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About the Journal

Focus and Scope

Pharmacy Education journal provides a research, development and evaluation forum for communication between academic teachers, researchers and practitioners in professional and pharmacy education, with an emphasis on new and established teaching and learning methods, new curriculum and syllabus directions, educational outcomes, guidance on structuring courses and assessing achievement, and workforce development. It is a peer-reviewed online open access platform for the dissemination of new ideas in professional pharmacy education and workforce development. *Pharmacy Education* supports Open Access (OA): free, unrestricted online access to research outputs. Readers are able to access the Journal and individual published articles for **free** - there are no subscription fees or 'pay per view' charges. Authors wishing to publish their work in *Pharmacy Education* do so without incurring any financial costs.

In addition we are listed in EBSCO, and indexed in the Emerging Sources Citation Index (ESCI - Web of Science), EMBASE and SCOPUS.

The Journal also recognises the importance of policy issues and current trends in the context of education, professional development and workforce.

The Journal publishes reports of research and innovation in all aspects of professional pharmacy education and training, case studies, country studies, innovations in laboratory and professional educational practice, workforce issues and development, reviews and reports on information technology in education and reviews of current literature.

The Journal has a clear international perspective, and has a longstanding policy of facilitating publication, in particular for younger Faculty, and those authors whose first language may not be English, and manuscripts from all regions seeking low cost engagement with the wider global community.

The Journal is published by the International Pharmaceutical Federation (FIP) and is aligned to the global mission of advancing education, advancing practice and advancing science.

Peer Review Process

Pharmacy Education has adopted a double-blind peer review process - the identities of the Authors and Reviewers are kept from being known to each other. A step-by-step checklist is provided for Authors, Reviewers and Editors to ensure this (see Ensuring a Blind Review).

Peer Review Process: Once a submission is received, the assigned Editor will select appropriate Reviewers based on their expertise and proven ability to critique. The peer reviews received will assist the Editor in determining the validity, significance and originality of the work submitted. Reviewers will also provide comment on manuscript content for scientific value, check for adherence to general scientific practice as well as *Pharmacy Education's* specific guidelines. The Peer Review process will look closely at methodology and the data validity, and consider the ethical approach. Reviewers are encouraged to provide suggestions for improvement and recommend to Editors if manuscripts should be accepted, accepted with revisions, or rejected.

Please note that an invitation for Authors to submit a revised version is not a guarantee of acceptance. Ultimately, the final decision lies with the Editor assigned to each submission. An Editor can reject any article at any time before publication, including after acceptance if concerns arise about the integrity of the work.

As part of their agreement with *Pharmacy Education,* Reviewers will keep manuscripts and associated material strictly confidential, and will not appropriate Authors' ideas before the manuscript is published. Once a review has been completed, Reviewers will be directed and expected to permanently delete/destroy any retained copies of manuscripts they hold (see Privacy Statement).

Timeliness: Reviewers are expected to respond promptly to requests to review and to submit reviews within the time agreed. Reviewers are also required to declare their conflicts of interest and recuse themselves from the Peer Review process if a conflict exists. Editors will do their utmost to ensure timely processing of manuscripts. Authors will be notified on any unusual delays in publication of manuscripts via email. Authors will ne notified as soon as possible if a manuscript is going to be rejected, either by the Journal Manager or Editorial Team.

Journal Ownership and Editorial Scope

Pharmacy Education is published by the International Pharmaceutical Federation (FIP). Appointments and dismissals to the Editorial Team are made by the Editor-in-Chief in consultation with FIP.

Editorial roles and responsibilities

Editor-in-chief - The Editor-in-Chief has full authority over content publication in *Pharmacy Education.* In co-operation with the wider Editorial Team and publisher, they direct overall strategy of the journal. Together with the Editors and Associate Editors, the Editor-in-Chief reviews and decides upon submitted manuscripts, ensuring timely publication of submissions.

Editors and Associate Editors – Editors and Associate Editors are appointed for a three (3) year term to the Editorial Team. Their responsibilities include, but are not limited to, decision making based on peer review feedback, recommending appointments to the Reviewer Board, and responding to editorial enquiries.

Advisory Board – *Pharmacy Education* is currently engaged in establishing an Advisory Board who alongside the Editor-in-Chief, Editors and Associate Editors will assist with:

- Guidance on the peer review and publishing policies of Pharmacy Education and where necessary, suggest reviewers to the Editor-in-Chief.

- Developing the journal by providing expertise to the Editor-in-Chief and FIP on how to increase impact and reach

- Impartial Judgement in appeal cases by providing professional, independent scientific comments to the Editor-in-Chief and FIP

- Promoting *Pharmacy Education*

Managing Editor – The Managing Editor assumes day-to-day responsibility of managing the submissions flow to *Pharmacy Education*. They liaise with Authors and Reviewers where needed, clarifying the Submission and Publication process as well as responding to all general enquires. The Managing Editor also completes all typesetting, proofreading and online publication of accepted manuscripts once accepted by the Editors.

Advertising in Pharmacy Education

Pharmacy Education does not provide opportunities for advertising on any of its platforms, including downloadable content. This policy maybe reviewed in future in conjunction with the publisher, FIP.

Competing Interest Guidelines

To assist *Pharmacy Education* in ensuring public trust in the scientific process and the credibility

of articles that it publishes, all those involved in the Submissions and Peer Review process are required to disclose perceived as well as actual conflicts of interest.

Authors: When submitting an article to *Pharmacy Education*, all Authors are required to disclose all financial and personal relationships that may bias their work (see Submission Preparation Checklist)

Peer Reviewers: Reviewers are asked at the time of conducting a review if they have conflicts of interest that may impact on their ability to provide an unbiased review. Reviewers are asked to disclose conflicts of interest to the assigned Editor. The assigned Editor will then cancel the review and reassign the article to another reviewer. Reviewers agree to not use knowledge of the work they are reviewing before its publication to further their own interests.

Editors and Journal Staff: Editors making final decisions on manuscripts will recuse themselves where conflicts of interest or relationships that pose potential conflicts are present. All editorial staff (including guest editors) provide the Editor-in-Chief with a completed Editorial Disclosure Form (up to date description of financial interests/conflicts). Editors will annually publish disclosure statements about potential conflicts of interests related to the commitments of journal staff.

Research involving Human participants and Informed Consent

It is the responsibility of the authors to ensure that research involving human subjects has been reviewed and approved by the appropriate research or ethics review committee, or that it has been determined to be exempt from such review.

Confirmation of this should be included in the Cover Letter and also included in the Methods section of the manuscript. Where informed consent is required, authors should include a statement in the manuscript detailing that informed consent was obtained from human subjects (see Submission Preparation Checklist)

Article Corrections, Replacement, Retractions & Removal Policy

Published articles are a permanent record that should remain unaltered. However, *Pharmacy Education* recognises that in exceptional circumstances, articles may need to be corrected, replaced, retracted or removed.

The Editor-in-Chief has full authority over content publication in *Pharmacy Education*. In making decisions regarding publication, the Editor-in-Chief is guided by the policies of the Journal as well as legal requirements such as libel, copyright, infringement and plagiarism.

Corrections

Detailed below are our procedures for managing requests for corrections post publication

Minor errors

If Authors identify a minor error once an article has been published online, they are advised to email their request for corrections to *Pharmacy Education* for consideration.

Minor errors include: errors in spelling, data, medical terms; missing text; amendments to tables, figures or appendices; errors in correspondence details, etc. The Journal may decline proposed corrections that are for aesthetic reasons; errors to text, typography tables, figures and appendices if the meaning is unchanged; errors in acknowledgments lists *etc*.

Significant Corrections

Corrections may be needed if honest errors have resulted in a portion of an article being misleading; if the author/contributor lists are disputed; or if potential conflicts of interest affecting authorship are disclosed post publication.

Where the Editor-in-Chief agrees that a correction is needed, the Journal will:

- Correct the error online, and to any article file for download, linking to a **Correction Notice** via a footnote

- The **Correction Notice** will detail the changes made to the original version, and the dates the changes were made.

Replacement

Honest errors such as mis-classification or miscalculation may lead to significant changes to the results, interpretations and conclusions. In such cases, the Journal will consider retraction with replacement of the article:

- The changed version of the article will undergo further editorial review;

- The authors will be required to detail and explain the changes made which will be published as supplementary material or in an appendix;

- The supplementary material/appendix will be attached to the changed version, allowing for

complete transparency.

Retraction

An article will be retracted if the results or conclusions are unsound and/or where misconduct breaching professional ethical codes has occurred. The publisher and Editor-in-Chief will conduct an investigation into the errors or misconduct before retracting an article. The following steps will be taken where articles are retracted:

- A **Statement of Retraction**, giving the reasons for the retraction and signed by the authors and/or the Editor-in-Chief will be published online linking to the original article.

- The original article is preceded by a screen containing the **Statement of Retraction**. The reader can then proceed to the article itself.

- A watermark will be added to the original PDF indicating on each page that it is "RETRACTED"

- The **Statement of Retraction** will be included as a numbered page in the Table of Contents to ensure proper indexing, and will include the article title in its heading

Removal

Very occasionally, it may be necessary to remove an article from the online database as a consequence of legal action (*e.g.*, defamatory content, infringement on legal rights, article is subject of a court order, or might pose a serious health risk if an article's content is acted upon).

In these circumstances:

- The article's metadata (title and author details) will be retained and the text replaced with an **Article Removal Notice**

- The **Article Removal Notice** will be included in the Table of Contents and prefix the metadata.

Expressions of Concern

If concerns or allegations of misconduct regarding a publication are raised, the Editor-In-Chief will consult the Committee on Publication Ethics (COPE) http://www.publicationethics.org and

initiate the appropriate procedure based on the nature of the concern or allegation. The Editor-in-Chief, with appropriate support form the Editorial Team, will assess each situation individually.

The Editor-in-Chief will consider issuing an **Expression of Concern** if:

- the Editor judges that readers should be made aware of potentially misleading information contained in a published article;

- investigations into any concerns of misconduct remain inconclusive;

- concerns remain over the impartiality of any investigations into alleged misconduct;

-an investigation is pending and a judgment is not expected for some time.

An **Expression of Concern** will be published and appear in the Table of Contents and include the title of the article in its heading. It should be noted that *Pharmacy Education* understands the potential repercussions that issuing an **Expression of Concern** can bring and will only take this action where it is deemed necessary.

If an investigation produces evidence of misconduct or reveals that the concerns raised are well founded after an **Expression of Concern** has been published, the Journal will instigate the Retraction process

Appeals and Complaints

Appeals

Authors are entitled to appeal editorial decisions if they believe their submission has been unfairly or inappropriately rejected. An appeal letter should be submitted to the Journal Manager (pej@fip.com)

The appeal letter should provide appropriate detail and context. For example, if an Editor has provided peer review comments it is worthwhile responding to each item in the letter. If the appeal is against the editorial decision made on the submission, explaining and justifying clearly the work's importance, relevance, and usefulness in the appeal letter is recommended.

An invitation to submit a revised version after sending an appeal letter does not guarantee acceptance; the revised article will proceed through the Peer Review process again.

Appeal letters will be ordinarily acknowledged within 5 working days, followed by a full response

containing the appeal decision within 4 weeks.

Complaints

Pharmacy Education aims to respond quickly, courteously, and constructively to complaints about the Journal's procedures, policies, or actions.

Complaints will be considered if:

- the complainant defines their dissatisfaction as a complaint; *and*

- it concerns a failure of process, *i.e.* a long delay or a severe misjudgement; and is not simply disagreement with an editorial decision;

- the issue being raised is within the responsibility of *Pharmacy Education*'s editorial remit

Complaints should be directly emailed to the Journal Manager (pej@fip.com) who will ordinarily formally acknowledge receipt within 5 working days.

- The Journal Manager will forward the complaint to a relevant person within the Journal organisation who will aim to provide a full response within four weeks. If this is not possible, an interim response and update will be given within the four weeks.

- Following this action, if the complainant remains unhappy, complaints will be escalated to the Editor-in-Chief whose decision is final.

- If a complainant remains unhappy, they may complain to an external body such as the **Committee on Publication Ethics** (COPE) http://www.publicationethics.org. They will consider complaints against Editors once a Journal's own Complaints procedures have been exhausted.

Whistleblowing

Pharmacy Education recognises that there may be legitimate reasons for individuals who wish to remain anonymous when raising issues relating to publication ethics. Concerns or allegations raised anonymously will be handled as they would be if the complaint were from another source, following the processes and procedures of the Journal.

If concerns remain after processes have been followed, The Editor-in-Chief will seek advice from **Committee on Publication Ethics** (COPE) http://www.publicationethics.org

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FIP Education Initiative

Journal History

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Through our FIP publication platform we are able to reach out to over 3 million pharmacists and pharmaceutical scientist worldwide.

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IAI SPECIAL EDITION

RESEARCH ARTICLE

Brotowali (*Tinospora crispa L.*) stem extract activity as an α-Amylase enzyme inhibitor

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Keywords
α-amylase enzyme
Aqueous extract
Ethanolic extract
Tinospora crispa L. stem

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Abstract

Introduction: Reducing glucose absorption in the gastrointestinal tract is one of the strategies for treating diabetes mellitus. The condition of treating diabetes mellitus can be achieved by inhibiting the activity of the α-amylase enzyme. Brotowali (Tinospora crispa L.)/Tc has antihyperglycemic activity; compounds contained in the Tc stem can inhibit the activity of the α-amylase enzyme. The extraction of the Tc stem used for treatment was done with water and/or ethanol. **Aim:** This study aimed to measure the inhibitory activity of the α-amylase enzyme in both aqueous and ethanolic extract Tc stem. **Methods:** The inhibitory activity test of the α-amylase enzyme was carried out using the UV-visible spectrophotometric method. **Results:** The aqueous extract and ethanolic extract of Tc stem had α-amylase enzyme inhibitory activity with IC_{50} values of 11.660 ± 0.310 mg/mL and 10.348 ± 0.313 mg/mL, respectively. The Tc stem extracted with water or ethanol can be used as an antidiabetic drug.

Introduction

Since ancient times, people have used plants as medicinal ingredients for the treatment of various conditions. Traditionally, diabetes mellitus was among the diseases that can be treated with the stems of brotowali (*Tinospora crispa L.)*/**Tc**. Managing blood sugar levels is a way to prevent diabetes mellitus. The α-amylase enzyme plays a role in converting carbohydrates into sugar; the inhibition of α-amylase enzyme activity can suppress the formation of blood sugar (Hilallzaid & Slemannkadan, n.d.). **Tc** stem is famous as a medicinal ingredient characterised by a very bitter taste. **Tc** contains more than 65 compounds isolated from various groups of compounds, such as furano-diterpenes, lactones, steroids, flavonoids, lignans, and alkaloids (Ahmad *et al.,* 2016). People use medicinal plants by boiling them in water. This statement goes along with the making or the use methods of **Tc** stems, as stated in the Formulary of Indonesian Traditional Medicines (Keputusan Menteri kesehatan Republik Indonesia, n.d.). Aqueous extracts from several plants exhibited the α-amylase enzyme inhibiting activity (Bhutkar & Bhise, 2012). The antidiabetic activity was tested using an *in vitro* method in the form of an α-amylase enzyme inhibition activity test (Patil *et al.* 2012, Antidiabetic, n.d.). This study aimed to compare the activity of aqueous and ethanolic extracts of **Tc** stems against α-amylase enzymes *in vitro*.

Material and method

Brotowali stem (*Tinospora crispa* L.) was received from PT HRL Internasional, East Java. The maceration method was used in the compound extraction of **Tc** leaf. The identification of **Tc** leaf methanolic extract compounds was carried out using Thin Layer Chromatography/TLC. The materials used were α-amylase enzyme (SIGMA Aldrich), Quercetin (E. Merck), ethanol pro analysis (E. Merck), double-distilled water, dimethyl sulfoxide pro analysis (E. Merck), iodine iodide reagent, potato starch, 1N HCL, acarbose tablets (PT Dexa Medica). The α-amylase enzyme (from porcine pancreas-type VI-B, CAS A3176, SIGMA Aldrich)

inhibitory activity test was carried out according to Ononamadu and colleagues (Ononamadu *et al.,* 2020) with few modifications. The following ingredients were mixed: potato starch (1% w/v), 1ml of test material (**Tc** extract, acarbose), 1 ml of the α-amylase enzyme (1% w/v), and 2 ml of acetate buffer (0,1M, 7,2 pH). The measurement of the inhibitory effect of the sample blank solution was carried out by taking 1 ml of 0.5% potato starch solution into a test tube. The mixture was incubated for one hour, then a 0.1 ml iodine-iodide indicator was added to the mixture. The absorbance measurement used a UV-Vis spectrophotometer using a wavelength of 536 nm. The percentage of inhibition was calculated as follows:

$$\% \text{ inhibition} = (As\text{-}Ac/As) \times 100$$

*Ac is the absorbance of the control; As is the absorbance of the sample.

The inhibitory concentration (IC_{50}) calculation was obtained from the linear regression equation after calculating the percentage of inhibition of α-amylase enzyme activity of the test material with a concentration range of 4 mg/ml, 8 mg/ml, 15 mg/ml, and 20 mg/mL. This research used the analysis of variance (ANOVA) to compare the treatment. A value of $p < 0.05$ was considered statistically significant, alongside the Tukey Post-Hoc Test significance and a 95% confidence interval. Linear regression measured the median IC_{50} to determine the inhibitory activities of α-amylase. This research used IBM SPSS statistics version 22 for statistical analysis.

Results

The addition of the concentrations of the three test materials (aqueous extract of **Tc** stem, ethanolic extract of **Tc** stem, acarbose tablet) increased the percentage of inhibition of α-amylase enzyme activity (Figure 1). The inhibitory activity of the α-amylase enzyme from acarbose was higher than that of the aqueous extract and the ethanol extract of the **Tc** stem. At concentrAntituberculosisAntituberculosisations of 4 mg/mL and 8 mg/mL, **Tc** stem aqueous extract showed higher inhibition of α-amylase enzyme activity than ethanolic extract, but at a concentration of 20 mg/mL, it occurred otherwise. At the same concentration of 15 mg/mL, **Tc** stem aqueous extract and **Tc** stem ethanolic extract showed the same percentage of inhibition of α-amylase enzyme activity. Statistical tests ($P<0.05$) showed a significant difference between the percentage of inhibition of α-amylase enzyme activity of aqueous extract **Tc** stem, ethanolic extract **Tc** stem, and acarbose tablets. The TLC of the **Tc** did not show a spot similar to the quercetin spot (Figure 2).

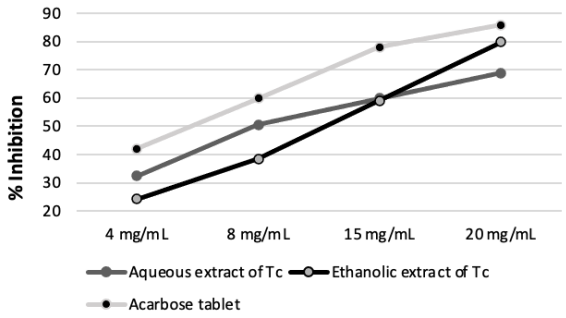
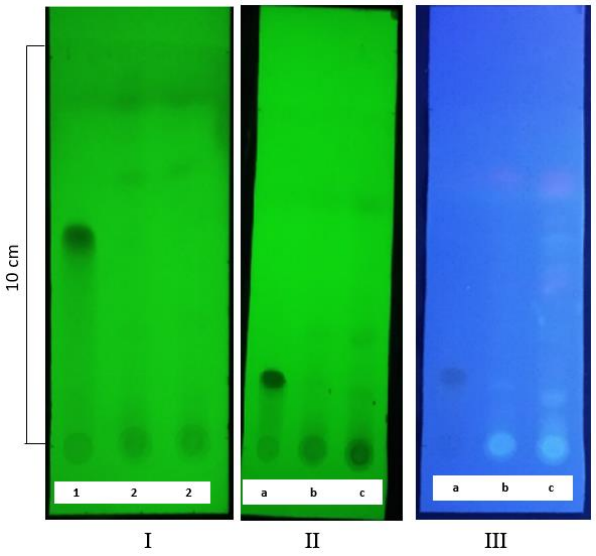


Figure 1: Percent inhibition of aqueous extract, ethanolic extract, and acarbose tablet



Note: (1) Quercetin, (2) Tc stem powder, (a) Quercetin, (b) Aqueous extract of Tc stem, (c) Ethanolic extract of Tc stem, (I-II) UV_{254} nm detection, (III) UV_{365} nm detection.

Figure 2: Thin Layer Chromatogram

Discussion

The inhibitory activity of aqueous and ethanol extracts of bitter leaf on α-amylase enzyme activity was tested *in vitro*. As shown in Figure 1, the higher concentration of the material tests increased the percentage inhibition of α-amylase enzyme activity. The level of inhibitory activity against the α-amylase enzyme is expressed as 50% inhibition concentration (IC_{50}). The IC_{50} value were 11.660 ± 0.310 mg/ml, 0.348 ± 0.313 mg/mL, and 5.554 ± 0.380 mg/mL for **Tc** stem aqueous extract, **Tc** stem ethanolic extract, and acarbose tablets, respectively. The antidiabetic drug acarbose was chosen as a positive control because of its chemical structure, similar to that of starch that acts as a substrate. Both compounds have a benzene ring

and a hydroxyl group that play a role in binding the enzyme's active site. This activity occurred so that a competitive inhibition mechanism of enzyme activity could happen (Takahama & Hirota, 2018). *In vivo* antidiabetic activity of **Tc** stem has been reported. *Tinospora crispa L.* stems contain alkaloids, flavonoids, glycosides, and terpenoids (Elya *et al*., 2015). In this study, a reference standard compound used flavonoid quercetin. The presence of quercetin in aqueous extract and ethanol extract of **Tc** stems could not show with the TLC. Even though there are faint spots in the same Rf region, the presence of the same compound with quercetin cannot be asserted. TLC did not detect the presence of quercetin at the same RF value (Figure 2).

Several studies reported the presence of quercetin in **Tc** stems. Methods other than TLC are recommended to detect the presence of quercetin in aqueous extracts and ethanolic extracts of **Tc** stems. Borapetoside C is the compound most commonly found in **Tc** plants and can inhibit the α-amylase enzyme (Hamid et al., 2015). Compounds in the aqueous extract and ethanol extract of **Tc** stems showed α-amylase enzyme inhibitory activity, which could be due to borapetoside C or several compounds, either singly or in a combination of the compounds in the extract. Several studies have shown that the overall activity of botanical extracts can result from mixtures of compounds with synergistic, additive, or antagonistic activity. Proponents of the medicinal use of natural product mixtures often claim that they are more effective than purified compounds due to beneficial “synergistic” interactions (Caesar & Cech, 2019). The active compound that functions as an inhibitor of the α-amylase enzyme can be in **Tc** stems aqueous or the ethanolic extracts, so both can be used as antidiabetic drugs. Further studies need to focus on the compounds or combinations of compounds in both aqueous extracts and ethanolic extracts of **Tc** stems responsible for the antidiabetic activity through the inhibition of the α-amylase enzyme.

Conclusion

In conclusion, *in vitro,* aqueous extract and ethanolic extract of brotowali (*Tinospora crispa* L.) stem showed α-amylase inhibitory activity with IC_{50} values of 11.660 ± 0.310 mg/mL and 10.348 ± 0.313 mg/mL, respectively.

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