

## Indonesian Journal of Biotechnology

- 2016–2018
- Biotechnology
- jurnal.ugm.ac.id/ijbiotech

#### Indonesian Journal of Biotechnology



VOLUME 23(2), 2018, 91-101 | RESEARCH ARTICLE

#### NMR metabolomics revealed metabolites and bioactivity variation in Torbangun leaves *Plectranthus amboinicus* L. with different origins

Nancy Dewi Yuliana<sup>1,\*</sup>, Muhammad Anwari Sugiharto<sup>1</sup>, Hanifah Nuryani Lioe<sup>1</sup>, Masao Goto<sup>2</sup>, and Yuko Takano Ishikawa<sup>2</sup>

- <sup>1</sup>Department of Food Science and Technology, Faculty of Agricultural Engineering and Technology, Bogor Agricultural University, IPB Dramaga, Bogor 16680, Indonesia
- <sup>2</sup>Functionality Evaluation Unit, Food Function Division, Food Research Institute, NARO, Tsukuba-Ibaraki, Japan

SUBMITTED 8 September 2018 REVISED 27 November 2018 ACCEPTED 11 December 2018

ABSTRACT Plectranthus amboinicus has been reported to have antidiabetic and antioxidant activities. Environmental factors might influence the plant's secondary metabolite profile and its beneficial properties. NMR-based metabolomics was used to show phytochemical variations between specimens of P. amboinicus grown in Japan and Indonesia. The results showed that flavonoids and triterpenes were among the discriminating factors of the variation between the two groups. Targeted comparative analysis of the concentration of the specific flavonoids of the plants using a validated HPLC-MWD method showed that the Japanese samples contained a higher concentration of total flavonoids compared with the Indonesian samples. The Japanese and Indonesian samples contained 1100.6 ± 5.1 and 532.4 ± 1.8 µg/g luteolin, and 584.5 ± 7.4 and 571.7 ± 11.6 µg/g apigenin, respectively. Eriodyctiol was detected only in the Indonesian samples. Contrarily, more intensive DPPH reduction and a-glucosidase inhibition activities were found in the Indonesian samples (Co<sub>50</sub> 14.4 ± 1.2 and 24.0 ± 0.3 µg/mL for the DPPH assay, 1181.9 ± 113.5 and 4451.4 ± 290.0 µg/mL for a-glucosidase inhibition, respectively). Thus, flavonoids might not be the only group of compounds related to the aforementioned bioactivities. This should be confirmed by further research targeting other groups of compounds, such as triterpenes.

KEYWORDS antidiabetes; antioxidant; flavonoids; metabolomics; Plectranthus amboinicus

#### 1. Introduction

Plectranthus amboinicus is a shrub spread over tropical Africa, Asia, Australia, and South America, particularly Brazil (Lukhoba et al. 2006). Similar with mint, sage, and basil, it belongs to Lamiaceae family. It has several local names for examples Indian-borage, Indian-mint, French-thyme, Spanish-thyme, Oreille, and Karpuravalli. In Indonesia, P. amboinicus is known as Torbangun. The leaves are traditionally used as breast milk simulant (lactagogue) by Bataknese lactating women in North Sumatra (Damanik et al. 2006). Many compounds have been identified from P. amboinicus leaves (Brieskom 1977; Brieskorn and Riedel 1977). The antihyperglycemic (Viswanathaswamy et al. 2011), and anti-inflammatory (El-Hawary et al. 2012) potential of the plant extracts were reported. Indeed, this pharmacological potential highlights the relevance of the plant in the treatment of increasingly relevant degenerative disease.

Variation of chemical composition of natural products may occur due to the variations in genotype, geographical origin, or post-harvest handling. These factors may significantly alter the efficacy of the plant functional properties (Wang et al. 2005). The same case might occur in *P. am*-

boinicus which grows in different environment. Thus, it is important to assess the variability of *P. amboinicus* as raw materials to keep a final product quality consistency. For such a purpose, metabolomics is one of the most reliable methods. The use of NMR in metabolomics based works is preferable as attributed to its high throughput capability, reproducibility, and robustness. Various multivariate data analysis such as Principal Component Analysis (PCA) or Orthogonal Projection to the Least Square-Discriminant Analysis (OPLS-DA) is very helpful to interpret a huge metabolomics data and to find discriminating factors responsible for samples classification (Yuliana et al., 2011a).

This study focused on P. amboinicus secondary metabolites profiling, particularly flavonoid variation in specimens of P. amboinicus grown in Bogor (Indonesia) and Tsukuba (Japan). To the best of our knowledge, this is the first report of NMR-based metabolomics application combined with HPLC-MWD targeted analysis to reveal the phytochemicals differences between Indonesian and Japanese P. amboinicus. We firstly used <sup>1</sup>H NMR-based metabolomics to identify discriminating factors of both samples. For NMR-metabolomics study, instead of single solvent extraction, we applied comprehensive extraction technique consisting of a continuous flow of solvent mix-

Indones J Biotechnol 23(2), 2018, 91-101 | DOI 10.22146/ijbiotech.38659 www.jurnal.ugm.ac.id/ijbiotech Copyright © 2018 THE AUTHOR(S). This article is distributed under a Creative Commons Attribution-ShareAlike 4.0 International license.

<sup>\*</sup>Corresponding author: nancy\_dewi@ipb.ac.id

#### Humaniora

- 2018
- Humanities; Indonesian culture
- jurnal.ugm.ac.id/jurnal-huma niora

#### HUMANIORA

VOLUME 30 Number 1 February 2018

#### Othering and Selfing: Reading Gender Hierarchies and Social Categories in Michel Houellebecq's Novel Soumission

#### Wening Udasmoro

Universitas Gadjah Mada, Indonesia Email: udasmoro@ugm.ac.id

In literature, questions of the self and the other are frequently presented. The identity politics that gained prominence after the attack on the World Trade Center in New York on 11 September 2001 has occupied considerable space in this debate throughout the globe, including in France. One example of a novel dealing with the self and other is Michel Houellebecg's Soumission (2015). This article attempts to explore the processes of selfing and othering in this work. The politics of identity that seems to present Muslims and Islam as the other and French as the self is also extended to other identities and aspects involved in the novel. This article attempts to show, first, how the French author Houellebecq positions the self and other in Soumission: second, the type of self and other the novel focuses on; and third, how its selfing and othering processes reveal the gender hierarchy and social categorization of French society. It finds that the novel presents a hierarchy in its narrative through which characters are positioned based on their gender and sexual orientation, as well as their age and ethnic heritage.

Keywords: Gender; Social Categories; Islam; Soumission; Houellebecq

#### INTRODUCTION

The politics of otherness is important in interpersonal relations, and no group is immune to the othering process. The Polish sociologist Zygmunt Bauman, 2009). The Crusades, considered by Christians a in his book Modernity and Ambivalence, wrote holy war against Muslims, lasted in several phases. that otherness is a means for communally creating The first lasted from 1096 to 1099, during which categories (Bauman, 1991, p. 75). These categories Christians attempted to secure access to holy sites, are generally created by dominant groups and applied as well as to defend Byzantine Emperor Alexius I to groups with less power. Zygmunt also explained, and Constantinople from Turkish attacks. The second "Being a stranger means, first and foremost, that nothing is natural, nothing is given of right, nothing comes free." The construction of otherness involves the thirteenth century, was known as the war against the creation and propagation of stereotypes and clichés about minority groups and other outsiders.

In French society, Muslims have experienced this process of othering (Udasmoro, 2017). It cannot

(Couvreur, 1998). These groups created stereotypes that exhibited their mutual lack of trust (Bowen, phase occurred in the twelfth century, albeit on a smaller scale. The third phase, which occurred during paganism. Meanwhile, during the fourth phase, almost all of Europe fell to the Ottoman Empire. In this phase, Islam and its culture spread widely throughout Europe.

Meanwhile, the rise of Islam in contemporary be ignored that Islam's history in Europe is one of France is inseparable from French colonialism in invasion and conquest. The Crusades, which lasted countries across the Mediterranean, particularly for several centuries, contributed to the othering of Morocco, Tunisia, and Algeria (Zwilling, 2015). Muslims by non-Muslim French people and vice versa Following the independence of these countries

doi.org/102216/jh.v29i3.32122 jurnal ugm ac id/jurnal-humaniora

## ASEAN Journal on Science & Technology for Development

- 2018-present
- Technology in ASEAN
- ajstd.org



#### ASEAN JOURNAL ON SCIENCE & TECHNOLOGY FOR DEVELOPMENT

Vol 37, No 1, 2020, 21–27 DOI 10.29037/ajstd.611 RESEARCH

#### Problem Solving of Isopropyl Alcohol – Water Azeotropic Characteristics Using Packed (Natural Zeolite) Bed Adsorber

Laras Prasakti<sup>1</sup>, Muhammad Hartono<sup>1</sup>, Pandu Prabowo Jati<sup>2</sup>, Muhammad Fajar Setiaji<sup>1</sup>, Sang Kompiang Wirawan<sup>1</sup>, and Hanifrahmawan Sudibyo<sup>1,\*</sup>

1chemical Engineering Department, Faculty of Engineering, Universitas Gadjah Mada, Jalan Grafika No. 2, Yogyakarta 55281, Indonesia
7echnical Services Operation Support, PT. Chevron Pacific Indonesia, Komplek Caltex Mandau, Bengkalis, Riau 28784, Indonesia
7corresponding author: hanifahmawans, Gemaliugma.cid

KEYWORDS Adsorption kinetics Natural zeolite Azeotropic mixture Freundlich model Isopropyl-alcohol-water ABSTRACT The adsorption kinetics of water from an azeotropic mixture of isopropyl alcohol and water using chemically activated natural zeolites with and without a binder (starch) was investigated. In addition, an investigation of the compressive strength of zeolite pellets was conducted to ascertain the performance of the adsorbent for long-term operation. Three parameters were applied in the zeolitemaking process: the particle size of zeolite (20, 30, 50, and 80 mesh), the sintering temperature (550, 750, and 1,000°C), the compaction pressure (2, 4, and 6 tonnes), and the starch-to-zeolite weight ratio (0, 13, 15, and 17). Initial screenings indicated that the strongest zeolite pellet was 80-mesh zeolite powder (without starch addition) that was compacted using 6 tonnes pressure and was sintered at 750°C. The adsorption tests using the strongest zeolite were conducted in a packed-bed column for three cycles, followed by compressive strength tests on the zeolite pellets after each cycle. According to the experimental data, zeolite pellets made without the addition of starch could adsorb up to 98.4% of the initial water in the mixture. From the four models proposed to describe the kinetics of adsorption of water from the mixture, the Freundlich model turned out to be the best model.

© The Author(s) 2020. This article is distributed under a Creative Commons Attribution-ShareAlike 4.0 International license.

#### 1. INTRODUCTION

Solvent recovery is an important process in the chemical industry to make the whole process more efficient and more economical, as well as to satisfy environmental regulations. Solvent recovery can be performed by several methods. For instance, by distillation using a distillation column, by pervaporation using a membrane (Kasik and Lin 2014; Chaniago et al. 2015), and by adsorptive separation in an adsorption column (Saha et al. 2015, Nagarajan and Chandiramouli 2017). While distillation appears to be the most frequently used separation technique in industry, its separation performances are limited, especially in a case where the difference of the boiling points of each chemical species is very tight, creating an azeotrope.

Isopropyl alcohol (IPA) is one of the organic solvents widely used in industry, either as a solvent or as an additive in pharmaceuticals (Walter et al. 2016), and is frequently mixed with water. One of the problems observed in the conventional distillation of an IPA-water mixture is the presence of an azeotropic condition when the IPA purity in the mixture is 87.7 wt.% and when the mixture temperature is 80.3°C (Kulla and Ray 2013). A more efficient dehydration of IPA in industry is necessary to allow the recycling of pure IPA, to create economic benefits, and to achieve an environmentally friendly process (Liu et al. 2014).

Some modifications have been made on the distillation of azeotropic mixtures, such as by using an additional solvent to perform extractive distillation or by employing membrane distillation (Sawamura et al. 2015; Chen et al. 2017). Separation using a membrane has also begun to recieve more attention from researchers, because it offers the recovery of pure IPA. Nonetheless, membrane distillation requires an expensive initial investment due to the high quality materials needed to provide high permeability, selectivity, durability, and mechanical stability. Additionally, the maintenance of the membrane by regular chemical cleaning also causes the operational expense to be costly (Hua et al. 2014). Therefore, this study focused on developing a method that was not only able to recover pure IPA, but also lowered the cost needed for separation.

In this study, adsorption was chosen as the method to be developed by utilizing chemically activated natural zeolite as an adsorbent, which was packed in a vertical cylindrical column. Natural zeolite has excellent properties for the water adsorption process because of its hydrophilic properties (Giroux et al. 2016; Siddiki et al. 2016). Compared with activated carbon, natural zeolite could have a higher surface area, up to 1000 m<sup>2</sup>/g, and poses a uniform pore size distribution. However, natural zeolite that exists in nature as aluminosilicate crystalline is known to be contaminated by metal oxides attached on the pore surface (Pérez-Page et al. 2016). To allow for the attachment of water molecules to the zeolite pore surfaces, free oxides and impurities such as Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, CaO, MgO, Na<sub>2</sub>O, and K<sub>2</sub>O must be removed (Bonaccorsi et al. 2016). These molecules may close the pathways into the pores or the active sites of the zeolite, causing the adsorption capacity of the zeolite

A journal of the ASEAN Committee on Science and Technology

PRINT ISSN 0217-5460 ONLINE ISSN 2224-9028

www.ajstd.org

## The research is good but the English is bad.

## The article is difficult to understand.

# Ask a colleague or friend to fix the English.

## Hire a native speaker.

## The eternal struggle

- All Indonesian journal editors suffer from the same headache: bad writing.
- This is a consistent problem, for authors and journals alike.
- Good writing is a skill that is difficult for academics to master.

#### The eternal struggle

- Journals' most common solutions:
  - Reject poorly written articles.
  - Ask authors to fix language problems after peer review.
  - Require authors to prove their article has been edited or proofread before being submitted.

#### The eternal struggle

- These solutions put the responsibility of publishing well-written articles on the author.
- This approach also does not guarantee quality.
  - Good research may be rejected.
  - Post-peer review editing slows down the review process.
  - Many authors hire bad editors.

# There is another solution: copyediting

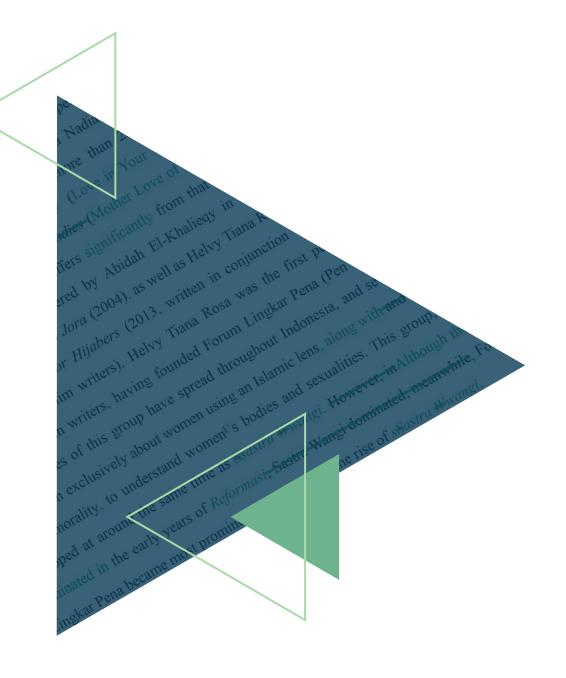
#### Another solution

- This solution is often not known by Indonesian journals.
- And when it is known, few journals make use of it.
  - Budgetary constraints.
  - They don't know their language deficiencies... or they don't care about them.

#### Another solution

- Readability (easiness of reading) aids the promotion of research...
- But journals care more about publishing articles as fast as possible, regardless of quality.
- The importance of copyediting is consequently not recognised, and undervalued.

# What is copyediting?



## What is copyediting?

- Reviewing and correcting written material to improve\* its:
  - Accuracy.
  - Readability.
  - Consistency.
  - Fit for journal's style.

## What is copyediting?

- Other tasks copyeditors can perform include:
  - Verifying cross-references in the text.
  - Checking numbering of footnotes, endnotes, tables, and figures.
  - Reviewing figure and table captions.
  - Confirming citations match references, and that references are in correct order.

## There are two types of editing

- Editing can be divided into two types:
  - Mechanical (or basic) editing.
  - Substantive editing.

## Two types of editing





## Two types of editing

- Basic editing.
- Ensuring content fits the journal's style.
- Fixing:
  - Spelling, punctuation, capitalisation.
  - Symbols, abbreviation, acronyms.
  - Numbering,Italicisation,hyphenation.



## Two types of editing

- Basic editing.
- Ensuring content fits the journal's style.
- Fixing:
  - Spelling, punctuation, capitalisation.
  - Symbols, abbreviation, acronyms.
  - Numbering,Italicisation,hyphenation.

- Basic editing + significant editing, including rewriting some content.
- Fixing:
  - Structure and organisation.
  - Internal inconsistencies.

#### Mechanical editing

Upon identification, wwe listed a total of 81 plant species belonging to 44 families from the our study area. Two bramble species of bramble, Rubus rosaefolius J.E. Smith and Rubus alpestris Bl. were identified in the field through the same a shortened local name, and thus, "stroberi". In this case, we combined both species into Rubus spp. in the analysis. Shrubland had the highest total number of plant species among the habitats, while woodland had the lowest (Table 3.3). There were more plant species in each growthform category recorded from shrubland compared with those from woodland and grassland, except for the seedling category, in which the grassland habitat had the highest number of species by a small margin. However, grassland had the lowest sapling species richness among the habitats. Compared with the tree category, saplings and seedlings were less diverse in both woodland and shrubland. The shrub and herb categories were the major contributors to the total plant species richness, constituting over 75 percent of the total plant species number in each habitat (Table 3.3). In general, shrubland was the habitat most diverse habitat in plant species, followed by grassland and then woodland.

Using the program—SPADE, it was predicted that both the woodland and the shrubland habitats—had moderate levels of community heterogeneity in the tree category, with an estimated tree—true species richness ranging from 10 to 26 for woodland, and 13 to 26 for shrubland (Table 3.4). The sapling category varied in its heterogeneity: in shrubland it was homogenous (with an estimated true species richness of 3), in woodland it was moderate (with true species richness estimates ranging from 6 to 14), and in grassland it was highly heterogeneous (true species richness estimates ranging from 2 to 34). The community heterogeneity of seedlings was low to homogenous in all habitats, with true species richness estimates ranging from 7 to 13 for shrubland, 9 for grassland, and 5 for woodland.—The Wwoodland and shrubland—habitats had moderate levels of community heterogeneity of the shrub layer, with true species richness estimates between 21 and 31 for shrubland and 14 species for woodland; the grassland was highly heterogeneous in the shrub eategory, with an\_estimated true species richness between 20 and 59. Each habitat varied in the heterogeneity of the herb category: woodland was homogenous (true species

#### Substantive copyediting

in many fields but only, very few studies can be found in focus on food marketing. This is particularly true for quantitative studies, which use a quantitative research design. To the best of our knowledge only a single-the study, conducted by -of-Sidali and Hemmerling (in review), has attempted to measure consumers' perceived authenticity of a food-specialty food, which was found to have demonstrating a positive influence on stated consumption. However, nNo studyies to dateso far has used a similar approach in a cross-country context. Therefore, this study attempts to fill this gap by quantitatively measuring customers' perceived authenticity of a German traditional specialty food in relation to their consumption of it. For this reason, in this study we measure customers' perceived authenticity related to consumption of a German traditional specialty using a quantitative design. To achieve this, an authenticity scale was developed using data from online surveys of gourmet consumers that were conducted during two different timeframes and in two different countries, namely Germany, whence this specialty originates, and Italy, where lower knowledge of the product is compensated by a higher general culinary awareness. After the validity of the authenticity scale was verified, its effect on German and Italian respondents' stated willingness to consume the specialty food was analysed. Thus, we develop an authenticity scale using data of online survey which have been obtained in two different timeframes as well as in two different countries. Once we have checked the validity of the authenticity scale, we analyze its effect on the stated consumption to consume the product specialty both in Germany, where this specialty stems, as well as in another country, i.e., Italy where the lesser knowledge of the product is compensated by a higher general culinary awareness.

#### **Current research on food authenticity**

Nowadays, pProduct authenticity isbecomes a keystone of modern marketing (Brown et al., 2003). As voiced by Spiggle et al. (2012) observed that an authentic product comprehends the meaning and essence of the tradition it embodies. According to the current literature, authenticity can be treated as a unidimensional, a bi-dimensional or a multidimensional

conducted This is a confusing construction Internationa We need to break this up, because it's too Discuss which/that. "periods" is better if it's still accurate. Do you really mean this? discussing next point, add "was Discuss. A note on the style... There are These two sentences don't have a strong bond.

Can you

reference

any? That

said, I don't

#### Mechanical vs. substantive

- A journal can be expected perform some mechanical editing.
  - This is part of the copyediting process.
- Conversely, normally a journal should not be performing substantive editing.
  - The article should not have been accepted.

# Responsibilities of the copyeditor



- It's not enough to be a...
  - Native speaker,
  - Good writer, and/or
  - Good scientist.

- A copyeditor must uphold the integrity of both the journal and the author.
  - Make as few changes as necessary.
  - Display correct judgement, knowing when a change is appropriate.
  - Enforce the rules of a given language.
  - Ensure the article conforms to the journal's requirements.

- A copyeditor must uphold the integrity of both the journal and the author.
  - Avoid changing the substance of the article.
  - Never undermine the scientific integrity of the article.
  - Never undermine the author's "voice," their authorial intentions, and their stylistic preferences.
  - Strive for the author to agree with your changes.

- Always stay up-to-date with...
  - Evolving language conventions (Chicago Manual of Style, Oxford Guide to Style).
  - Academic conventions (MLA, APA).
  - Reference styles (CSE, APA, AMA).
  - International standards (ISO).

In other words: Copyediting requires specific skills and responsibilities

## Can a lecturer be a copyeditor?

- No.
- A lecturer (probably) can't be a copyeditor.
- Regular academics are simply too busy to carry out these responsibilities.

## Assistant or managing editor?

- No, unless you are:
  - A native speaker or capable writer, and
  - Experienced in the aforementioned responsibilities of copyediting.

## But why not?

- It requires specific skills and responsibilities!
- But also: it is a waste of your time.
- You should be focused on:
  - Improving the quality of submitted articles.
  - Ensuring that articles are scientifically sound before being reaching the copyediting phase.
  - Ensuring a robust editorial workflow.
  - Publishing on time.

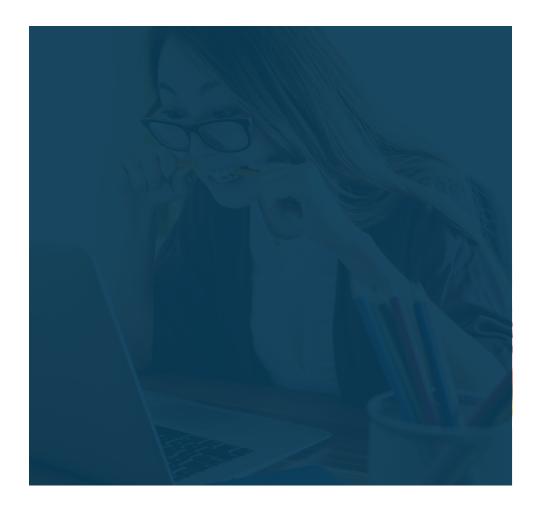
## Copyediting within the editing workflow



# Copyediting is not proofreading

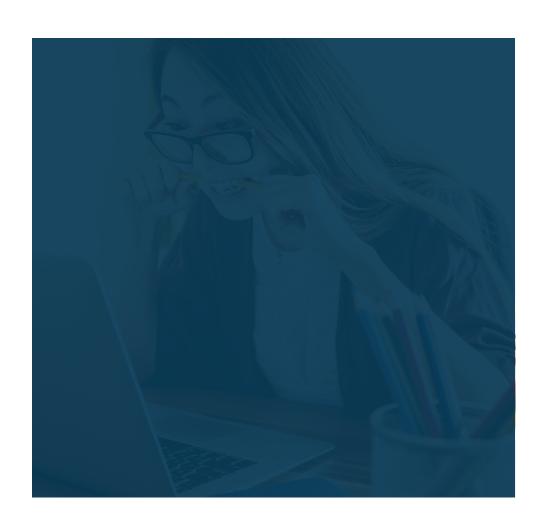
## Copyediting vs. proofreading





## Copyediting vs. proofreading

- Is performed by an editor on behalf of the journal.
- After the article is accepted, before it is typeset.
- Purpose is to ensure there are no English errors or types in manuscript.



# Copyediting vs. proofreading

- Is performed by an editor on behalf of the journal.
- After the article is accepted, before it is typeset.
- Purpose is to ensure there are no English errors or types in manuscript.

- Is performed by:
  - The author to confirm changes.
  - The editor to ensure there are no mistakes.
- After article is typeset, before it is published.
- Purpose is to confirm article is ready for publishing.

# Editing workflow

#### Author editing



- Author hires editor.
- Before submission or at review stage.

# Editing workflow

#### Author editing



- Author hires editor.
- Before submission or at review stage.

#### Copyediting



- Journal hires editor.
- After article is accepted, before typesetting.

# Editing workflow

#### Author editing



- Author hires editor.
- Before submission or at review stage.

**Copyediting** 



- Journal hires editor.
- After article is accepted, before typesetting.

#### **Proofreading**



- Author confirms changes.
- Before article is published.

All three aspects are necessary for a journal to ensure an articles meets its editorial standards

# The eternal struggle

- Author editing:
  - Before submitting the article, ensuring it fits journal requirements.
- Copyediting:
  - After accepting the article, ensuring it is free of mistakes.
- Proofreading:
  - Finalising publication.

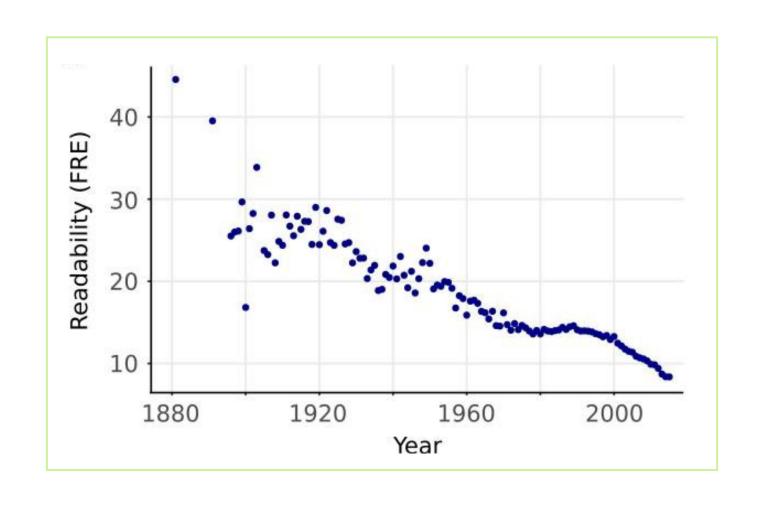
# Do I really need a copyeditor?



# The readability of science is steadily decreasing.

— Plavén-Sigray et al. 2017

### The readability of science is decreasing.



# Some medical journals are reported to have readability scores of just 15/100.\*

— Hall 2006

# All journals need copyediting

# All journals need copyediting

- The eternal struggle of bad writing applies not just to Indonesian journals.
- Even journals with "good" English suffer from a readability problem.
  - Excessive use of jargon.
  - Needlessly complex sentence structures.

# All journals need copyediting

- Journals with traditionally poor English are doubly in need of a copyeditor.
  - Someone who has the task of ensuring articles are at minimum readable.
- Even if you don't publish in English, your journal still needs copyediting.
  - This is not an English problem.
  - Not all Indonesians are good writers.

# What if I can't hire an copyeditor?



- Sometimes a journal doesn't have the budget for a copyeditor.
- Sometimes you can't find a competent editor.
- For this, you can put several policies in place to compensate for the lack of a copyeditor.

- Put an editorial process in place for:
  - Assessing,
  - Improving, and
  - Proofing articles.
- Designate editors to hold each responsibility.
- Maintain consistency and build experience.

- Don't accept an article with bad language.
  - Ask the author to hire an editor and resubmit or revise.
  - Check the result using your own internal editorial process.
- If you can't edit the whole article, at minimum edit the abstract.
  - (Scopus notices this.)

- Never publish an article after typesetting/layouting before checking it first.
- Always check the PDF. Look for:
  - Typos, misspellings, bad punctuation.
  - Citation errors, inconsistent references and cross-references.
  - Formatting errors, mistakes in the layout.

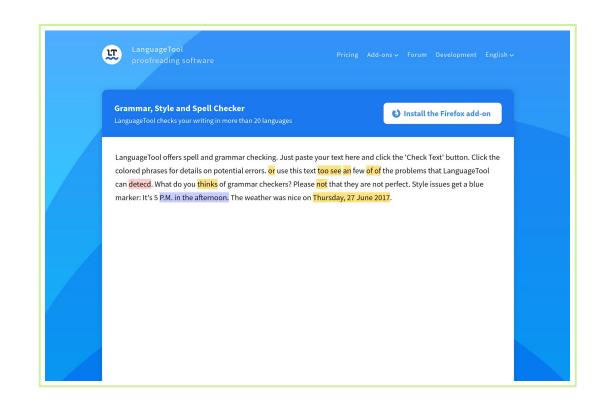
#### Always check the PDF!

- The most common mistakes are those that the editors should have noticed.
- These are unacceptable errors!
- Authors can not be expected to find layouting inconsistencies.
  - That is the journal editor's job.

- You can also use readability tools to help you judge and fix the quality of the language.
  - None of these tools are perfect.
  - Each has good and bad features.

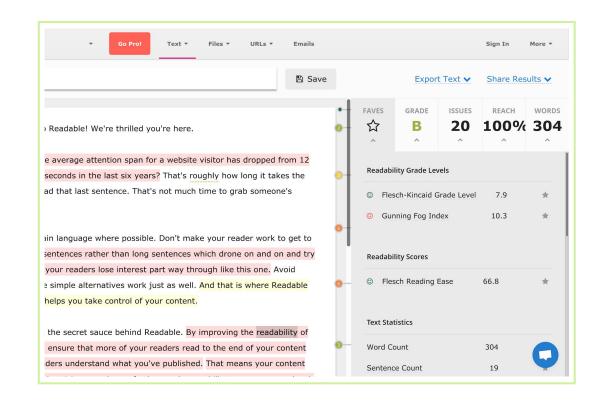
#### LanguageTool.

- Finds mistakes; does not assess quality of language.
- Free version available;
   browser extensions;
   Google Docs (free) or
   Microsoft Office (paid).
- languagetool.org



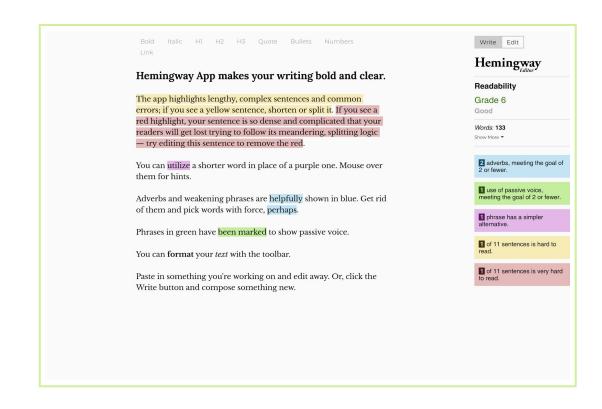
#### Readable.

- Finds mistakes;assesses readability.
- Free to test in browser.
- app.readable.com



#### Hemingway.

- Assesses readability;finds structuralproblems, not typos.
- Free in browser.
- hemingwayapp.com



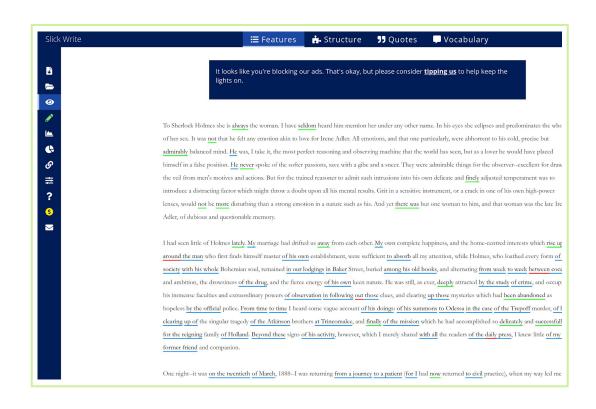
#### Typely.

- Assesses readability and sentiment.
- Better as a writing tool; enables exporting readability report to PDF.
- Free.
- typely.com



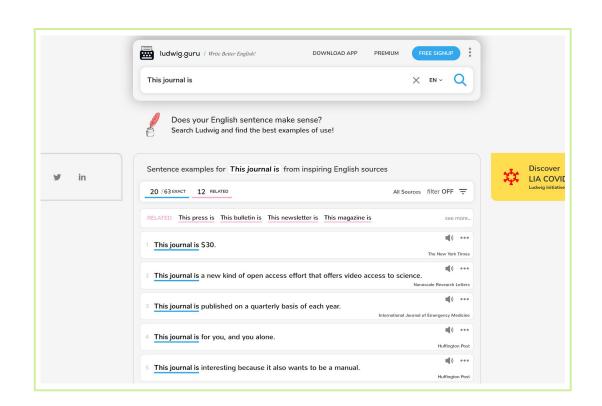
#### Slick Write.

- Checks and fixes structure, grammar, and vocabulary.
- Free.
- slickwrite.com



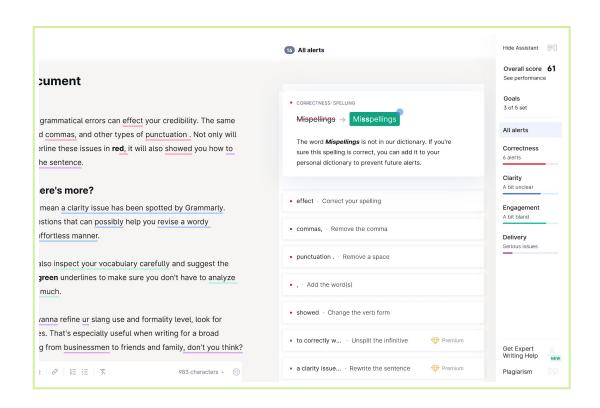
#### Ludwig.

- "Sentence search engine."
- Does not fix mistakes but finds examples of good sentences.
- Free and premium.
- ludwig.guru



#### Grammarly.

- Most popular current tool.
- Finds mistakes and assesses readability.
- Free browser extension.
- grammarly.com





### References

- Hall JC. 2006. The readability of original articles in surgical journals. ANZ Journal of Surgery 76:68-70. doi:10.1111/j.1445-2197.2006.03651.x.
- Plavén-Sigray P, Matheson GJ, Schiffler BC, Thompson WH. 2017. The readability of scientific texts is decreasing over time. eLife 6:e27725. doi:10.7554/eLife.27725.
- Stainton, EM. 2002. The fine art of copyediting. 2nd edition. New York: Columbia University Press.

## Image credits

- 1. [Book page with notes], Jasmin Ne, <a href="https://unsplash.com/photos/tcg2cmpCrx0">https://unsplash.com/photos/tcg2cmpCrx0</a>, Unsplash license.
- 2. [Fruit watching vegetable], www\_slon\_pics, <a href="https://pixabay.com/images/id-3026343">https://pixabay.com/images/id-3026343</a>, Pixabay license.
- 3. [Book with notebook and pen], JessBaileyStudio, <a href="https://pixabay.com/images/id-3176776">https://pixabay.com/images/id-3176776</a>, Pixabay license.
- 4. [Pencil with bite marks], congerdesign, <a href="https://pixabay.com/images/id-1891732">https://pixabay.com/images/id-1891732</a>, Pixabay license.
- 5. [Team spirit], Anemone123, <a href="https://pixabay.com/images/id-2447163">https://pixabay.com/images/id-2447163</a>, Pixabay license.
- 6. [Book with glass], congerdesign, <a href="https://pixabay.com/images/id-528391">https://pixabay.com/images/id-528391</a>, Pixabay license.
- 7. [People pointing at laptop screen], John Schnobrich, <a href="https://unsplash.com/photos/2FPjlAyMQTA">https://unsplash.com/photos/2FPjlAyMQTA</a>, Unsplash license.
- 8. [Man with magnifying glass], Tumisu, <a href="https://pixabay.com/images/id-4340698">https://pixabay.com/images/id-4340698</a>, Pixabay license.

## Image credits

- 9. [Man working in front of sunset], Simon Abrams, <a href="https://unsplash.com/photos/k T9Zj3SE8k">https://unsplash.com/photos/k T9Zj3SE8k</a>, Unsplash license.
- 10. [Woman biting pencil], JESHOOTS.COM, <a href="https://unsplash.com/photos/-2vD8lihdnw">https://unsplash.com/photos/-2vD8lihdnw</a>, Unsplash license.
- 11. "Brainstorming over paper," Helloquence, <a href="https://unsplash.com/photos/5fNmWej4tAA">https://unsplash.com/photos/5fNmWej4tAA</a>, Unsplash license.
- 12. [Teddy bears reading], MabelAmber, <a href="https://pixabay.com/images/id-2855982">https://pixabay.com/images/id-2855982</a>, Pixabay license.
- 13. "Mia wants treats!", Camylla Battani, <a href="https://unsplash.com/photos/AoagGAqrLpU">https://unsplash.com/photos/AoagGAqrLpU</a>, Unsplash license.
- 14. [Fists together], mohamed\_hassan, <a href="https://pixabay.com/images/id-3213924">https://pixabay.com/images/id-3213924</a>, Pixabay license.



# Joaquim Baeta

- joaquimbaeta.com
- **y** jaybaeta
- github.com/jaybaeta