)
	2	AJAS (Agrivita Journal of agricultural science)	24778516	Fakultas Pertanian, Universitas Brawijaya
	3	Al-Jami'ah: Journal of Islamic Studies	2338557X	Universitas Islam Negeri Sunan Kalijaga
	4	Atom Indonesia	23565322	Badan Tenaga Nuklir Nasional
	5	Biodiversitas : Journal of Biolodical Diversity	20854722	Jurusan Biologi Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Sebelas Maret
	6	BIOTROPIA	1907770X	SEAMEO-BIOTROP
	7	Bulletin of Electrical Engineering and Informatics	23029285	Universitas Ahmad Dahlan
	8	Cakrawala Pendidikan	24428620	Lembaga Pengembangan dan Penjaminan Mutu Pendidikan UNY
	9	Electronic Journal of Graph Theory and Applications	23382287	Indonesian Combinatorial Society (InaCombS), Institut Teknologi Bandung (ITB) Indonesia dan GTA Research Centre, The University of Newcastle Australia
	10	<i>Gadjah Mada International Journal of Business</i>	23387238	Fakultas Ekonomika dan Bisnis Universitas Gadjah Mada
	11	HAYATI Journal of Biosciences	20864094	Perhimpunan Biologi Indonesia bekerja sama dengan Departemen Biologi Fakultas Matematika dan Ilmu Pengetahuan Alam Institut Pertanian Bogor
	12	<i>IJAIN (International Journal of Advances in Intelligent Informatics)</i>	25483161	Universitas Ahmad Dahlan
	13	<i>IJASEIT (International Journal on Advanced Science, Engineering and Information Technology)</i>	24606952	INSIGHT -Indonesian Society for Knowledge and Human Development

14	IJOG : Indonesian Journal on Geoscience	23559306	Sekretariat Badan Geologi
15	Indonesian Journal of Geography	23549114	Faculty of Geography UGM and The Indonesian Geographers Association
16	Indonesian Journal of Islam and Muslim Societies	2406825X	Program Pascasarjana, IAIN Salatiga
17	<i>Indonesian Journal of Pharmacy</i>	23389486	Fakultas Farmasi, Universitas Gadjah Mada
18	<i>Indonesian Journal of Science and Technology</i>	25278045	Universitas Pendidikan Indonesia
19	International Journal of Technology	20872100	Faculty of Engineering Universitas Indonesia
20	<i>International Journal on Electrical Engineering and Informatics</i>	20875886	Institut Teknologi Bandung
21	Journal of Engineering and Technological Sciences	23385502	Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM), Institut Teknologi Bandung
22	Journal of ICT Research and Applications	23385499	Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM), Institut Teknologi Bandung
23	Journal of Mathematical and Fundamental Sciences	23385510	ITB Journal Publisher
24	Journal of Regional and City Planning	25026429	Lembaga Penelitian dan Pengabdian kepada Masyarakat, Institut Teknologi Bandung
25	Journal of the Indonesian Tropical Animal Agriculture	24606278	Fakultas Peternakan dan Pertanian UNDIP
26	Journal on Mathematics Education	24070610	The Indonesian Mathematical Society
27	Jurnal Manajemen Hutan Tropika	20892063	Departemen Manajemen Hutan Fakultas Kehutanan IPB dan Persatuan Sarjana Kehutanan Indonesia
28	Jurnal Pendidikan IPA Indonesia	20894392	Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Negeri Semarang
29	Jurnal Respirologi Indonesia	26203162	Perhimpunan Dokter Paru Indonesia
30	Microbiology Indonesia	20878575	Perhimpunan Mikrobiologi Indonesia (Indonesian Society of Microbiology)
31	Operations and Supply Chain Management: An International Journal	25799363	Pusat Publikasi Ilmiah LPPM Institut Teknologi Sepuluh Nopember
32	Paramita: Historical Studies Journal	24075825	Jurusan Sejarah, Fakultas Ilmu Sosial, Universitas Negeri Semarang dan

				Masyarakat Sejarawan Indonesia
	33	<i>QIJIS (Qudus International Journal Of Islamic Studies)</i>	24769304	Pusat Penelitian dan Pengabdian Masyarakat (P3M) STAIN KUDUS
	34	Studia Islamika	23556145	UIN Syarif Hidayatullah Jakarta
	35	TEFLIN Journal	0215773X	TEFLIN (The Association of Teachers of English as a Foreign Language in Indonesia)
	36	<i>Tropical Animal Science Journal (Media Peternakan)</i>	2615790X	Fakultas Peternakan Institut Pertanian Bogor dan Himpunan Ilmuwan Peternakan Indonesia
	37	Wacana, Journal of the Humanities of Indonesia	24076899	Universitas Indonesia
Peringkat 2 (Dua)	1	Aceh International Journal of Science and Technology	25032348	Program Pascasarjana, Universitas Syiah Kuala
	2	Acta Veterinaria Indonesiana	23374373	Fakultas Kedokteran Hewan IPB
	3	Adabiyat : Jurnal Bahasa dan Sastra	25492047	Fakultas Adab dan Ilmu Budaya Univ. Islam Negeri Sunan Kalijaga
	4	Addin	24769479	STAIN Kudus
	5	AFKARUNA: Indonesian Interdisciplinary Journal of Islamic Studies	25990586	Universitas Muhammadiyah Yogyakarta
	6	Agraris : Journal of Agribusiness and Rural Development Research	25279238	Program Studi Agribisnis, Fakultas Pertanian, Universitas Muhammadiyah Yogyakarta
	7	Agritech	25273825	Fakultas Teknologi Pertanian, Universitas Gadjah Mada
	8	Ahkam: Jurnal Ilmu Syariah	24078646	Fakultas Syariah dan Hukum, Universitas Syarif Hidayatullah Jakarta
	9	AKADEMIKA: Jurnal Pemikiran Islam	23562420	Lembaga Penelitian dan Pengabdian kepada Masyarakat Institut Agama Islam Negeri Metro
	10	Aksara	25800353	Balai Bahasa Bali
	11	Al-'Adalah	2614171X	Fakultas Syariah Universitas Islam Negeri Raden Intan Lampung
	12	Al-Ahkam	25023209	Fakultas Syariah dan Hukum, Universitas Islam Walisongo Semarang
	13	ALCHEMY Jurnal Penelitian Kimia	24434183	Universitas Sebelas Maret

14	Al-Daulah : Jurnal Hukum dan Perundangan Islam	25030922	Program Studi Siyasah Jinayah, Fakultas Syariah dan Hukum, Universitas Islam Negeri Sunan Ampel Surabaya
15	Al-Ihkam: Jurnal Hukum dan Pranata Sosial	24423084	Jurusan Syariah STAIN Pamekasan
16	Al-Iqtishad : Jurnal Ilmu Ekonomi Syariah (Journal of Islamic Economics)	24078654	UIN Syarif Hidayatullah Jakarta bekerjasama DPP Ikatan Ahli Ekonomi Islam Indonesia
17	Al-Manahij : Jurnal Kajian Hukum Islam	25794167	Fakultas Syariah IAIN Purwokerto
18	Al-Qalam	2540895X	Balai Penelitian dan Pengembangan Agama Makassar
19	Al-Risalah : Forum Kajian Hukum dan Sosial Kemasyarakatan	25409522	Fakultas Syariah Institut Agama Islam Negeri Sulthan Thaha Saifuddin Jambi
20	Al-Tahrir : Jurnal Pemikiran Islam	25022210	IAIN Ponorogo
21	Al-Ta'lim Journal	23557893	Fakultas Tarbiyah dan Keguruan IAIN Imam Bonjol Padang
22	Anima	26205963	Laboratorium Psikologi Umum Universitas Surabaya
23	Animal Production	25415875	Fakultas Peternakan Universitas Jenderal Soedirman
24	APMBA (Asia Pacific Management and Business Application)	26152010	Jurusan Manajemen FEB Universitas Brawijaya
25	Arabiyat: Jurnal Pendidikan Bahasa Arab dan Kebahasaaraban	24429473	Jurusan Pendidikan Bahasa Arab Fakultas Ilmu Tarbiyah dan Keguruan UIN Syarif Hidayatullah
26	Arena Hukum	25274406	Fakultas Hukum, Universitas Brawijaya
27	Asy-Syir'ah Jurnal Ilmu Syari'ah dan Hukum	24430757	Fakultas Syari'ah dan Hukum UIN Sunan Kalijaga
28	Balaba: Jurnal Litbang Pengendalian Penyakit Bersumber Binatang Banjarnegara	23389982	Balai Penelitian dan Pengembangan Kesehatan Banjarnegara
29	Berkala Ilmu Kedokteran (Journal of the Medical Sciences)	23563931	Fakultas Kedokteran Universitas Gadjah Mada Yogyakarta
30	Berkala Ilmu Kesehatan Kulit dan Kelamin (Periodical of Dermatology and Venerology)	25494082	Departemen/Staf Medik Fungsional Kesehatan Kulit Dan Kelamin Fakultas Kedokteran Universitas Airlangga
31	Berkala Ilmu Perpustakaan dan Informasi	24770361	UPT Perpustakaan UGM

32	Berkala Penelitian Hayati (Journal of Biological Researchers)	2337389X	Perhimpunan Biologi Indonesia (PBI) Cabang Jawa Timur
33	<i>Binus Business Review</i>	24769053	Universitas Bina Nusantara
34	Biopropal Industri	25022962	Balai Riset dan Standardisasi Industri Pontianak
35	BIOSAINTIFIKA: Berkala Ilmiah Biologi	23387610	Jurusan Biologi, Fakultas Matematika dan Ilmu Pengetahuan, Universitas Negeri Semarang
36	BISNIS & BIROKRASI : Jurnal Ilmu Administrasi dan Organisasi	23557826	Pusat Kajian Ilmu Administrasi, Fakultas Ilmu Administrasi, Universitas Indonesia
37	Brawijaya Law Journal : Journal of Legal Studies	25030841	Fakultas Hukum, Universitas Brawijaya
38	Buletin Ekonomi Moneter Perbankan	24609196	Pusat Riset dan Edukasi Bank Sentral. Bank Indonesia
39	Buletin Kebun Raya (The Botanic Garden Bulletin)	24601519	Pusat Konservasi Tumbuhan Kebun Raya - LIPI
40	Buletin Penelitian Sistem Kesehatan	23548738	Pusat Humaniora Kebijakan Kesehatan dan Pemberdayaan Masyarakat, Badan Penelitian dan Pengembangan Kesehatan
41	Buletin Penelitian Tanaman Rempah dan Obat	25274414	Pusat Penelitian dan Pengembangan Perkebunan, Kementerian Pertanian
42	Buletin Peternakan	2407876X	Fakultas Peternakan Universitas Gadjah Mada
43	Celt : A Journal of Culture, English Language Teaching and Literature	25024914	Fakultas Bahasa dan Seni, Universitas Katolik Soegijapranata
44	<i>Civil Engineering Dimension</i>	1979570X	Universitas Kristen Petra
45	CommIT (Communication and Information Technology) Journal	24607010	Universitas Bina Nusantara
46	Dental Journal (Majalah Kedokteran Gigi)	24429740	Fakultas Kedokteran Gigi Universitas Airlangga
47	Dentika : Dental Journal	2615854X	Fakultas Kedokteran Gigi USU
48	DIMENSI: Journal of Architecture and Built Environment	23387858	LPPM Universitas Kristen Petra Surabaya
49	Dinamika Ilmu: Jurnal Pendidikan	24429651	Fakultas Tarbiyah dan Ilmu Keguruan IAIN Samarinda
50	Dinamika Kerajinan dan Batik : Majalah Ilmiah	25286196	Balai Besar Kerajinan dan Batik
51	Dinamika Pendidikan	25025074	Jurusan Pendidikan Ekonomi Universitas

			Negeri Semarang (UNNES)
52	Economic Journal of Emerging Markets	2502180X	Universitas Islam Indonesia
53	Edukasia: Jurnal Penelitian Pendidikan Islam	25023039	Program Studi Pendidikan Agama Islam Jurusan Tarbiyah STAIN Kudus
54	EDUSAINS	24431281	Jurusan Pendidikan IPA Fakultas Ilmu Tarbiyah dan Keguruan UIN Hidayatullah Jakarta
55	Eksplorium : Buletin Pusat Pengembangan Bahan Galian Nuklir	2503426X	Pusat Teknologi Bahan Galian Nuklir Jakarta
56	EKUITAS : Jurnal Ekonomi dan Keuangan	25485024	Sekolah Tinggi Ilmu Ekonomi Indonesia Surabaya
57	el Harakah: Jurnal Budaya Islam	23561734	Universitas Islam Negeri Maulana Malik Ibrahim Malang
58	ELKOMIKA: Jurnal Teknik Energi Elektrik, Teknik Telekomunikasi, & Teknik Elektronika	24599638	Teknik Elektro Institut Teknologi Nasional
59	EMITTER : <i>International Journal of Engineering Technology</i>	24431168	Politeknik Elektronika Negeri Surabaya
60	Epistemé : Jurnal Pengembangan Ilmu Keislaman	25023705	Pascasarjana IAIN Tulungagung
61	Esensia : Jurnal Ilmu-Ilmu Ushuluddin	25484729	Fakultas Ushuluddin dan Pemikiran Islam UIN Sunan Kalijaga
62	Etikonomi	24610771	Fakultas Ekonomi dan Bisnis UIN Syarif Hidayatullah Jakarta
63	Floribunda	24606944	Penggalang Taksonomi Tumbuhan Indonesia
64	Folia Medica Indonesiana	2599056X	Fakultas Kedokteran Universitas Airlangga
65	Forum Arkeologi	25276832	Balai Arkeologi Bali
66	Forum Geografi	24603945	Fakultas Geografi UMS
67	Ganendra : Majalah IPTEK Nuklir	25035029	Pusat Sains Dan Teknologi Akselerator (PSTA) Badan Tenaga Nuklir Nasional (BATAN) Yogyakarta
68	Geoplanning : Journal of Geomatics and Planning	23556544	Geomatics and Planning Laboratory, Departement of Urban and Regional Planning, Diponegoro University
69	Global Medical and Health Communication	24605441	Pusat Penerbitan Universitas-Lembaga Penelitian dan Pengembangan Masyarakat (P2U-LPPM) Fakultas Kedokteran

			Universitas Islam Bandung
70	Global Strategis	24429600	Department of International Relations, Faculty of Social and Politics, Universitas Airlangga
71	Harmonia : Journal of Arts Research and Education	25412426	Department of Drama, Dance and Music, Faculty of Language and Arts, Universitas Negeri Semarang
72	Hasanuddin Law Review	24429899	Fakultas Hukum Universitas Hassanudin
73	HSJI (Health Science Journal of Indonesia)	23383437	Badan Penelitian dan Pengembangah Kesehatan Kementerian Kesehatan
74	Humanitas: Indonesian Psychological Journal	25986368	Fakultas Psikologi Universitas Ahmad Dahlan
75	IBDA` : Jurnal Kajian Islam dan Budaya	24775517	LPPM IAIN Purwokerto
76	IJCCS (<i>Indonesian Journal of Computing and Cybernetics Systems</i>)	24607258	Indonesian Computer, Electronics, and Instrumentation Support Society (IndoCEISS)
77	IJEIS (<i>Indonesian Journal of Electronics and Instrumentation Systems</i>)	24607681	Indonesian Computer, Electronics and Instrumentation Support Society (IndoCEISS)
78	ILMU KELAUTAN: Indonesian Journal of Marine Sciences	24067598	Jurusan Ilmu Kelautan Fakultas Perikanan dan Ilmu Kelautan Universitas Diponegoro
79	Ilmu Pertanian (<i>Agricultural Science</i>)	25277162	Fakultas Pertanian Universitas Gadjah Mada
80	Ilmu Ushuluddin	25027530	Himpunan Peminat Ilmu Ushuluddin (HIPIUS) bekerjasama dengan Fakultas Ushuluddin UIN Syarif Hidayatullah Jakarta
81	Indonesia Law Review	23562129	Djokosoetono Research Center (DRC) Faculty of Law University of Indonesia
82	Indonesian Capital Market Review (ICMR)	23563818	Management Research Center (MRC), Fakultas Ekonomi dan Bisnis Universitas Indonesia
83	Indonesian Journal of Business and Entrepreneurship	24077321	Graduate Program of Management and Business, Bogor Agricultural University (MB-IPB)
84	Indonesian Journal of Clinical Pathology and Medical Laboratory	24774685	Perhimpunan Dokter Spesialis Patologi Klinik Indonesia
85	Indonesian Journal of Obstetrics and Gynecology	23387335	Perkumpulan Obstetri dan Ginekologi Indonesia

	(Majalah Obstetri dan Ginekologi Indonesia)		
86	Indonesian Journal of Tropical and Infectious Disease	23560991	Lembaga Penyakit Tropis Universitas Airlangga
87	Indonesian Journal of Urology	23551402	Ikatan Ahli Urologi Indonesia (IAUI)
88	Industria : Jurnal Teknologi dan Manajemen Agroindustri	25493892	Jurusan Teknologi Industri Pertanian, Fakultas Teknologi Pertanian, Universitas Brawijaya
89	Inferensi : Jurnal Penelitian Sosial Keagamaan	25021427	LP2M Institut Agama Islam Negeri (IAIN) Salatiga
90	Inovasi : Jurnal Politik dan Kebijakan	26148935	Badan Penelitian dan Pengembangan Provinsi Sumatera Utara
91	<i>International Journal of Agriculture System (IJAS)</i>	25806815	Universitas Hasanuddin
92	International Journal of Remote Sensing and Earth Sciences	2549516X	Lembaga Penerbangan dan Antariksa Nasional (LAPAN)
93	International Journal of Renewable Energy Development : JRED	22524940	Jurusan Teknik Kimia Universitas Diponegoro
94	International Journal on Emerging Mathematics Education	25485806	Universitas Ahmad Dahlan bekerjasama dengan SEAMEO Regional Centre for QITEP in Mathematics
95	International Research Journal of Business Studies	23384565	Universitas Prasetiya Mulya
96	Iqtishadia: Jurnal Kajian Ekonomi dan Bisnis Islam	25023993	Program Studi Ekonomi Syari'ah Jurusan Syaria'h dan Ekonomi Islam Sekolah Tinggi Agama Islam Negeri (STAIN) Kudus
97	Islamica: Jurnal Studi Keislaman	23562218	Program Pascasarjana UIN Sunan Ampel Surabaya
98	Istinbath	18296505	Jurusan Syari'ah, Sekolah Tinggi Agama Islam Negeri Mataram
99	JAI (Jurnal Anestesiologi Indonesia)	2089970X	Universitas Diponegoro. Bagian Anestesiologi dan Terapi Intensif
100	JAM : Jurnal Aplikasi Manajemen	23026332	Jurusan Manajemen, FEB, Universitas Brawijaya
101	Jantra	19079605	Balai Kajian Sejarah dan Nilai Tradisional Yogyakarta
102	JAS (Journal of ASEAN Studies)	23381353	Universitas Bina Nusantara
103	JDM (Jurnal Dinamika Manajemen)	23375434	Jurusan Manajemen, Fakultas Ekonomi, Universitas Negeri Semarang

104	JEJAK : Jurnal Ekonomi dan Kebijakan	24605123	Jurusan Ekonomi Pembangunan Falkutas Ekonomi Universitas Negeri Semarang
105	JGEET (Journal of Geoscience, Engineering, Environment and Technology)	25415794	UIR PRESS
106	JKAP (Jurnal Kebijakan dan Administrasi Publik)	24774693	Magister Administrasi Publik FISIPOL UGM
107	JKKI : Jurnal Kedokteran dan Kesehatan Indonesia	25272950	Fakultas Kedokteran, Universitas Islam Indonesia
108	JNTETI (Jurnal Nasional Teknik Elektro dan Teknologi Informasi)	24605719	Jurusan Teknik Elektro dan Teknologi Informasi Fakultas Teknik UGM
109	Journal of Biomedicine and Translational Research	25032178	Fakultas Kedokteran, Universitas Diponegoro
110	Journal of Degraded and Mining Lands Management	25022458	Fakultas Pertanian, Universitas Brawijaya
111	Journal of Dentistry Indonesia	23554800	Fakultas Kedokteran Gigi Universitas Indonesia
112	<i>Journal of Economics, Business, & Accountancy</i>	2888785X	Sekolah Tinggi Ilmu Ekonomi Perbanas Surabaya
113	Journal of Education and Learning	23029277	Universitas Ahmad Dahlan Yogyakarta
114	<i>Journal of Indonesian Economy and Business</i>	23385847	Fakultas Ekonomi dan Bisnis, UGM
115	Journal of Islamic Architecture	23564644	Jurusan Teknik Arsitektur UIN Maulana Malik Ibrahim Malang
116	Journal of Mechatronics, Electrical Power, and Vehicular Technology	20886985	Pusat Penelitian Tenaga Listrik dan Mekatronik Lembaga Ilmu Pengetahuan Indonesia
117	Journal of Tropical Life Science : International Journal of Theoretical, Experimental, and Applied Life Sciences	25274376	Jurusan Biologi, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Brawijaya
118	<i>Journal of Urban Society's Arts</i>	2355214X	Institut Seni Indonesia Yogyakarta
119	<i>Journal of Visual Art and Design</i>	23385480	Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM), Institut Teknologi Bandung
120	JPBI (Jurnal Pendidikan Biologi Indonesia)	25276204	Universitas Muhammadiyah Malang
121	JRP (Jurnal Review Politik)	26156504	Fakultas Ushuluddin dan Filsafat UIN Sunan Ampel Surabaya
122	JSINBIS (Jurnal Sistem Informasi Bisnis)	25022377	Program Magister Sistem Informasi Universitas Diponegoro
123	JSP (Jurnal Ilmu Sosial dan Ilmu Politik)	25027883	Fakultas Ilmu Sosial dan Ilmu Politik, Universitas Gadjah Mada

8	JME (Journal of Mathematics Education)	25282026	USN Scientific Journal
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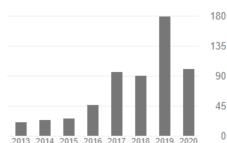
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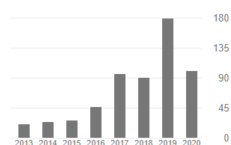
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Roles of doctors at health centres in applying principles of family medicine to prevent diphtheria in Banda Aceh

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ABSTRACT

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Background: They are expected to be able to apply principles of family-based health treatments by prioritizing preventive, coordinative, and collaborative services. Based on the principles, identifying and managing diphtheria cases at some of health centres should be evaluated because there have been an increase of diphtheria cases, especially in Banda Aceh city.

Objective: This study aimed to evaluate roles of doctors in the health centres to prevent the diphtheria. Furthermore, this research also aimed to determine obstacles of the diphtheria treatments encountered by the doctors.

Methods: This study was a multiple case study. Its data were collected by in-depth interviews with doctors at five health centres in Banda Aceh. Data from the interviews were verified by using source and technical triangulation methods at the health offices and governmental hospitals in Banda Aceh.

Result: Doctors' efforts at the health centres in Banda Aceh to apply principles of family medicine for the immunization experienced some obstacles. For example, they had less understanding about developing problems in their societies, namely issues of illegitimate (*haram*) vaccines and KIP (post-immunization follow-up events). They also did not make active efforts to identify diphtheria cases by making coordination with their colleagues in other health service units.

Conclusion: The doctors at the health centres of Banda Aceh had not fully implemented the principles of family medicine.

Latar Belakang: Dokter puskesmas diharapkan dapat menerapkan prinsip kedokteran keluarga dengan mengutamakan pelayanan yang bersifat pencegahan serta koordinatif dan kolaboratif. Berdasarkan prinsip inilah tindakan penemuan dan penatalaksanaan kasus difteri di tingkat puskesmas harus di evaluasi lagi mengingat masih banyaknya penemuan kasus difteri di kota Banda Aceh.

Tujuan Penelitian: Penelitian ini bertujuan mengevaluasi peran dokter puskesmas dalam menerapkan prinsip kedokteran keluarga dalam mencegah difteri. Selain itu juga untuk mengetahui hambatan apa saja yang ditemui dokter puskesmas dalam melaksanakan kedua program pencegahan difteri tersebut.

Metode: Penelitian ini bertujuan mengevaluasi peran dokter puskesmas dalam menerapkan prinsip kedokteran keluarga dalam mencegah difteri. Selain itu juga untuk mengetahui hambatan apa saja yang ditemui dokter puskesmas dalam melaksanakan kedua program pencegahan difteri tersebut.

Hasil: Upaya dokter puskesmas untuk penerapan prinsip kedokteran keluarga dalam hal peningkatan cakupan imunisasi menemui kendala dengan kurangnya pemahaman dokter akan permasalahan yang

The ethyl acetate fraction of sponge *Stylissa carteri* decreases viability in HER2+ trastuzumab-resistant breast cancer cells

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ABSTRACT

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Background: HER2+ breast cancer is a very aggressive type of breast cancer. Although trastuzumab, specifically targeted for HER2, has been used for breast cancer treatments, some patients become resistant to trastuzumab. A marine sponge is one of the potential sources of anticancer agents. One of marine sponges commonly found in Indonesia is *Stylissa carteri*, but it has not been explored extensively.

Objective: This study aimed to identify cytotoxic effects of the ethyl acetate fraction of *Stylissa carteri* on HCC-1954, HER2+ trastuzumab-resistant breast cancer cells, by assessing cell viability and determining IC₅₀ value.

Methods: This study was an experimental *in vitro* study conducted in The Cell Culture Laboratory, Faculty of Medicine Universitas Padjadjaran on February 2018 to June 2018. The *Stylissa carteri* was collected from Pramuka Island, Kepulauan Seribu National Park Jakarta. HCC-1954 cells were treated by serial concentration of fractions and were incubated for 72 hours. Cell viability were observed under a microscope and analysed with MTT assay. The IC₅₀ value was also determined by using four parametric logistic regression (4PL) method by Sigmaplot version 12.0.

Result: Data of this study showed descent of cell viability significantly when exposing the ethyl acetate fraction of *Stylissa carteri*. There was a decrease of 49% cell viability in 10 µg/ml of the ethyl acetate fraction of *Stylissa carteri*. The estimated IC₅₀ value was 9.25 µg/ml.

Conclusion: This result indicated that the ethyl acetate fraction of *Stylissa carteri* has cytotoxic effects on HER2+ trastuzumab-resistant breast cancer cells.

Latar Belakang: Kanker payudara tipe HER2+ adalah jenis yang sangat agresif. Walaupun tersedia trastuzumab yang secara spesifik menarget HER2, sebagian pasien mengalami resistensi terhadap trastuzumab. Spons laut diketahui berpotensi baik sebagai sumber obat anti kanker. *Stylissa carteri* adalah salah satu spesies spons laut yang banyak ditemukan di perairan Indonesia namun belum banyak dieksplorasi potensinya.

Tujuan: Penelitian ini bermaksud untuk mengetahui efek sitotoksik fraksi etil asetat *Stylissa carteri* terhadap sel kanker payudara HER2+ resisten trastuzumab (HCC-1954) melalui parameter viabilitas sel dan penghitungan nilai IC₅₀.

Comparisons of physical properties and rates of rifampicin dissolution in Fixed Dose Combination (2FDC) tablet against rifampicin tablet

Normalitasari Ayu Damayanti¹, Widyasari Putranti^{*1}, Deasy Vanda Pertiwi¹

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ABSTRACT

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Fixed Dose Combination (FDC), rifampicin, physical property test, type 1 dissolution test

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Background: The World Health Organization (WHO) has recommended using fixed dose combination (FDC) for tuberculosis treatments as it can improve patient compliance and prevent drug resistance. A combination of rifampicin and isoniazid can cause reductions in concentration of each drug because the rifampicin is labile and can not be mixed with all three other TB drugs

Objective: This study is aimed to understand effects of the combination of both physical properties and dissolutions of rifampin.

Methods: This laboratory study observed rifampicin tablets and combination tablets of rifampicin and isoniazid (2 FDC) by testing physical properties of the tablets and dissolution tests. Friability test was conducted by using friability tester, hardness test was by hardness tester, disintegration test was by disintegration tester and dissolution test was by dissolution tester type 1 (basket). Its data were analysed by Mann Whitney test. The data had value if $p < 0.05$ with CI 95%.

Results: This study found that each tablet of rifampicin and 2 FDC tablets respectively had averages of 0.25% and 0.14% of brittleness, 11.07 kg and 10.19 kg of hardness, 2 minutes 1 second and 10 minutes 9 seconds of disintegration time. Consequently, the generic rifampicin tablets were more fragile but harder and faster to crumble than the 2 FDC tablets, in which their mean values were DE_{45} 92.03% and 93.94%. Based on statistical test of Mann Whitney on the rifampicin tablets and 2 FDC, there were no significant differences of hardness test result and mean DE_{45} 0.076 ($p > 0.05$), while there were significant difference of fragile test result and disintegration time 0.015 ($p < 0.05$).

Conclusion: The combination of rifampicin and isoniazid in tablet 2 Fixed Dose Combination (2 FDC) had no effects on the dissolution rates of rifampicin, but they had effects on some parameters of physical property test of the tablets.

Latar Belakang: World Health Organization (WHO) telah merekomendasikan penggunaan Fixed Dose Combination (FDC) pada pengobatan TBC karena dapat meningkatkan kepatuhan pasien dan mencegah terjadinya resistensi obat. Rifampisin memiliki sifat labil dan tidak bisa dicampurkan dengan ketiga macam obat TBC lainnya. Adanya bentuk sediaan FDC dapat menyebabkan berkurangnya konsentrasi obat rifampisin.

Tujuan Penelitian: Mengetahui pengaruh bentuk FDC terhadap sifat fisik dan disolusi rifampisin.

Metode: Penelitian laboratoris ini dilakukan pada tablet rifampisin sediaan tunggal dengan tablet kombinasi yang berisi rifampisin dan isoniazid (2 FDC) dengan menguji sifat fisik tablet (uji kerapuhan, kekerasan, waktu hancur) dan uji disolusi (tipe 1). Data dianalisis dengan menggunakan uji Mann Whitney.

Protein hydrolysate as a functional food for chronic kidney disease

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The progress of science and technology in the last few decades has improved the welfare and health of humanity. Invention in the fields of medicine, biochemistry, nutrition and food technology show their role in overcoming and managing various diseases through the role of functional food. The discovery of the process and manufacture of protein hydrolysate shows a pivotal role in fulfill the nutritional needs of several diseases. Because the structure of the protein will determines its function, then bioinformatics take an important role of in preparing functional food production for the future.

Protein hydrolysate, mixtures of amino acids obtained from the hydrolysis process made by separating proteins from acids, alkalis, or enzymes. Hydrolysate nutrients preparations that is produced from original ingredients in the form of amino acids that build it, are commonly used as a provider of nutrients and special dietary fluids for patients who are unable to consume ordinary food protein.¹

Its use as a protein supplement, among others, as energetic drinks, geriatric products, sports nutrition or weight control diets. While its use in the clinical field, among others, as functional food for patients with phenylketonuria (PKU), hypoallergenic infant, acute and chronic liver disease, short bowel syndrome, crohn's disease, pancreatitis and ulcerative colitis.²

In the academic literature, functional food is defined as food that is intended to be eaten as part of a daily diet and contains biologically active components that have the potential to improve health or reduce the risk of disease.³ In other words, a modified food which is provides benefits to health in addition to the benefits of it's nutritional content. Functional food is one of the mainstays in efforts to maintain public health, which has effect of reducing health costs, increasing productivity and fostering people's economy. Three important things to determine functional food through research are: bioactive compounds, biological availability and biomarkers of valid scientific evidence which states that a food has good physiological effects, which are beneficial to health.⁴

Preliminary studies indicate that protein hydrolysate is more effectively used than whole protein or amino acids. In addition, they promote a strong insulinotropic effect, which reduces protein breakdown and increases the absorption of muscle and branched-chain amino acid tissue. These effects contribute to the benefits of protein hydrolysate to increase repair of tissue damage caused by surgery, ulcers, burns, and muscle damage exercises. There is evidence that protein hydrolysate might be useful to repair tissue damage in some diseases, however additional research is needed to further examine the various roles of protein hydrolysate in this process.⁵

Aedes aegypti vector resistance status on malation and activity of non specific esteration enzymes in Tembalang district, Semarang city

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***Aedes aegypti* vector resistance status on malation and activity of non specific esteration enzymes in Tembalang district, Semarang city**

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ABSTRACT

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Background: Controlling of dengue vectors around dengue haemorrhagic fever cases is often conducted by using insecticides including a malathion insecticide in the city of Semarang. A research on susceptibility status of *Ae. aegypti* to insecticides, used for fogging and based on a high number of hemorrhagic fever cases in Tembalang district, Semarang city, needs to be observe.

Objective: This study aimed to determine resistance status of *Ae. aegypti* mosquitoes based on bioassay and biochemical tests of esterase non-specific enzyme activity in the Tembalang District.

Methods: This study used a cross sectional design, it was conducted in June-September 2018 in a population of *Aedes* sp. from Tembalang District, Semarang City. Samples of F2 generations of female *Ae. aegypti* were obtained by ovitraps in the Tembalang District consisting of 12 urban villages, and their resistance status were tested by impregnated paper bioassay with malathion at a diagnostic dose of 0.8%. Esterase enzyme activity in the *Ae. aegypti* mosquito body of this population was tested biochemically to prove an increase in a non-specific esterase enzyme on the α -naphthyl acetate substrate.

Results: The bioassay results showed that mortality rates of *Ae. aegypti* at the 12 villages in Tembalang district after 24 hour test by impregnated paper indicated a range of 0-62%. Mechanism of resistance indicating an increase of non-specific enzyme esterase activity on α -naphthyl acetate at Rowosari, Kedungmundu, Sambiroto, and Meteseh could not be seen, It began to be seen in a low percentage (15%) at Sendang Mulyo, Tandang, Sendangguwo and Bubusan, and in a moderate percentage (45-75%) in Tembalang, Jangli and Mangunharjo. The mechanism of high esterase enzyme activity could be seen in the *Ae. aegypti* population at Kramas with AV $\geq$ 0,700-0,900 by a percentage of 20%, and AV $\geq$ 0,900 by a percentage of 80%.

Conclusion: This study provided information about some *Ae. aegypti* mosquitoes from Tembalang District that showed resistance to the malathion insecticide with an elevation of non-specific esterase enzyme activity on α -naphthyl acetate substrate in several villages except Kelurahan Rowosari, Kedungmundu, Sambiroto, and Meteseh.

Latar Belakang: Pengendalian vektor dengue di sekitar kasus Demam Berdarah Dengue selalu dijalankan dengan menggunakan insektisida malation di Kota Semarang. Penelitian status kerentanan *Aedes aegypti* terhadap insektisida yang digunakan untuk fogging berdasarkan tingginya kasus Demam Berdarah Dengue di kecamatan Tembalang perlu dilakukan.

Tujuan: Penelitian ini bertujuan untuk mengetahui status resistensi nyamuk *Aedes aegypti* dengan uji bioassay dan biokimiawi enzim esterase non-spesifik di kecamatan Tembalang.

Metode: Penelitian menggunakan desain cross sectional dilakukan pada bulan Juni – September 2018 pada populasi nyamuk *Aedes sp* dari kecamatan Tembalang kabupaten Semarang. Sampel *Ae. aegypti* betina generasi F2 hasil penangkapan menggunakan ovitrap di kecamatan Tembalang yang terdiri dari 12 kelurahan telah diuji status resistensinya dengan metode impragnater paper bioassay dengan malation pada dosis diagnostik 0,8%. Aktivitas enzim esterase pada tubuh nyamuk dari populasi tersebut diuji secara biokimiawi untuk membuktikan adanya peningkatan enzim esterase non-spesifik terhadap substrat α -naftil asetat.

Hasil: Hasil bioassay menunjukkan bahwa mortalitas nyamuk *Ae. aegypti* dari 12 kelurahan di kecamatan Tembalang 24 jam paska pengujian impragnater paper berkisar antara 0-62%. Mekanisme resistensi yang berupa peningkatan aktivitas enzim esterase non-spesifik terhadap α -naftil asetat di kelurahan Rowosari, Kedungmundu, Sambiroto, dan Meteseh belum terlihat, dan mulai terlihat di kelurahan Sendang Mulyo, Tandang, dan Sendangguwo dengan persentase yang rendah (15%), dan kelurahan Bubusan, Tembalang, Jangli dan Mangunharjo dengan persentase sedang (45-75%). Mekanisme aktivitas enzim esterase yang tinggi ditunjukkan pada populasi nyamuk *Ae. aegypti* dari kelurahan Kramas dengan $AV \geq 0,700-0,900$ sebanyak 20%, dan $AV \geq 0,900$ sebanyak 80%.

Kesimpulan: Penelitian ini memberikan informasi bahwa sebagian nyamuk *Ae. aegypti* dari kecamatan Tembalang menunjukkan status resisten terhadap insektisida malation dengan mekanisme peningkatan aktivitas enzim esterase non-spesifik terhadap substrat α -naftil asetat di beberapa kelurahan kecuali kelurahan Rowosari, Kedungmundu, Sambiroto, dan Meteseh.

INTRODUCTION

Until now, dengue hemorrhagic fever (DHF) is an inevitable health problem in communities. The DHF is caused by dengue viruses, which transmits through bites of *Aedes aegypti* mosquitos.¹ The World Health Organization (WHO) reported that a number of dengue cases each year increased from 0.4 to 1.3 million in 1996-2005, 2.2 million in 2010 and 3.2 million in 2015.²

Based on existing reports, the DHF has been endemic in 33 provinces of Indonesia and 436 districts or cities, 605 sub-districts, and 1803 villages or sub-districts. Central Java province is one of the dengue-endemic areas in Indonesia with a number of 14,376 cases, an incidence rate (IR) of 42.26 / 100,000 and a case fatality rate (CFR) of 1.48% beyond the Indonesian CFR standard of 0.78%.³ Semarang is one of dengue-endemic cities, especially at Tembalang district which consists of 12 urban villages and has the highest dengue cases. The Tembalang district has 2 primary health cares, namely puskesmas Rowosari and puskesmas Kedungmundu. Incidences of the DHF in Tembalang district in 2016 reached IR of 70.68 / 100,000 populations and decreased to 36.63 / 100,000 populations in 2017.⁴

A DHF control, namely a controlling vector, is necessary to prevent and stop the dengue-endemic transmission. One of the DHF vector eradication programs usually uses insecticides.³ Insecticides are the largest group of pesticides used in vector eradication programs for pests and diseases, as well as various types of intruding insects around houses.⁵ Results of interviews with the P2P Department of Health of Semarang City reported that insecticides used for fogging in 2011 were lambda-cyhalothrin; in 2014-2015 was a malathion insecticide; in 2016 was synthetic pyrethroid (Cynof); and in 2017 until now is d-d trans cyphenothrin 50 g / l.

Biochemical testing is one of insect susceptibility tests on the insecticides in addition to the WHO standard tests using impregnated paper and molecular tests. This test is to examine

mosquito resistance on an essential insecticide based on quantification of enzymes responsible for its resistance process. Advantages of the biochemical tests is that the susceptibility status information can be obtained more quickly and can show its resistance mechanism that is measured individually using the esterase enzyme non-specific on α -naphthyl acetate.⁶

Based on a previous research on *Aedes sp* resistance, there was a 77.8% monooxygenase activity caused by a detoxification enzyme mechanism; therefore, *Aedes sp.* is a high-risk vector for transmitting dengue viruses in Semarang City.⁷ Another research conducted by Soenjono et al. examining vector *Ae. aegypti* susceptibility test on malathion in Tomohon City showed that *Ae. aegypti* was resistant to the malathion insecticide.⁸ It is also similar to *Ae. aegypti* mosquitos at the Port of Tanjung Emas Semarang which showed resistance to malathion.⁹

In Tembalang district, there is a tendency for resistance on organophosphate insecticides. *Ae. aegypti* mosquitos as a primary vector need to be examined to determine levels of susceptibility on the insecticide¹². Based on the discussion above, Purposes of this study is to examine resistance status of *Aedes aegypti* mosquitos on malathion and to analyze increases of non-specific esterase enzymes on α -naphthyl acetate of *Ae. aegypti* at each village in the Tembalang district.

METHODS

This study used analytic observational research and cross-sectional study design. It was conducted on June to November 2018. Its independent variables were exposures of malathion insecticides through impregnated malathion of 0.8% for 1 hour in *Ae. aegypti* in the Tembalang district area, while the dependent variables were resistance status of *Ae. aegypti* and increased activities of the esterase enzyme non-specific on α -naphthyl acetate.

Mosquito sample collections

Aedes aegypti mosquitos as research subjects were obtained by ovitraps. Ovitrap installation

was used to catch eggs of the *Aedes sp.* The obtained eggs were bred in the Undip Entomology laboratory and the FK-KMK UGM Parasitology laboratory.

Ae. aegypti larvae survey in residential areas

An entomological survey in residential areas was conducted at some villages of the Tembalang district, which consisted of 117 urban villages with a total number of 36,371 houses. These study locations were only at 12 villages of the Tembalang district, specifically Tembalang, Bulusan, Kramas, Mangunharjo, Jangli, Tandang, Sambiroto, Meteseh, Kundumundu, Sendangmulyo, Sendangguwo, and Rowosari. Samples of population were larvae *Ae. aegypti* from water reservoirs at residents' homes at the 12 villages, Tembalang district, Semarang city.

Referring to a calculation of a Lemeshow cross-sectional formula, this study had 40 samples in each 12 villages, so that the total samples in this study were 480 houses.

Bioassay

Standard kits for vulnerability testing consisted of 4 test tubes and a pair of control tubes. Each tube was filled with 25 healthy female mosquitoes with a total number of 125 mosquitoes. The tests were conducted at the 12 villages in which each village had 125 mosquitoes; therefore, 12 villages consisted of 1,500 mosquitoes. The tests used impregnated paper containing 0.8% malathion insecticides, while in control groups the tests used mineral oil of impregnated paper which did not contain insecticides. The mosquitoes were contacted for 60 minutes in a contact tube, and the numbers of dead mosquitos were recorded. Then the dead mosquitos were transferred in to a collector tube and were placed in fresh air for 24 hours (holding) by giving sugar water. The number of the dead mosquitoes after 24 hours in a recovery tube was calculated.

Criteria to determine resistance status were established according to WHO standards in 2016: percentage of deaths $\geq 98\%$ = susceptible

(SS), 90-97% = tolerant (RS) and needs to be confirmed molecular resistance mechanism, <90% = resistant (RR) and does not need to be confirmed with other bioassay methods if a minimum number of 100 mosquitoes test.⁹

Biochemical Test

Early third instar larvae of the F2 generation crushed individually to be made homogenate and dissolved with 0.5 ml of phosphate buffer saline (PBS) solution. 0.02 M homogenate, 50 µl by micropipette and put into the microplate wells. For each well, then 50 µl of prepared substrate materials was added, specifically: 3mg of α-naphthyl acetate was dissolved into 0.5ml acetone, and then 100 µl was taken to be added to BPS until a volume of a substrate solution became 10ml. The solution inside a microplate well was left for 60 seconds.

Each microplate well containing 50 µl homogenate and 50 µl substrate was added by 50 µl coupling reagent (coupling reagent = 30 mg fast blue and 7 ml SDS 5% + 3 ml aquadest). Then it was allowed to stand for 10 minutes while observing color changes arising from red color to be blue gradually. This reaction was stopped by adding 50 µl of 10% acetic acid solution. The non-

specific enzyme activity (absorbance value) was then read with an ELISA reader at a wavelength (λ) of 450 nm. Relationships of resistance status and resistance mechanism based on an increase in the activity of the esterase enzyme non-specific on α-naphthyl acetate were grouped as the following: absorbance value (AV) <0,700 (very susceptible/ SR); AV ≥0,700-0,900 (medium resistance/ RS); AV > 0,900 (high resistance).

Ethical Clearance

No. 131/EC/H/FK-UNDIP/XII/2018, Ethics Committee of Faculty of Medicine, Universitas Diponegoro, Semarang

RESULTS

Bioassay results

Test results of *Ae. aegypti* mosquito susceptibility based on the impregnated paper method containing 0.8% malathion active ingredients were presented in Table 1. Table 1 demonstrated that the highest percentage of dead mosquitos observed for 24 hours after treatment was at Sendangmulyo (49%), while the lowest was at Sambiroto (0%). *Ae.aegypti* from all 12 villages were resistant to the malathion insecticides.

Table. 1. Resistance status of *Aedes aegypti* mosquitoes at 12 villages in Tembalang district on malathion based on an impregnated paper test with a diagnostic dose of malathion (0.8%)

Villages	Numbers of tested mosquitos *	Mosquito mortality 24 hours after treatment		Resistance Status
		Numbers of death	Percentages (%)	
Sendangmulyo	100	49	49	Resistant
Bulusan	100	41	41	Resistant
Tembalang	100	39	39	Resistant
Keramas	100	33	33	Resistant
Tandang	100	16	16	Resistant
Sendangguwo	100	61	61	Resistant
Rowosari	100	2	2	Resistant
Jangli	100	13	13	Resistant
Mangunharjo	100	32	32	Resistant
Kedungmundu	100	19	19	Resistant
Sambiroto	100	0	0	Resistant
Meteseh	100	8	8	Resistant

* Four replications, 25 mosquitoes for each sample in each district

Biochemical Test Results

Results of biochemical test of the non-specific esterase enzyme activity on α -naphthyl acetate

substrate in the *Ae. aegypti* larvae population in 12 villages in the Tembalang district were presented in Table 2 below.

Table 2. Non-Specific Esterase Enzyme Activity On A-Naphthyl Acetate Substrate In *Aedes aegypti* mosquito population in Tembalang district based on a biochemical test by reading Elisa Reader = λ 450 nm

Villages	Absorbance Levels					
	Low		Middle		High	
	Numbers	%	Numbers	%	Numbers	%
Sendangmulyo	17	85	1	5	2	10
Bulusan	11	55	6	30	3	15
Tembalang	10	50	5	25	5	25
Kramas	0	0	4	20	16	80
Tandang	17	85	2	10	1	5
Sendanguwo	17	85	1	5	2	10
Rowosari	20	100	0	0	0	0
Jangli	7	35	9	45	4	20
Mangunharjo	5	25	10	50	5	25
Kedungmundu	20	100	0	0	0	0
Sambiroto	20	100	0	0	0	0
Meteseh	20	100	0	0	0	0

Note: 2 repetitions of 20 larvae each in every tube

Table 2 indicated that an increase in the activity of the non-specific esterase enzyme on α -naphthyl acetate is not a resistant mechanism of the *Ae. aegypti*. Those were resistant to the malathion insecticides were at Rowosari, Kedungmundu, Sambiroto, and Meteseh due to their low percentage (100%). The mechanism of increasing esterase enzyme activity was seen in Sendang Mulyo, Tandang and Sendanguwo with a low percentage (15%), and Bulusan, Tembalang, Jangli and Mangunharjo with average percentages (45-75%). The mechanism of high esterase enzyme activity was shown in the *Aedes* mosquito population in Kramas with $AV \geq 0,700-0,900$ by a percentage of 20%, and $AV > 0,900$ by a percentage of 80%.

DISCUSSION

The results of the resistance test on the malathion insecticides indicated that *Ae. aegypti*

at the 12 villages in Tembalang district were resistant to insecticides. These results were in line with the *Ae. aegypti* at Rukukan, Tomohon city which were resistant to the malathion insecticides.

The observation results of esterase enzyme activity of mosquito populations at the 12 villages showed that the most significant percentage of the mosquitos increasing in the enzyme esterase activity was in Kramas, with moderate (20%) and high (80%) level of the activity.

This result was in line with the percentage of the dead mosquitos in the bioassay results. The resistance status meant that the resistance status of *Ae. aegypti* on the malathion insecticides in Kramas could be associated with an increase in the esterase enzyme activity. The increase of the activity indicated a metabolic detoxification mechanism in the insect's body. Esterase is one of the detoxification enzymes known to play

roles in the mechanism of insect resistance to insecticides from organophosphate groups. The esterase is one of the hydrolase enzyme groups, a large group of enzymes that catalyzes hydrolysis reactions of aliphatic compounds, aromatic esters, choline esters and organophosphorus.¹⁰

This information is essential to be used as a basis to select replacement insecticides when rotating the insecticide replacement. Moderate-high esterase enzyme activity in the *Ae. aegypti* population at some villages in Tembalang district can allow resistance to insecticide compounds beside the malathion, which also has an ester group. Organophosphates are esters of phosphoric acid or thiophosphoric acid so that all insecticides from the organophosphate group have esters. In addition to organophosphates, insecticides from the carbamate group also contain an ester group because carbamate insecticides are esters of N-methyl carbamic acid.¹¹

At four other villages (Rowosari, Kedungmundu, Sambiroto, Meteseh), each of the four village had a low level of esterase activity, so it was not in line with the percentage of the number of the dead mosquitos in bioassay results indicating resistance status. This condition indicated that the resistance status of *Ae. aegypti* of malathion insecticides at the four villages was not related to an increase in the activity of the enzyme esterase, meaning there was no resistance to the malathion.

In the villages that did not show presence of esterase enzyme activity, there might have changes in its carboxylesterase enzyme. However, this study did not assess whether there was specific a mechanism. The carboxylesterase enzyme could hydrolyze one or both carboxylate groups making up the malathion compounds. If the carboxylic group making up the malathion compounds changed, this insecticide compounds would lose their functions. Resistance caused by enzyme activity usually occurs when the enzyme blocks the insecticide compounds from reaching their targets.¹²

Tackling problems of the resistance in addition to controlling uses of the insecticides in a controlled and directed manner is also necessary to replace uses of chemical insecticides such as organophosphate with bioinsecticides and mosquito breeding programs (PSN) that are encouraged by the Indonesian government (drain, cover, bury) and are supported by public awareness to maintain hygiene and health.³

CONCLUSION

This research provides information of *Ae. Aegypti* at 12 villages in Tembalang district that showed resistance status to malathion insecticides with a mechanism of increasing non-specific esterase enzyme activity on α -naphthyl acetate substrate in the villages except Rowosari, Kedungmundu, Sambiroto, and Meteseh.

CONFLICT OF INTEREST

None declare.

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