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REVIEW ARTICLE

Antioxidant Profile of Velvet Bean and Jack Bean and The Effect of Processing Towards Its Value – A Review

Steffi Agustine Chandra[1], Christiana Retnaningsih[2]*, Alberta Rika Pratiwi[2]

[1]*Magister of Food Technology Department, Faculty of Agricultural Technology, Soegijapranata Catholic University*

[2]*Faculty of Agricultural Technology, Soegijapranata Catholic University*

**Corresponding author, tel: 0812-2520-287, email: nik@unika.ac.id*

ABSTRACT

Velvet bean (*Mucuna pruriens*) and jack bean (*Canavalia ensiformis*) are considered as local legumes in Indonesia and some other tropical countries. However, there are still not many explorations regarding their nutritional and functional values. There are many studies claiming antioxidant capacities of these beans, which are mainly affected by its flavonoid, polyphenol, and tannin contents. Levodopa or L-DOPA, a non-protein amino acid compound present as the dominant compound in velvet bean, also reported to exhibit bioactive capacities. On the other hand, kaempferol was reported as the dominant flavonoid compound in jack bean. As processing treatments subjected into velvet bean and jack bean can affect the bioactive compounds present and their antioxidant capacities, it is important to understand and put into considerations how different processing treatments may affect these qualities while producing functional food based on these food sources. This review was written with the objective of highlighting the antioxidant profiles of velvet bean and jack bean seeds as well as the effect of processing treatments towards their value. It was concluded that jack bean and velvet bean have the potential to be utilized as functional foods due to their high antioxidant capacities, which are mainly affected by the presence of phenolic and flavonoid compounds in jack bean and velvet bean, as well as L-DOPA in velvet bean. Pretreatments such as soaking and dehulling can significantly reduce the phenolic and flavonoid content of velvet bean and jack bean seeds, while fermentation can increase those values instead. However, reduction of L-DOPA content happens as a result of soaking, dehulling, cooking, germinating, and fermentation processes.

KEYWORDS: *Mucuna pruriens, Canavalia ensiformis, Antioxidant, Functional food*

Introduction

Velvet bean (*Mucuna pruriens*) and jack bean (*Canavalia ensiformis*) are part of Fabaceae family. These kinds of beans are usually grown in tropical area, including South Asia and South East Asia. As legumes, these beans have nodules on their roots that allow them to bind Nitrogen from the soil, eliminating the need of external Nitrogen source as well as making them capable of improving soil fertility (USDA, 2013). Both velvet bean and jack bean have several advantages, including their capabilities to grow in extreme environments that allow them to be grown on any type of soil, their capabilities to endure drought, their endurance against pests, even to the extent of being able to exterminate weeds and nematodes (Hanum and der Maesen, 1997). In Indonesia, velvet bean and jack bean are considered as local food source, as opposed to soybean, which are still 80% imported in Indonesia. Some local industries in Central Java are reported to utilize jack bean and velvet bean into tempeh, tofu, soy sauce, milk, flour, chips, bread, cakes, or other local food products.

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Velvet bean and jack bean also act as good sources of nutrition. The crude protein value of velvet bean was reported to reach 26.75±1.29%, while that of jack bean reaches 31.33±1.52%, in which these values are already close to that of soybean, which is 35% (Rahayu *et al.*, 2019; Puspitojati *et al.*, 2019). In terms of crude fiber, velvet bean was reported to contain 19 grams per 100-gram dry weight, while jack bean contains 14.12 gram per 100-gram beans (Hanum and der Maesen, 1997; Smartt and Nwokolo, 2012). Therefore, these beans can be utilized as good alternative sources of nutrition. Furthermore, velvet bean and jack bean are also reported to contain phytochemical compounds such as polyphenol, flavonoid, tannin, alkaloid, saponin, and glycosides that are known for exhibiting bioactive functions such as antioxidant, antihypertension, antidiabetic, as well as antihyperlipidemic (Kumbhare et al, 2023; Diniyah et al, 2020; Oladunni et al, 2024; Dimitry et al, 2022; Indrati et al, 2019).

According to Kumbhare *et al.* (2023), antioxidant occurs as defensive mechanism that works by fighting effects of reactive oxygen species and free radicals that cause degradations in the body. The working mechanism of antioxidant itself can be identified as hydrogen atom transfer (HAT) or single electron transfer (SET), or the combination of those two. HAT mechanism works by absorbing one hydrogen atom from antioxidant, turning said antioxidant into free radical in the process. On the other hand, SET mechanism was initiated by the transfer of single electron from antioxidant to free radical, resulting in formation of radical cation out of said antioxidant. However, it is difficult to differentiate between SET and HAT reactions. Both reactions are also often found to activate in tandem in most cases (Liang and Kitts, 2014).

Velvet bean and jack bean can be utilized in several food products, including plant-based milk. However, the processing treatments during the production of these food product may affect the bioactive compounds that are present in these beans, as most compounds that are responsible for antioxidant activities are sensitive to external conditions, such as moisture, temperature, oxygen, or other process. Although there are reviews that studied effects of processing on antioxidants that come fruits and vegetables as well as reviews related to antioxidant potential of legumes in the past decade, no review has been found that discuss processing effects on legume antioxidant, specifically in velvet bean and jack bean, yet. Velvet bean and jack bean contain antinutritional factors and toxic compounds such as trypsin inhibitor, hydrogen cyanide, and phytic acid, and thus, require different treatments from fruits and vegetables. Therefore, the objective of this article is to review antioxidant profiles of both velvet bean and jack bean, as well as the effect of pretreatments and processing treatments towards the antioxidant activities and profiles of treated velvet bean and jack bean.

Materials and Method

Materials

The materials used in this article are research articles from both international as well as national journal reporting about antioxidant profile and capacities of velvet bean and jack bean seeds, which are published from 2019 to 2024.

Methods

This review was written by combining experimental research results published from 2019 to 2024, which are obtained from Google Scholar search. The keywords used for searching included the words “velvet bean”, “jack bean”, “*Mucuna pruriens*”, “*Canavalia ensiformis*”, and “antioxidant”. Articles that emerged from the searching result was pre-screened based on title and abstract. Further screening was done by examining the selected articles to find articles that provide the most reliable and complete data and discussions

to be further analyzed and reviewed. Exclusion criteria are review articles, book chapters, non-experimental sources as well as studies with insufficient information, while inclusion criteria are research articles with clear data and analysis that highlight antioxidant properties and capacities of velvet bean and jack beans, as well as factors affecting their values.

Results and Discussion

Antioxidant Profile of Velvet Bean Seeds and Jack Bean Seeds

Velvet bean is often used as raw material for many traditional medication and pharmaceutical industries due to its ability to exhibit antioxidant, antiinflammation, antihypertension, and antidiabetic capacities. These bioactive capacities are mostly caused by the presence of polyphenol, flavonoid, tannin, alkaloid, saponins, and glycoside components (Sowdhanya *et al.*, 2023). Furthermore, according to Ishmayana *et al.* (2023), levodopa or L-DOPA (L-3,4-dihydroxyphenilalanine) also plays role in its antioxidant capacity. L-DOPA is an amino-acid-group-containing bioactive compound that is found abundantly in velvet bean that contains two hydroxyl group located in adjacent to each other on a single aromatic ring (also known as catechol structure). This structure was reported be the one responsible for the compound's free radical fighting activities. However, it is advised to limit consumption of L-DOPA despite its antioxidant, anti-stress, neuroprotective and anti-Parkinson activities, as it may exhibit negative effects towards thyroid.

Kumbhare *et al.* (2023) concluded that methanolic extract of velvet bean seeds exhibit higher antioxidant capacity compared to the leaves, stem, and roots parts, which was also proven by its higher values of total phenolic and total flavonoid content and its lower IC_{50} value for DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical scavenging activity. Similar result was also observed in the study done by Shelke *et al* (2022), who compared antioxidant activity of velvet bean seeds and its leaves. The result showed higher inhibition percentage of DPPH from ethanolic extract of velvet bean seeds compared to its leaves. Antioxidant capacity and the phytochemical profile of velvet bean seed are summarized in Table 1.

Table 1. Summary of in vitro antioxidant capacity and phytochemical content of velvet bean (*Mucuna pruriens*) seeds.

Sample	Antioxidant Capacity	Phytochemical Content	Reference
Velvet bean seeds methanolic extract	DPPH IC_{50}: 18.34 ± 0.182 µg ABTS IC_{50}: 8.64 ± 0.149 µg DMPD IC_{50}: 293.1 µg *β-carotene bleaching protection:* 14,85 ± 0,30% (at 30 µg concentration) FRAP: 0.194 ± 0.006 AU (at 60 µg concentration) Total Antioxidant Activity (*TAA*): 0.137 ± 0.006 AU (at 100 µg concentration)	Total phenolic: 327.48 mg Gallic acid Equivalent (GAE)/g Total flavonoid: 277.59 mg Quercetin Equivalen*t* (QE)/g	Kumbhare *et al.* (2023)
Velvet bean seeds extracted with various	DPPH *radical scavenging activity* at 50 µg concentration: 76.96% (ethanolic extract); 63.38%	N/A	Shelke *et al.* (2022)

organic solvent	(petroleum ether extract); 32.53% (acetone extract)		
Velvet bean seeds ethanolic extract	DPPH IC_{50}: 6.88 µg/mL; *Lipid peroxidation inhibition* IC_{50}: 11.53 mg/mL	Total phenolic: 21.78 mg GAE/g extract dry weight Total flavonoid: 423.48 mg QE/g extract dry weight	Theansungnoen *et al.* (2022)
Velvet bean seeds ethanolic extract (macerated at 60°C, 360 minutes)	DPPH: 38.30±0.03 mg *Ascorbic Acid Equivalent*/g dry weight; ABTS: 6.36±0.03 mg *Ascorbic Acid Equivalent*/g dry weight; FRAP: 35.06±0.34 mM Fe^{2+}/gram extract	Total phenolic: 41.78 mg GAE/g dry weight Total flavonoid: 3.10 mg QE/100 g dry weight Total tannin: 2.37 mg Tannic Acid Equivalent (TAE)/100 g dry weight	Diniyah *et al.* (2023)
Velvet bean seeds aqueous extract	DPPH IC_{50}: 10.75 ± 0.04 mg/mL *Ascorbic Acid Equivalent Antioxidant Capacity (AEAC)*: 27,029.26 ± 936.89 mg AE/100 g powder extract	Total phenolic: 230.00 ± 9.31 µg GAE/mg	Iamsaard *et al.* (2020)
Velvet bean seeds methanolic extract	DPPH IC_{50}: 23.75 ± 0.44 ppm DPPH IC_{50} of L-DOPA isolate: 8.92 ± 0.03 ppm	L-DOPA isolate content: 0.49 mg/g dry weight	Ishmayana *et al.* (2023)
Velvet bean seeds methanolic extract	Inhibition of radical formation on in vitro lymphocyte suspension + H_2O_2 + *M. pruriens* seed extract at 300 µg/ml: 48.83%	Total phenol content: 64.23 ± 0.39 mg GAE/g Tannin content: 29.17 ± 0.21 mg/100 g Saponin content: 771.9 ± 0.32 mg/100 g Flavonoid content: 1.78 ± 0.61 mg QE/g L-DOPA: 3.62 ± .031%	Jadhav *et al.* (2022)

In order to obtain better understanding of the compounds responsible for antioxidant activity exhibited by velvet bean seeds, several studies were also done to identify the bioactive compounds present in velvet bean seeds. Identification of bioactive compounds within velvet bean samples can be done using several methods, such as High-Performance Liquid Chromatography (HPLC) or Gas Chromatography (GC), which are often paired with Mass Spectrophotometry (MS). Table 2 shows summary of bioactive compounds identified in velvet beans by using different analysis methods.

Table 2. Bioactive compounds identified in velvet bean (*Mucuna pruriens*) seeds

Identification Method	Sample	Bioactive Compound	Reference
HPLC-UV and FTIR	L-DOPA isolate	L-DOPA	Ishmayana *et al.* (2023)
LC-QTOF-MS/MS in positive and negative mode	Velvet bean (*M. pruriens*) aqueous extract	**Amino acid**: L-arginine, phenylalanine, isoleucine, aspartic acid, L-DOPA **Oligosaccharide:** raffinose **Flavonoid:** deguelin, Apigenin 7-O-[beta-D-apiosyl-(1->2)-beta-D-glucoside] **Nucleoside:** guanosine **Vitamin:** riboflavin **Saponin:** Hederagenin 3-O-arabinoside **Hydrocinnamic acid derivatives:** Caffeic acid 3-glucoside	Sruthi and Jayabaskaran (2024)
HRLC-MS/MS	Velvet bean seeds methanolic extract	**Cinnamic acid:** (Z)-N-feruloyl-5-hydroxyanthranilic acid **Phenylpropanoid:** Senkirkine, LysoPE(18:2(9Z,12Z)/0:0) **Phenol ester:** Dipivefrin **Phenol:** 5-(3′,4′,5′-trihydroxyphenyl)-gamma-valerolactone **Flavonoid**: 2,6-Dihydroxyphenylacetate, Beclomethasone dipropionate, 10-Acetoxyligustroside, Apimaysin **Isoflavonoid:** Luteolin	Kumbhare *et al.* (2023)
GC-MS	Velvet bean seeds extracted with various organic solvent	**Carboxylic:** Oxalic acid cyclohexyl pentyl ester (petroleum ether extract), 1,2-Benzenedicarboxylic acid (acetone extract, ethanolic extract), mono(2-ethylhexyl) ester (acetone extract, ethanolic extract), Octadecanoic acid methyl ester (methanolic extract)	Shelke *et al.* (2022)

		Aromatic hydrocarbon: Azulene (petroleum ether extract, chloroform extract) **Fatty acid:** 9,12-octadecadienoic acid[zz] (petroleum ether extract), n-Hexadecanoic acid (chloroform extract), Tridecanoic acid (methanolic extract), methyl ester (methanolic extract) **Vitamin:** β-Tocopherol	
GC-MS	Velvet bean seeds ethanolic extract	Palmitic acid	Theansungnoen *et al.* (2022)

Jack bean is reported to contain saponin, flavonoid, alkaloid, and polyphenol components that exhibit antioxidant activities as well as the ability to reduce the risk of suffering various chronic diseases. Based on a study done by Sutedja *et al.* (2020) using chromatographic methods (HPLC and LC-MS/MS), kaempferol was the dominant flavonoid found in methanolic extract of jack bean, with the total value of 5.57 mg/100 gram, in which 52.75% of its content was in the form of kaempferol tetraglycoside while 17.71% of its content was in the form of kaempferol triglycoside. Diniyah *et al* (2020) also reported the presence of epicatechin and coumaric acid in ethanolic extract (70%) of jack bean using HPLC. However, those compounds were not considered as the dominant compounds in jack bean. Table 3 shows the summary of antioxidant capacity and phytochemical contents of jack bean seeds.

Table 3. Summary of in vitro antioxidant capacity and phytochemical content of jack bean (*Canavalia ensiformis*) seeds

Sample	Antioxidant capacity	Phytochemical Content	Reference
Jack bean seeds methanolic extract	-	Kaempferol: 5.57 mg/100 gram	Sutedja *et al.* (2020)
Jack bean seeds methanolic extract (1:10 w/v)	DPPH free radical scavenging activity: ~30%	Total phenolic: ~4 mg GAE/g sample Total flavonoid: ~2.5 mg catechin equivalent (CE)/g sample	Sutedja *et al.* (2021)
Jack bean seeds extracted using 70% ethanol (100 µg/mL)	DPPH antioxidant capacity: 19.42% ABTS antioxidant capacity: 37.28%	Total phenolic: 38.60 mg GAE/g dry weight Total flavonoid: 24.61 mg CE/g dry weight	Diniyah *et al.* (2020)
Jack bean seeds aqueous extract (1:50 w/v)	FRAP: 26.81±0.01 mg/g DPPH free radical scavenging activity: 75.22±0.01%	Total flavonoid 0.36±0.01mg GAE/g Total phenolic: 15.20±0.50 mg GAE/g	Oladunni *et al.* (2024)

ABTS scavenging ability: 88.99±0.02%	
Fe^{2+} chelation ability: 73.42±0.51%	
Nitric oxide (NO) radical scavenging ability: 67.48±0.46%	
Hidroxyl (OH) radical: 64.95±0.34%	

By comparing data from Table 1 and Table 3, it is observed that velvet bean shows higher antioxidant capacities than jack bean. This difference might be caused of the presence of L-DOPA as dominant compound in velvet bean, which exhibits antioxidant properties as shown by the DPPH IC_{50} value of 8.92 ± 0.03 ppm from L-DOPA isolate. Furthermore, both ethanolic and methanolic extracts of velvet bean also show higher total phenolic content compared to those of jack bean (Kumbhare *et al.*, 2023; Diniyah *et al.*, 2023; Sutedja *et al.*, 2020; Diniyah *et al.*, 2020).

When compared to gallic acid standard and rutin standard, aqueous extract of velvet bean also showed comparable antioxidant activities. At concentration of as low as 0.0025 mg/mL, velvet bean showed higher percentage of DPPH scavenging activity than rutin, but still lower than that of gallic acid. However, at the concentration of 0,04 mg/mL, velvet bean showed lower scavenging activity percentage than rutin and gallic acid, which indicates the dose-dependent scavenging ability of antioxidant compound from velvet bean against hydroxyl radicals (Jimoh *et al.*, 2020). When compared against ascorbic acid, BHA, and BHT, methanolic extract of velvet bean seed showed slightly higher IC50 value, which are 5.24 µg, 4.3 µg, 13.7 µg, and 18.34 µg for ascorbic acid, BHA, BHT, and velvet bean seed, respectively (Kumbhare *et al.*, 2023).

By comparing the data in Table 1 and Table 3, it can also be observed that different types of solvent also result in different values of total phenolic, total flavonoid, and antioxidant activities of velvet bean and jack bean extracts. The amount and type of bioactive compounds that are extracted from velvet bean and jack bean are affected by the polarity of the solvent used and its ability to penetrate through the food matrix as well as its ability to break the covalent bond in order to free and dissolve the bioactive compounds from the food matrix (Jimoh *et al.*, 2020).

Effect of Processing Treatments Towards Antioxidant Capacities of Velvet Bean and Jack Bean

Pretreatment and processing treatments of velvet bean and jack bean seeds, such as soaking, dehulling, grinding, or boiling, may affect the phytochemical contents of said beans, either antinutritional compounds or bioactive compounds or both. Sutedja *et al.* (2021) studied the effect of each legume-based milk processing steps towards the total phenolic content, total flavonoid content, kaempferol content, and antioxidant activity of jack bean milk, starting from boiling process at 95°C for 30 minutes, soaking for 24 hours followed by secondary soaking for 50 minutes and dehulling, grinding, and filtration.

The result of Sutedja *et al.* (2021) study revealed that significant increase of total phenolic content, total flavonoid content, kaempferol content, and DPPH free radical scavenging activity was observed towards jack bean seeds after 30 minutes of boiling at 95°C. This phenomenon may occur as a result of the penetration of bean matrix by heat, which leads to softening of the cell wall matrix and breaking of hydrogen bonds as well as ionic bonds between phenolic compounds and polysaccharide inside the bean, causing the release of phenolic compounds from the cell to allow easier extraction. However, a contrast

result was presented by Ezegbe *et al* (2023), in which boiling process for 20 minutes already resulted in significant decrease of phenolic, tannin, and L-DOPA in velvet bean seeds, where the decrease becomes higher the longer the boiling process was performed, as phenolic compounds are sensitive to heat and prone to degradation. The decrease of L-DOPA as a result of boiling process also occurs as a result of partial oxidation and changes of chemical properties within L-DOPA (Deli *et al.*, 2021).

Sutedja *et al.* (2021) and Oladunni *et al.* (2024) concluded that soaking process leads to decrease of total phenolic content, total flavonoid content, and kaempferol content of jack bean, which happens due to the leaching of phenolic and flavonoid components into the soaking water. Similar result also reported by another study, where phenolic content of velvet bean seeds underwent significant decrease after at least 24 hours of soaking (Ezegbe *et al.*, 2023). The value of phenolic compounds lost also increased as the length of soaking process increased. Another bioactive component that play role in antioxidant activity of velvet beans, namely tannin and L-DOPA, also underwent significant decrease as a result of soaking process. This phenomenon ultimately leads to the decrease of DPPH free radical scavenging activity value of both velvet bean and jack bean after soaking process.

The studies done by Sutedja *et al.* (2021), Oladunni *et al.* (2024), and Dimitry *et al.* (2022) showed that decrease of total flavonoid content, total phenolic content, and antioxidant activity were also observed as results of dehulling process of velvet bean and jack bean seeds during vegetal milk processing. The DPPH radical scavenging activity of velvet bean milk produced using whole bean flour was reported to be significantly higher compared to that of velvet bean milk made using dehulled bean flour, with the value of 233.6 – 299.9 mg Trolox/100 mL and 167.2 – 201.3 mg Trolox/100 mL respectively. This phenomenon might occur due to the presence of flavonoid, phenolic, and other antioxidant compounds in the skin of the seeds, that are also removed as a result of dehulling process.

Other process such as germination was reported to have no significant effect towards total phenolic content of velvet bean seeds, but it reduces L-DOPA content significantly. It was reported that secondary metabolism and production of bioactive compounds may occur as result of germination or sprouting process, and thus, resulting in alteration of these compounds inside the seed. Phenylpropanoid pathway that produces secondary metabolites in plants such as flavonoid, caffeic acid, and ferulic acid, involves activity of phenylalanine ammonia-lyase (PAL) activity that catalyzes deamination of phenylalanine into trans-cinnamic acid and ammonia. The reduction of L-DOPA content as a result of germination may be due to L-DOPA status as substrate for PAL activity (Dulce-Maria *et al.*, 2021; Hong *et al.*, 2021).

Additionally, fermentation process using *Rhizopus oligosporus* increases total phenolic content of velvet bean seeds, although it also reduces its L-DOPA content (Ezegbe *et al.*, 2023). Previous studies suggested that proteolytic enzyme activities take place during fermentation, that help release bound phenolic compounds into free phenolic, resulting in increased bioavailability. Other metabolic pathway might also take place during fermentation, that resulted in increase of phenolic compounds or the reduction of L-DOPA in beans (Liu *et al.*, 2022).

Conclusion

The seeds of velvet bean and jack bean are food sources that have high antioxidant potential that play roles in preventing the occurrence of chronic diseases to people that consumes it and thus, those beans deserve to be explored and utilized as alternative food sources. DPPH IC_{50} value of velvet bean was reported to be as low as 23.75 ± 0.44 ppm on its methanolic extract, indicating a very strong antioxidant capability. On the other hand, DPPH antioxidant capacity of jack bean was reported to be as strong as 19.42% on 100 µg/mL 70% ethanolic extract. Antioxidant capacities of velvet bean and jack bean are mostly

affected by their flavonoid and phenolic content. Furthermore, L-DOPA also plays significant role towards the antioxidant capacity of velvet bean seeds.

Pretreatments and processing treatments subjected to velvet bean and jack bean have potential to affect their phenolic and flavonoid content as well as antioxidant capacities. Soaking and dehulling can significantly reduce the phenolic and flavonoid content and ultimately, the antioxidant capacity of velvet bean and jack bean seeds, while fermentation can increase those values instead. On the other hand, L-DOPA content undergoes reduction when subjected to soaking, dehulling, cooking, germinating, and fermentation processes. This information may serve as considerations when applying said processes during production of velvet bean and jack bean based functional food in the future.

Supporting Information

There is no additional information regarding this article.

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Conflict of Interest

Authors declare no conflict of interest to disclose.

Author Contributions

Chandra compiled the data and wrote the manuscript, Pratiwi analysed the data, Retnaningsih revised the manuscript. All authors agreed to the final version of this manuscript.

Ethical Statement

There is no ethical statement needed for this work.

References

Deli, M., Nguimbou, R. M., Djantou, E. B., Tatsadjieu Ngoune, L., & Njintang Yanou, N. (2020). Bioactive compounds of velvet bean (Mucuna pruriens L.) seeds. *Bioactive Compounds in Underutilized Vegetables and Legumes*, 1-19.

Dimitry, M. Y., Therèse, B. A. M., Edith, D. M. J., Armand, A. B., & Nicolas, N. Y. (2022). Hypolipidemic and antioxidant effects of vegetal milk produced with Mucuna pruriens L. seed in rats fed a high-fat diet. *Heliyon*, *8*(11).

Diniyah, N., Alam, M. B., & Lee, S. H. (2020). Antioxidant potential of non-oil seed legumes of Indonesian's ethnobotanical extracts. *Arabian Journal of Chemistry*, *13*(5), 5208-5217.

Diniyah, N., Bulgis, U. M., & Marchianti, A. C. N. (2023). Antioxidant activity and phytochemical compositions of Mucuna pruriens L. in different conditions of time and temperature extraction. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1177, No. 1, p. 012042). IOP Publishing.

Dulce-María, D. A., Adrián, C. R., Cuauhtémoc, R. M., Ada-Keila, M. N., Jorge, M. C., Erika, A. S., & Edith-Oliva, C. R. (2021). Isoflavones from black chickpea (Cicer arietinum L) sprouts with antioxidant and antiproliferative activity. *Saudi journal of biological sciences*, *28*(1), 1141-1146.

Ezegbe, C. C., Nwosu, J. N., Owuamanam, C. I., Victor-Aduloju, T. A., & Nkhata, S. G. (2023). Proximate composition and anti-nutritional factors in Mucuna pruriens (velvet bean) seed flour as affected by several processing methods. *Heliyon*, *9*(8).

Hanum, I. Faridah and L.J.G Van der Maesen, "PROSEA : Plant Resources of South-East Asia 11, Auxiliary Plants", Prosea Foundation, Bogor, 1997.

Hong, P. Y., Huang, Y. H., Lim, G. C. W., Chen, Y. P., Hsiao, C. J., Chen, L. H., ... & Hsieh, L. S. (2021). Production of trans-cinnamic acid by immobilization of the Bambusa oldhamii BoPAL1 and BoPAL2 phenylalanine ammonia-lyases on electrospun nanofibers. *International Journal of Molecular Sciences*, *22*(20), 11184.

Iamsaard, S., Arun, S., Burawat, J., Yannasithinon, S., Tongpan, S., Bunsueb, S., Lapyuneyong, N., Choowong-in, P., Tangsrisakda, N., Chaimontri, C., & Sukhorum, W. (2020). Evaluation of antioxidant capacity and reproductive toxicity of aqueous extract of Thai Mucuna pruriens seeds. *Journal of Integrative Medicine*, *18*(3), 265-273.

Ishmayana, S., Malini, D. M., & Soedjanaatmadja, U. M. (2023). Nutritional content and the activities of l-Dopa (L-3, 4-dihydoxyphenyalanine) from Mucuna pruriens L. DC seeds of Central Java accession. *Arabian Journal of Chemistry*, *16*(1), 104390.

Jadhav, S. N., Nayyar, S., Hundal, J. S., & Singh, J. (2022). In-vitro evaluation of Mucuna pruriens seeds by nutritional and phytochemical analysis, assessment of antioxidant property and estimation of L-DOPA content by RP-HPLC. *Pharma Innov.*, *11*(1), 289-294.

Jimoh, M. A., Idris, O. A., & Jimoh, M. O. (2020). Cytotoxicity, phytochemical, antiparasitic screening, and antioxidant activities of Mucuna pruriens (Fabaceae). *Plants*, *9*(9), 1249.

Kumbhare, S. D., Ukey, S. S., & Gogle, D. P. (2023). Antioxidant activity of Flemingia praecox and Mucuna pruriens and their implications for male fertility improvement. *Scientific Reports*, *13*(1), 19360.

Liang, N., & Kitts, D. D. (2014). Antioxidant property of coffee components: assessment of methods that define mechanisms of action. *Molecules*, *19*(11), 19180-19208.

Liu, W., Dun, M., Liu, X., Zhang, G., & Ling, J. (2022). Effects on total phenolic and flavonoid content, antioxidant properties, and angiotensin I-converting enzyme inhibitory activity of beans by solid-state fermentation with Cordyceps militaris. *International Journal of Food Properties*, *25*(1), 477-491.

Oladunni, O. M., Olayinka, O. J., & Olalekan, O. (2024). Implications of dehusking and aqueous soaking on anti-nutrients, phytochemical screening and antioxidants properties of jack beans (Canavalia ensiformis L. DC). Journal of Research in Chemistry, 5(1): 135 – 142

Puspitojati, E., Muhammad Nur Cahyanto, Yustinus Marsono and Retno Indrati. (2019). Production of Angiotensin-I-Converting Enzyme (ACE) Inhibitory Peptides during the Fermentation of Jack Bean (*Canavalia ensiformis*) Tempe. *Pakistan Journal of Nutrition,* 18(5): 464-470.

Rahayu, N. A., Cahyanto, M. N., & Indrati, R. (2019). Pola perubahan protein koro benguk (Mucuna pruriens) selama fermentasi tempe menggunakan inokulum Raprima. *Agritech*, *39*(2), 128-135.

Ramli, N. A. M., Chen, Y. H., Zin, Z. M., Abdullah, M. A. A., Rusli, N. D., & Zainol, M. K. (2021). Effect of soaking time and fermentation on the nutrient and antinutrients composition of Canavalia ensiformis (Kacang Koro). In *IOP Conference Series: Earth and Environmental Science* (Vol. 756, No. 1, p. 012033). IOP Publishing.

Shelke, D. B., Tayade, S., Gawande, P., & Sonawane, H. B. (2022). GC-MS analysis and antioxidant potential of wild underutilized medicinally important legume, velvet bean (Mucuna pruriens L. DC.). *Notulae Scientia Biologicae*, *14*(1), 11098-11098.

Smartt, J., Nwokolo, E. “Food and Feed from Legumes and Oilseeds”. Springer US, Swiss, 2012.

Sowdhanya, D., Singh, J., Rasane, P., Kaur, S., Kaur, J., Ercisli, S., & Verma, H. (2023). Nutritional significance of velvet bean (Mucuna pruriens) and opportunities for its processing into value-added products. *Journal of Agriculture and Food Research*, 100921.

Sruthi D, Jayabaskaran C. (2024). Performance of Different Solvents and Extraction Methods on Therapeutic Potential of Mucuna pruriens (L.) DC. and Chemical Profiling of Screened Extract with Chromatography-Mass Spectrometry Approach. *Current Research in Complementary & Alternative Medicine*, 8: 237.

Sutedja, A. M., Yanase, E., Batubara, I., Fardiaz, D., & Lioe, H. N. (2020). Identification and characterization of α-glucosidase inhibition flavonol glycosides from jack bean (Canavalia ensiformis (L.) DC. *Molecules*, *25*(11), 2481.

Sutedja, A. M., Ito, A., Yanase, E., Batubara, I., Fardiaz, D., & Lioe, H. N. (2021). Influence of jack bean (Canavalia ensiformis (L) DC) milk processing on bioactive compounds and its antioxidant activity. *Food Science and Technology*, *42*, e11521.

Theansungnoen, T., Nitthikan, N., Wilai, M., Chaiwut, P., Kiattisin, K., & Intharuksa, A. (2022). Phytochemical analysis and antioxidant, antimicrobial, and antiaging activities of ethanolic seed extracts of four Mucuna species. *Cosmetics*, *9*(1), 14.

USDA. Jack Bean (*Canavalia ensiformis*) Plant Guide [Internet]. United States Department of Agriculture. 2013 [cited 7 April 2024]. Available from: https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_caen4.pdf.

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