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Health benefits of *Leucaena leucocephala* Seeds: A scoping review Protocol

Nur Hayati Azizul^{1*}, Roshan Jahn Mohd Salim¹, Fatehar Ramly², Mohd Fairulnizal Md Noh¹, Rashid Li³ and Nurul Izzah Ahmad²

¹Nutrition, Metabolic and Cardiovascular Research Centre, Institute for Medical Research, National Institutes

Of Health, Ministry of Health Malaysia, Malaysia

²Environmental Health Research Centre, Institute for Medical Research, National Institutes of Health, Ministry of Health Malaysia, Malaysia

³Forest Research Institute Malaysia, Malaysia

***Corresponding author:** Nur Hayati Azizul, Nutrition Metabolic and Cardiovascular Research Centre, Institute for Medical Research, Ministry of Health, Kompleks NIH, No. 1, Jalan Setia Murni U13/52, Seksyen U13, Setia Alam, 40170 Shah Alam, Selangor, Malaysia.

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Abstract

Background: The usage of plants to maintain health has been practiced since long time ago. *Leucaena Leucocephala* seed is well known for its medicinal benefits. However, the summary of the health benefits rooting back to its phytochemicals components and mechanism of action is limited. This protocol presents the method to conduct scoping review on the health benefits of *Leucaena leucocephala* seed.

Method: Using Arksey and O'Malley's scoping review methodology, we will begin the searching process by finding the published articles in the electronic databases (Pubmed, Scopus, Cochrane Library, ClinicalTrials.gov, Google scholar, Lens.org) using selected keywords and defined inclusion criteria. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) diagram (2009) will be used to guide the selection flow. The review process will involve two stages: title and abstract review and subsequently full paper review. The data will be extracted in a pre-defined finding table. The information will be analysed descriptively.

Conclusion: The scoping review protocol lays the methodology of performing systematic literature review on the health benefits of *Leucaena leucocephala* seed. As an outcome, the review will summarize the available evidence, identify the research gaps in this topic and suggest future direction for new research. Furthermore, the outcomes will be beneficial for knowledge translation and to inform stakeholders and experts on the future works of this topic.

Keywords: Health Benefits, Health Effects, Medicinal Properties, Nutraceuticals, *Leucaena Leucocephala*

Introduction

Leucaena leucocephala is a leguminous tree classified under the Family Fabaceae. It is also commonly known as White Lead tree, White Popinac, Jumbay and Wild Tamarind [1]. It is distributed widely across all continents around the world including Africa, Asia, America, Middle East, Indian Asian and Australasia [2]. It spreads through the cleared areas as a shrub or tiny tree rising up to 10 m in height. *Leucaena* leaves appear similar to those of tamarind, having white flowers tinged with yellow, and having long flattened pods.

Seeds are dark brown with the hard-shining seed coat. It has hard heavy wood (about 800 kg/m), with a pale-yellow sapwood and light reddish-brown heartwood. Bark on young branches is smooth and grey-brown or salmon pink, whereas older barks are darker grey-brown, and Trough with shallow, rusty orange-brown vertical fissures, and deep red inner bark [3].

Leucaena leucocephala is also called as a miracle tree because of its vast benefits. It is used as forage, timber and human food



[4]. Ruminants fed with *Leucaena leucocephala* experienced increased milk output and showed very high live weight gain (Ruskin et al., 1984). Almost all parts of the plant were used as human food. The young pods are cooked as vegetables and roasted seeds are used as coffee substitutes in Philippines [5]. It has several phytochemicals contributing to its nutraceutical potentials, such as antidiabetic [6,1,7], anticancer and antimetastatic [8], antibacterial [3] and antihelminthic [7]. However, despite of its tremendous medicinal benefits, limited research has been conducted on the phytochemicals and the mechanism of actions of the plant towards health benefit in human. Therefore, this scoping review aimed to map the available evidence pertaining to the research patterns of *Leucaena leucocephala*. The outcome of the scoping review can be used to plan on new research project. This protocol outlines the plan of the scoping review.

Methods/Design

Scoping review is a process of mapping the existing literature or evidence base. [9] It is used to summarize the available evidence and identify research gap on the topic. The aim of this scoping review is to map the health benefits of *Leucaena leucocephala* seed and its phytochemicals. From the outcome, we aim to identify the research gaps and suggest future areas that need to be explored. The scoping review will be conducted by utilizing an established scoping review framework by Arksey and O' Malley [9] and current recommendations by [10].

According to these frameworks, there are six stages of conducting a scoping review:

(1) Identifying the research question; (2) Identifying relevant studies; (3) Study selection; (4) Charting the data; (5) Collating, summarising and reporting the results and (6) Consultation with

the stakeholders and experts.

Stage 1: Identifying the research question

Upon examining the topic, we developed two main research questions:

- I. What are the research pattern characteristic of *Leucaena leucocephala* seed for the past 10 years in terms of:
 - a. The number of research conducted
 - b. Research design and methodology (*in vitro*, *in vivo* and clinical trials)
- II. What are the phytochemical constituents of *Leucaena leucocephala* seed, in terms of:
 - a. The primary and secondary metabolites involved in giving the health effects
 - b. Mechanism of the biological activity

Stage 2: Identifying relevant studies

After finalizing the topic of interest, we will perform a preliminary check with certain websites (Cochrane, PROSPERO, DARE and Health Evidence) to find out the availability of similar topic to avoid redundancy. Several keywords have been selected. Subject headings and list of keywords and synonyms have been developed, as shown in (Table 1). The keywords were combined using Boolean operators (AND, OR, NOT), adjacencies and truncations. A comprehensive search will be conducted for primary studies, reviews and grey literature from different databases (Pubmed, Scopus, Cochrane Library, ClinicalTrials.gov, Google scholar, Lens.org) published from January 2010 to January 2020. All websites and databases are registered by our National Institute of Health library [11].

Table 1: List of keywords.

Health benefits	<i>Leucaena leucocephala</i> seed
Health effects	White lead tree seed
Medicinal properties	
Nutraceuticals	

Stage 3: Study selection

Studies of the topic will be selected if fulfilling the inclusion criteria for the study selection. The inclusion criteria are:

- a. Published articles from January 2010 to January 2020
- b. Articles published in Malay and English language
- c. Full text articles from primary studies, technical reports, and review articles (systematic review or narrative review).

Selection of study will be conducted in two stages. In the first stage, the titles and abstract will be individually reviewed

by researcher to determine the eligibility based on the defined keywords and inclusion criteria [12]. Duplicates will be removed during importation of the citation into Endnote and irrelevant articles will be excluded. Any uncertainty will not eliminate the citation for consideration in the second stage. Subsequently, full articles for selected abstract will be retrieved. In the second stage, researchers will work in pairs, independently screen the full articles [13]. Any discrepancies will be discussed, and a consensus will be attained. If the discussion did not achieve into a consensus, a third-party opinion from other team members will be sought. We will not include articles merely stating the health benefits of *Leucaena*

leucocephala seed without further explanation on the biological mechanism. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) diagram (2009) will be used as a guide to record the number of articles selected in each process.

Stage 4: Charting the data

We will sort and extract general and detailed data from the selected articles in the form of spreadsheet. Based on discussion

Table 2

Finding table						
Study title/ Author/ Year	Location	Study design of the (antidiabetic/antioxidant/ Primary and Mechanism of (in vitro, study anticarcinogenic/ secondary the biological in vivo, antimicrobial) metabolites activity clinical trial, review)	Objectives	Scopes	Findings	Limitation

Stage 5: Collating, summarizing, and reporting the results

The data will be summarized in a descriptive manner. The number of studies and its percentage will be calculated according to the scope. Table of findings will be used to present the data. The limitation will be analysed and categorized accordingly, if possible.

Stage 6: Consultation with the stakeholders and experts in *Leucaena leucocephala*

Expert opinion of *Leucaena leucocephala* will be sought from a researcher from Forest Research Institute Malaysia (FRIM) who performed research works focused on this plant. The information such as plant parts and the available health benefits will be discussed. This scoping review is conducted to identify future potential areas that can be explored, possibly in collaboration with FRIM or other institution.

Conclusion

Our protocol of scoping review intends to lay out the method planned for systematically reviewing the information on health benefits of *Leucaena leucocephala* seed and its phytochemicals. It is a feasible mean to synthesize the broad evidence available on the topic. Scoping review allows interpreting results of individual studies within the evidence. By summarizing all related studies, it improves understanding of inconsistencies of evidence. Apart from identifying the research gaps, the review will help to provide evidence based for knowledge translation so that the result will be used for developing nutraceutical products and as a guideline for a better nutritional health to the community.

Conflict of Interest

We declare no conflict of interest.

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with team members and preliminary exercise, several information will be selected to be included in the finding table. This information will be able to answer the research questions and objective of the review [14]. The information to be included in the finding tables will be author, year, location, study design, objectives, scopes, findings, and limitation (Table 2). Any additional relevant information will be included appropriately.

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