Volume 11, Issue 3 (2023) pp. 164-171 **DOI**: 10.48309/ijabbr.2023.2002641.1441

Original Article

Moringa Leaves with Beneficial Secondary Metabolites

Jaya B. Puri | AbdulBasit Shaikh | Umesh Pravin Dhuldhaj *

Department of Biotechnology, School of Life Sciences, Swami Ramanand Teerth Marathwada University, Nanded 431606, India

*Corresponding Author E-mail: umeshpd12@gmail.com

Received: 2023-06-05, Revised: 2023-08-12, Accepted: 2023-08-18

Abstract

Background: Moringa originally belongs to India and later on it is taken up to different parts of the world. *Moringa oleifera* is well known ethnobotanical plant belongs to Moringaceae family of plants which is highly significant in Indian food. The immature pods, leaves are eaten as nutritious plant parts. Nowadays, this plant is of high importance in Indian market because of its medicinal and economical importance. Moringa is cultivated on large scale not only in India, but also all over the globe especially in warm countries.

Methods: In this study, it was found that this plant contains secondary metabolites which are present in all parts of the plants. The analysis of secondary metabolites has been done on shade dried leaves using soxhlet method with chloroform and water as the solvent of extraction.

Results: In the qualitative estimations of these extracts, we observed presence of secondary metabolites such as alkaloids, tannins, carbohydrate, cardiac glycosides, phenols, protein, amino acids, flavonoids, saponins, resins, terpenoids, coumarins, and quinons. During the quantitative estimation, we observed that plant contains optimum concentrations of alkaloids, flavonoids, and tannins in leaves. The higher amount of secondary metabolites indicates that this plant has anti-oxidative activity around 86.62 % with absorbance 0.13.

Conclusion: The plant Moringa contains numerous necessary components for the growth of human being such as nutrients, vitamins, and necessary elements. It can be a desired component of human diet.

Keywords: Moringa; Secondary metabolites; Antioxidant.

1. Introduction

Moringa (*Moringa oleifera*) is very common plant of India and pods of it used as the important food material and known by several names like drumstick, horsh radish tree, etc. belongs to family moringaceae [1].

It is originally belongs to Himalayan tracts of north India and having shoot height around 5-10 meter [2, 3]. The plant parts such as leaves, flowers, and pods are rich source of nutrients. Hence, it has a special place in Indian vegetables [4-6]. The majorly it contains the nutrients and elements such as β-

carotene, protein, vitamin C, calcium, and potassium [7, 8].

It also has therapeutic potential and used in the treatment of chronic diseases such as cancers, etc. and contains more than 40 sorts of natural anti-oxidants as well as higher amount of phenolic compounds hence, its crude extracts showing potent anti-oxidative properties [9]. It is an important ethnobotanical plant with bioactive potential such as antitumor, antipyretic, antiepileptic, anti-inflammatory, antiulcer, anti-diabetic, antioxidant, antifungal, and antibacterial properties [10]. It is to be reported that Moringa contains the bruceantin and maytansine with higher anticancer potential that can be used in conjugation of monoclonal antibodies for targeting tumor cells especially on pancreatic tumor cells [11].

Moringa is also rice source of β-sitosterol which helps to maintain cholesterol level in the blood serum and having greater anti-ulcer potential (1).

In this study, it was found that this plant contains secondary metabolites which are present in all parts of the plants. The analysis of secondary metabolites has been done on shade dried leaves by using soxhlet method with chloroform and water as the solvent of extraction. In the qualitative estimations of these extracts, we observed presence of secondary metabolites such as alkaloids, tannins, carbohydrate, cardiac glycosides, phenols, protein, amino acids, flavonoids, saponins, resins, terpenoids, coumarins, and quinons.

During the quantitative estimation, we observed that plant contains optimum concentrations of alkaloids, flavonoids, and tannins in leaves. The higher amount of secondary metabolites indicates that this plant is having anti-oxidative activity around 86.62 % with absorbance 0.13.

2. Materials and Methods

The plant material was obtained from local market and required chemicals were purchased from reputed chemical suppliers. The collected leaves of Moringa were shade dried and powdered by grinder. Fine powdered sample was further subjected soxhletion for the extraction of secondary metabolites using water and chloroform as the solvent. The obtained extracts were filtered and dried in rotary evaporator and stored in refrigerator till further use.
The obtained aqueous and chloroform extract were subjected to qualitative and quantitative estimations of secondary metabolites with their respective standards protocols. The presumptive metabolites are tested for qualitative estimations as per the protocol suggested by Kancherla *et al.* (2019) [9].

The test is conducted foralkaloids, tannins, carbohydrate, cardiac glycosides, phenols, protein, amino acids, flavonoids, saponins, resins, terpenoids, coumarins, and quinons. Furthermore, aqueous and chloroform extracts were screened for estimating flavonoids (colorimetric method), phenpols (Folin-reagent method), total tannins content [12], and antioxidant activity of crude extracts were measured by DPPH assay [13].

The quantitative estimations have been done of flavonoids [14], phenolics [15], and tannins [10].

3. Results and Discussion

The crude extract obtained after the soxhletion were screened for the presence of secondary metabolites by qualitative estimation method and we observed in aqueous extract of Moringa leaves contains higher amount of alkaloids while chloroform extract rich in alkaloids, carbohydrates, and cardiac glycosides.

The presence of flavonoids, phenols, amino acids, and saponins were detected in aqueous extracts and absent in chroroform extract. While chloroform extract rich in tannins, and also shows the presence of terpenoids, quinols, and resins which aqueous extract contains higher amount of coumarins (See Table 1 and Figure 1).

Table 1 Qualitative analysis of Moringa leaves in chloroform and aqueous extracts

Sr. No.	Compound	Aqueous Extract	Chloroform extract
1	Alkaloid	Highly positive	Highly positive
2	Carbohydrate	Negative	Highly positive
3	Cardic glycosidase	Slightly positive	Highly positive
4	Flavonoid	Positive	Negative
5	Phenol	Positive	Negative
6	Amino acid	Positive	Negative
7	Saponin	Positive	Negative
8	Tannin	Negative	Highly positive
9	Terpenoids	Negative	Negative
10	Quinols	Negative	Negative
11	Resins	Negative	Positive
12	Coumarins	Positive	Negative

The crude extract obtained after the soxhletion were screened for the presence of secondary metabolites by qualitative estimation method and we observed in aqueous extract of Morginga leaves contains higher amount of subjected to thin layer chromatography and silica column chromatography. In the present study, we estimated the concentrations of secondary metabolites of aqueous extract and observed that the flavonoid concentrations is around 26.66 µg/ml, phenols 11.30 µg/ml, and tannins are around 23.25 µg/ml (See Table 2 and Figures 2-7). DPPH activity is observed to around 86.62 % with absorbance 0.13. As the plant is having higher amount of secondary metabolites such as phenolics and alkaloids responsible for higher anti-oxidative potential.

Figure 1 Qualitative analysis of aqueous extract of Moringa leaves

Table 2 Quantitative analysis of aqueous extract of Moringa leaves

Sr. No.	Compound	Concentration
1	Flavonoid	26.66 µg/ml
2	Phenols	11.30 µg/ml
3	Tannins	23.25 µg/ml

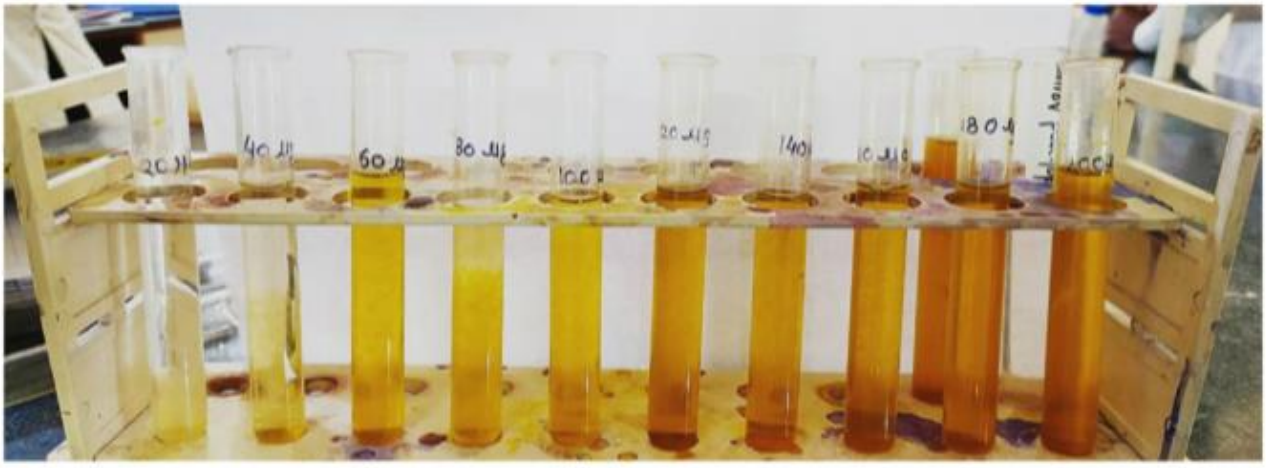

Figure 2 Estimation of flavonoid by comparing the standard compounds

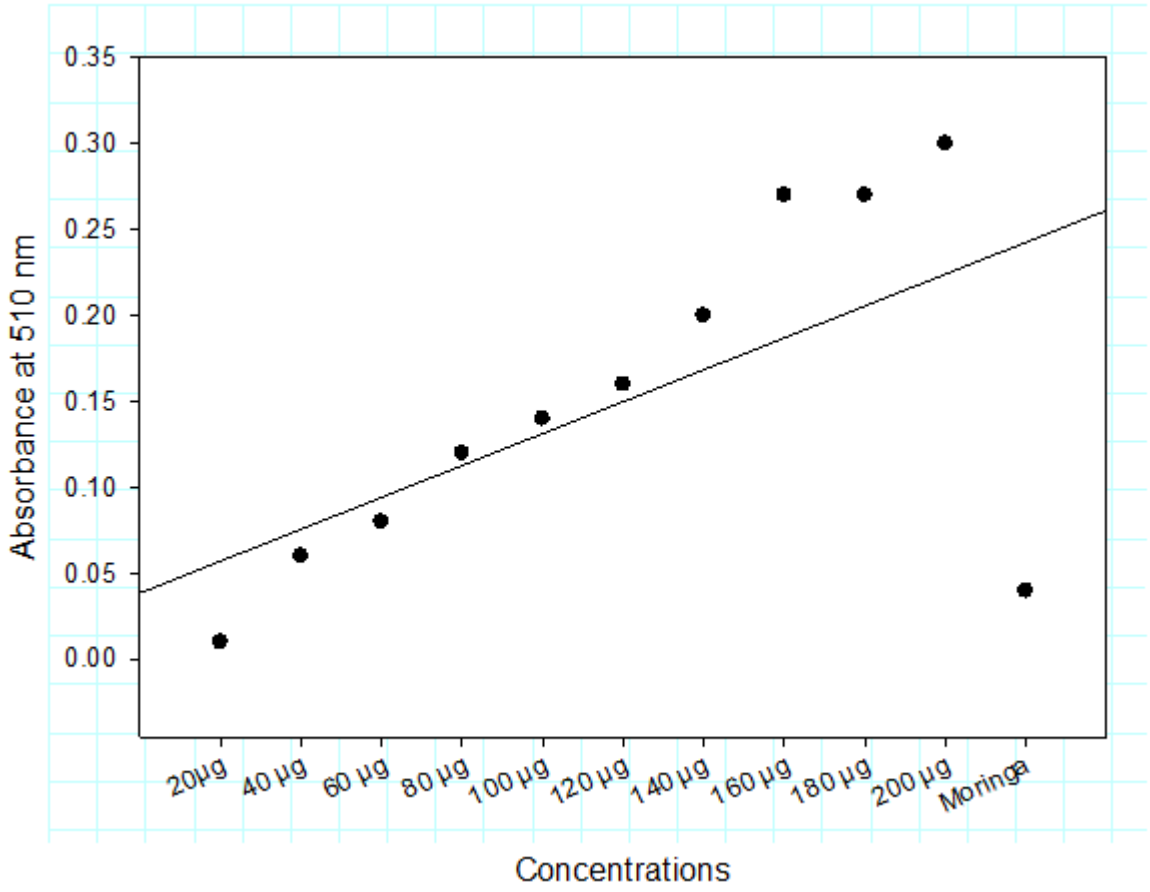

Figure 3 The standard graph of flavonoid for estimating unknown concentration in Moringa

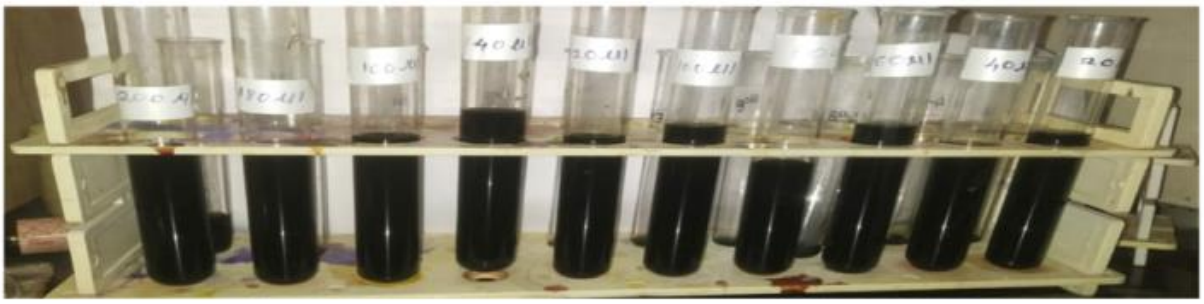

Figure 4 Estimation of phenol by comparing the standard compounds

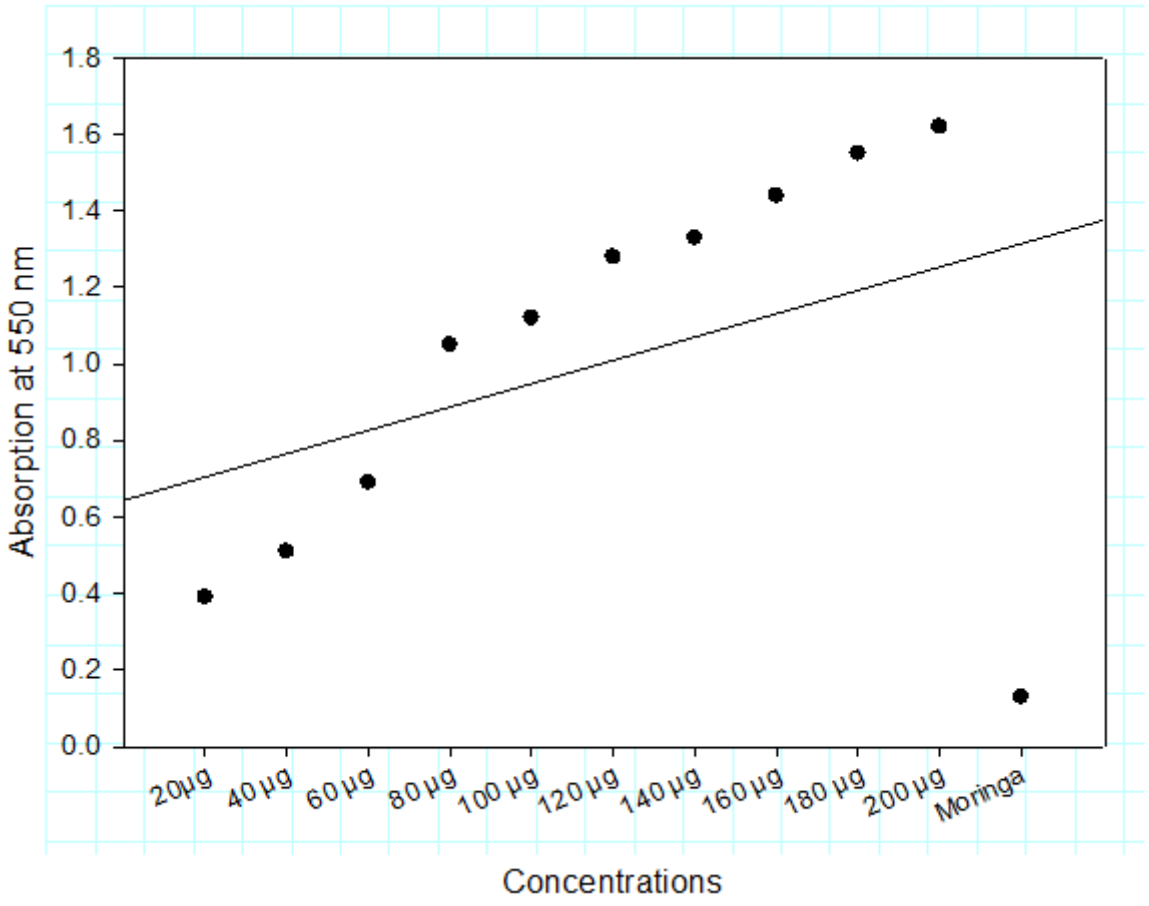

Figure 5 The standard graph of phenols for estimating unknown concentrations in Moringa

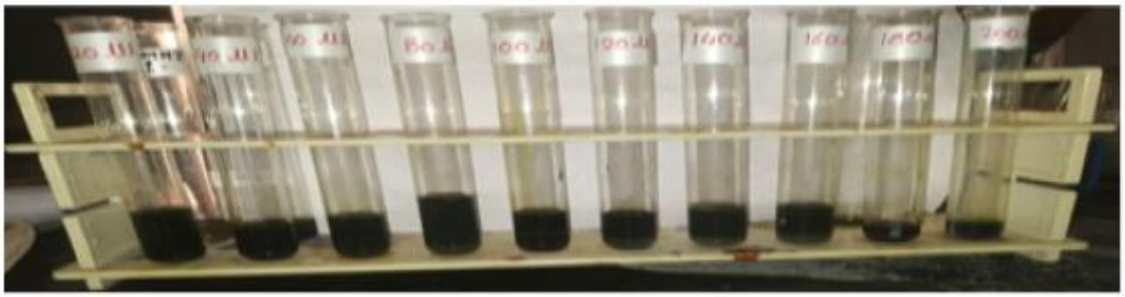

Figure 6 Estimations of tannins by comparing the standard compounds

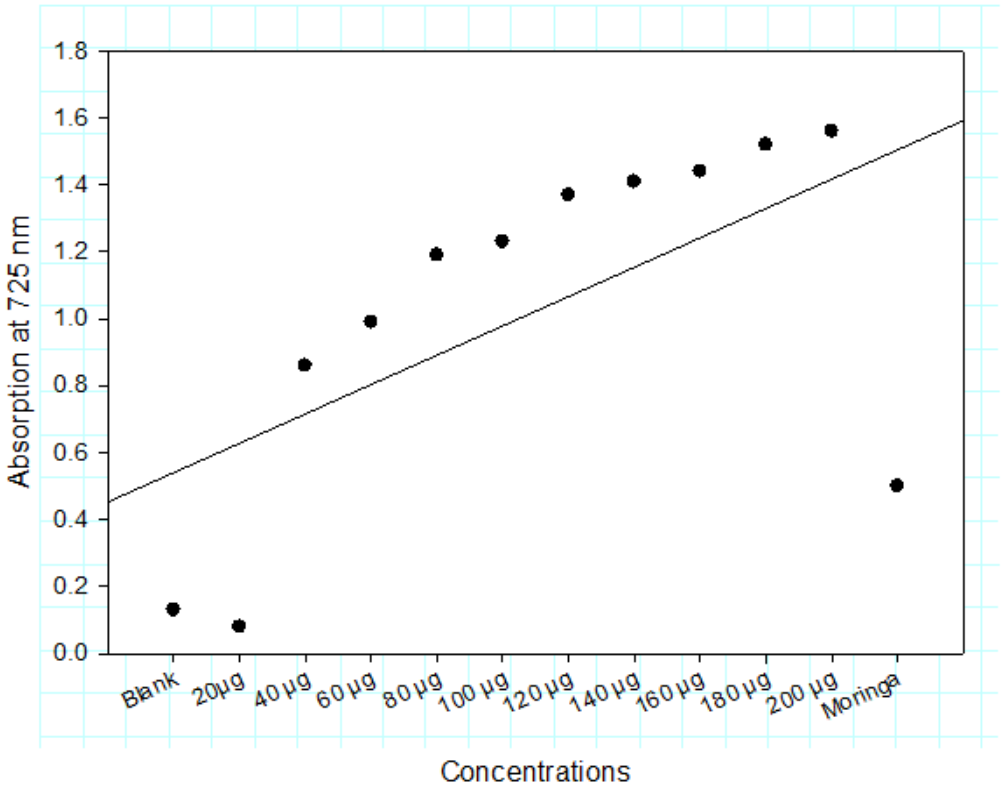

Figure 7 The standard graph of Tannins for the estimation of unknown concentrations in Moringa

Conclusion

Moringa oleifera is well known for its medicinal properties since ancient times, and also it is one of the nutritious vegetable. This plant is rich source of enormous amounts of minerals, elements, and especially secondary metabolites such as β-sitosterols. The major nutrients and elements belongs to this plants are β-carotene, protein, vitamin C, calcium, and potassium. This plant is also prominent for its anti-cancerous properties and the compounds bruceantin and maytansine are the potential anti-cancerous agents. It can be conjugated with monoclonal antibodies to target cancerous cells such as pancreatic tumor cells.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

ORCID

Jaya B. Puri
https://orcid.org/0009-0008-2473-6676
AbdulBasit Shaikh
https://orcid.org/0000-0003-3280-5981
Umesh Pravin Dhuldhaj
https://orcid.org/0000-0002-7439-4669

References

1. Abalaka ME, Daniyan SY, Oyeleke SB, Adeyemo SO. The antibacterial evaluation of Moringa oleifera leaf extracts on selected bacterial pathogens, *J Microbiol Res*; 2012; 2(2):1-4. [Crossref], [Google Scholar], [Publisher]
2. Anwar F, Ashraf M, Bhanger MI. Interprovenance variation in the composition of Moringa oleifera oilseeds from Pakistan, *J Am Oil Chem Soc*; 2005 Jan; 82(1):45-51. [Crossref], [Google Scholar], [Publisher]
3. Anwar F, Bhanger MI. Analytical characterization of Moringa oleifera seed oil grown in temperate regions of Pakistan, *J Agric Food Chem*; 2003 Oct 22; 51(22):6558-63. [Crossref], [Google Scholar], [Publisher]
4. Anwar F, Latif S, Ashraf M, Gilani AH. Moringa oleifera: a food plant with multiple medicinal uses. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives, 2007 21(1):17-25. [Crossref], [Google Scholar], [Publisher]
5. Cragg GM, Newman DJ. Plants as a source of anti-cancer agents, *J Ethnopharmacol*; 2005 Aug 22; 100(1-2):72-9. [Crossref], [Google Scholar], [Publisher]
6. D'souza J, Kulkarni AR (1993) Comparative studies on nutritive values of tender foliage of seedlings and mature plants of Moringa oleifera Lam. J Econ Taxon Bot 17:479–485. [Google Scholar], [Publisher]
7. Dillard CJ, German JB. Phytochemicals: nutraceuticals and human health, *J Sci Food Agric*; 2000 Sep 15; 80(12):1744-56. [Crossref], [Google Scholar], [Publisher]
8. Islam Z, Islam SM, Hossen F, Mahtab-ul-Islam K, Hasan MR, Karim R. Moringa oleifera is a prominent source of nutrients with potential health benefits, *Int J Food Sci*; 2021 Aug 10; 2021. [Crossref], [Google Scholar], [Publisher]
9. Kancherla N, Dhakshinamoothi A, Chitra K, Komaram RB. Preliminary analysis of phytoconstituents and evaluation of anthelminthic property of Cayratia auriculata (in vitro), *Maedica*; 2019 Dec; 14(4):350. [Crossref], [Google Scholar], [Publisher]
10. Kedare SB, Singh RP. Genesis and development of DPPH method of antioxidant assay, *J Food Sci Technol*; 2011 Aug; 48:412-22. [Crossref], [Google Scholar], [Publisher]
11. Mughal MH, Ali G, Srivastava PS, Iqbal M. Improvement of drumstick (Moringa pterygosperma Gaertn.)–a unique source of food and medicine through tissue culture, *Hamdard Med*; 1999; 42(1):37-42. [Google Scholar], [Publisher]
12. Noreen H, Semmar N, Farman M, McCullagh JS. Measurement of total phenolic content and antioxidant activity of aerial parts of medicinal plant Coronopus didymus, *Asian Pac J Trop Med*; 2017 Aug 1; 10(8):792-801. [Crossref], [Google Scholar], [Publisher]
13. Peri C, Pompei C. Estimation of different phenolic groups in vegetable extracts, *Phytochem*; 1971 Sep 1; 10(9):2187-9. [Crossref], [Google Scholar], [Publisher]
14. Shraim AM, Ahmed TA, Rahman MM, Hijji YM. Determination of total flavonoid content by aluminum chloride assay: A critical evaluation, *Lwt*; 2021 Oct 1; 150:111932. [Crossref], [Google Scholar], [Publisher]
15. Siddhuraju P, Becker K. Antioxidant properties of various solvent extracts of total phenolic constituents from three different agroclimatic origins of drumstick tree (Moringa oleifera Lam.) leaves, *J Agric Food Chem*; 2003 Apr 9; 51(8):2144-55. [Crossref], [Google Scholar], [Publisher]
16. Singh R, Verma PK, Singh G. Total phenolic, flavonoids and tannin contents

in different extracts of Artemisia absinthium, *J Complement Med Res*; 1970 Jan 1; 1(2):101. [Google Scholar], [Publisher]

17. Somali MA, Bajneid MA, Al-Fhaimani SS. Chemical composition and characteristics of Moringa peregrina seeds and seeds oil, *J Am* ***Oil*** *Chem Soc*; 1984 Jan; 61(1):85-6. [Crossref], [Google Scholar], [Publisher]

How to cite this article:
Jaya B. Puri, AbdulBasit Shaikh, Umesh Pravin Dhuldhaj*. Moringa Leaves with Beneficial Secondary Metabolites. *International Journal of Advanced Biological and Biomedical Research*, 2023, 11(3), 164-171.
Link: https://www.ijabbr.com/article_707207.html