Research Article

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PHARMACOGNOSTIC AND PHYTOCHEMICAL STUDY OF *LANTANA CAMARA* L. LEAF

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ABSTRACT

The world of flora is vast and immense, but unfortunately, known species of plants are getting endangered day by day due to improper collection and excessive usage. Many species of medicinal plants are unknown to the pharmaceutical industry and are widely utilised by folklore practitioners. So, it is necessary to evaluate and explore the therapeutic uses of such medicinal plants. Medicinal plants play an essential role in drug discovery. *Lantana camara* L. is a species of flowering shrub in the family Verbenaceae. It is an important medicinal plant with several medicinal uses in the traditional system of medicine. It has been used to cure many health problems in different parts of the world. Thus, it is necessary to explore the drug's identity through proper pharmacognostic and phytochemical analysis. Hence the present study was aimed at a pharmacognostic and phytochemical study on the leaf of *Lantana camara* L. The transverse section of the midrib shows the presence of an arch-shaped vascular bundle. The percentage of extraction yield was maximum in methanolic extract (24.36%). The drug's phytochemical study showed the presence of protein, carbohydrates, Gallo tannin, saponin, flavonoids, steroids, and phenols, and ash analysis revealed the presence of chlorides.

Keywords: *Lantana camara* L., phytochemical study, pharmacognosy

INTRODUCTION

The drug *Lantana camara* L. is a large scrambling evergreen shrub belonging to the family Verbenaceae. A native of tropical America, but now naturalized in many parts of India as a troublesome weed. It is a strong-smelling shrub with stout recurved prickles. Leaves are 5-10×2.5-5.5cm, ovate or elliptic ovate shape, acute at apex, cuneate-rounded or cordate at base, crenate, pubescent, opposite often rugose, scabrous on both sides. petioles are 1-1.2 cm long. Flowers in axillary, peduncled, capitate spike; Peduncle 5-6cm long, pubescent, broad above. Bracts: Ovate or narrow, 6mm long, lanceolate, hispid. Calyx: Membranous, 3 mm long. Corolla: Orange, red, tube up to 1 cm long, limb 6-8 mm across. Fruits are fleshy drupes, 5 mm in diameter, endocarp hard, green when young, and purple or black on ripening.[1-3]

The plant has a remarkable effect on folklore medicine. Mainly leaf of the plant is used by folklore practitioners, especially for inflammatory conditions. Pounded leaves and juice manage cuts, ulcers, and swellings, the decoction of leaves and fruits is used as a lotion for wounds, and for rheumatism, oil is spread on leaves and is warmed and applied on the affected part.

Even though folklore practitioners effectively use this drug in different disease conditions, there is a need for the proper standardization of the drug. Hence, the present study aimed to explore the pharmacognostic characters, preliminary phytochemical screening, and chromatographic analysis of the authenticated sample of the leaf of *Lantana camara* L.

MATERIALS AND METHODS

Collection of samples: Leaves of *Lantana camara* L. were collected from Moodbidri village of Dakshin Kannada, Karnataka, India, and were authenticated by Dr Subrahmanya Padyana, director of ATMA research centre Moodbidri. Herbarium number ATMA/AC/2021/02 of this plant was deposited in the ATMA research centre Moodbidri. The leaf was cleaned, dried in the shade, powdered, and stored in an airtight container for further study.

Pharmacognostic Study

Macroscopic evaluation: The external features of the test sample *Lantana camara* L. were documented. The organoleptic characters and photo documentation of the macroscopic characters were done.

Microscopic study: The specimen was cut into thin transverse sections using a sharp blade, and the sections were stained with safranin. The transverse sections were photographed using Zeiss AXIO trinocular microscope attached to a Zeiss Axio Cam camera under bright field light.

Physicochemical Study

Physical standards: The air-dried leaves of *Lantana camara* L. were powdered finely and subjected to various analyses such as determination of moisture content, determination of total ash, determination of acid insoluble ash, determination of water-soluble ash, water soluble extractive value, methanol soluble extractive, ethanol soluble extractive value, chloroform soluble extractive value, acetone soluble extractive value, petroleum ether soluble extractive value, and ash analysis.[4, 5]

Preliminary Phytochemical Study

Various extracts were subjected to preliminary phytochemical studies to know the presence of proteins, carbohydrates, tannins, saponins, flavonoids, steroids, alkaloids, triterpenoids, starch, resins, phenolics, and ellagic acid. The ash of the crude drugs was subjected to various chemical tests to find the components such as carbonates, fluorides, chlorides, sulphates, chromate, phosphate, potassium, sodium, aluminium, and calcium.[6]

Chromatographic Studies

HPTLC fingerprint profile: Water extract was analysed using CAMAG Automatic TLC Sampler 4 (ATS4). Stationary phase: material-HPTLC plates silica gel 60 F 254, Plate size 5.0×10.0 cm, developed in twin trough chamber (20×10cm) previously saturated with a mobile phase composed of ethyl acetate: methanol: formic acid: water (7.5:1.5:0.5:0.5). The examination was done at 250 nm, 366 nm, and 550 nm wavelength.

RESULTS

Pharmacognostic study

Macroscopic feature of the fresh leaf of *Lantana camara* L.: The leaves are simple opposite, decussate carried by a petiole. Ovate or ovate-oblong shape, 5-8 cm long and 3-5 cm wide, bright green in colour, truncated to subcordate at the base, acute or acuminate at the apex. Rough on the upper surface, finely hairy, with serrated margins.

Microscopy of *Lantana camara* L.: Microscopy of the transverse section of the leaf shows the upper epidermis, mesophylls, and lower epidermis. The arch-shaped vascular bundle is present in the midrib, and mesophyll is divided into two layers - the palisade layer and the spongy layer. It bears simple covering trichomes of various sizes and glandular trichomes with unicellular stalks.

Physicochemical study

Physicochemical constants like a loss on drying, total ash, acid insoluble ash, water soluble ash, and percentage of extractive values in polar and non-polar solvents are given in Table 1 and Table 2

Preliminary phytochemical analysis

The results of preliminary phytochemical studies and ash analysis are given in Table 3 and Table 4.

Chromatographic study

HPTLC densitometric scans were documented at 254 nm, 366 nm, and 550 nm. (Table 5, 6 and 7) and Figures 4, 5, and 6, HPTLC densitometric scans were documented at 254 nm, 366 nm, and 550 nm. (Table 5, 6 and 7) and Figure 4.

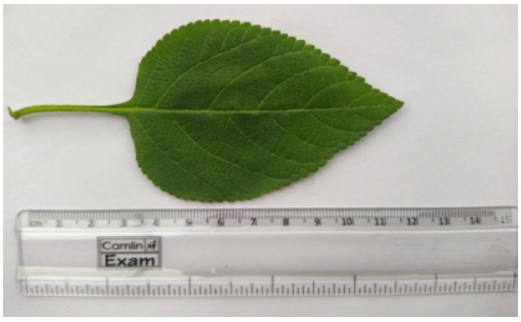


Figure 1: Leaf of *Lantana camara* L.

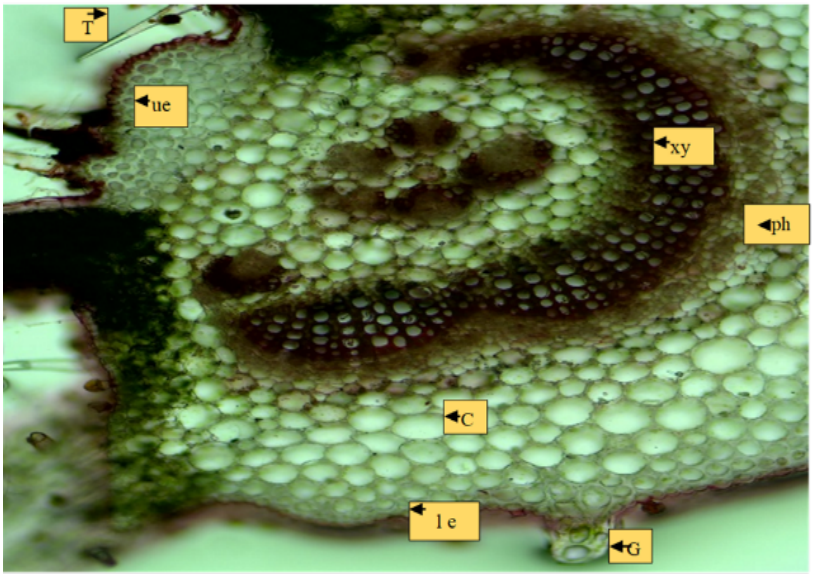


Figure 2: T.S of *Lantana camara* L. leaf showing xy-xylem, ph-phloem, le-lower epidermis, ue-upper epidermis, T-covering trichomes, G-Glandular trichome, C-collenchyma

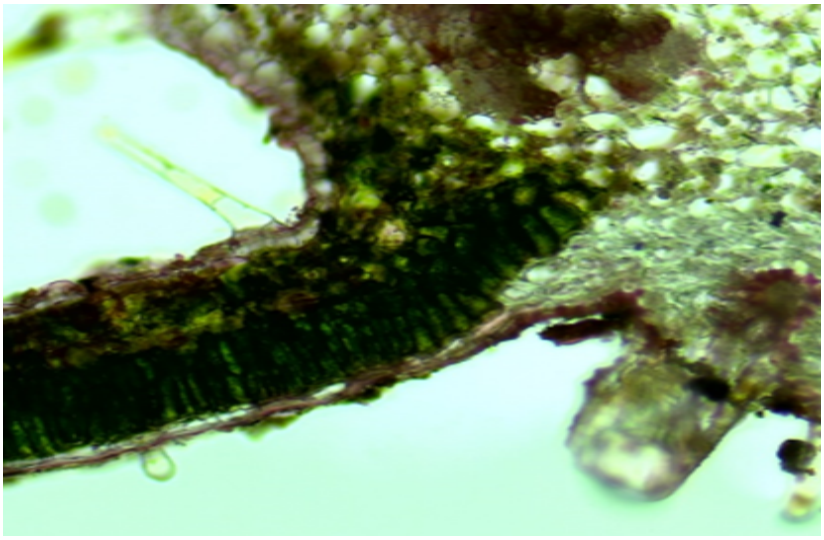


Figure 3: Palisade parenchyma

Table 1: Physical standards

Parameter	Results
Total ash	5.14%
Water soluble ash	4.74%
Acid insoluble ash	0.18%
Percentage of moisture content	74%

Table 2: Percentage of extractive values in polar and non-polar solvents

Solvents	Percentage of extract of *Lantana camara* L.
Water	20%
Ethanol	23.2%
Methanol	24.36%
Chloroform	1.92%
Petroleum ether	1.44%
Acetone	7.36%

Table 3: Preliminary Phytochemical analysis

Phytochemical analysis		Result
Proteins	Biuret's test	Present
	Million's test	Present
Carbohydrates	Benedict's test	Present
	Fehling's test	Present
	Molisch's test	Present
Tannins	Ferric chloride test	Presence of Gallo tannin
Saponins	Foam test	Present
Flavonoids	Shinoda test	Present
Steroids	Salkowski reaction	Present
Alkaloids	Dragendorff's test	Absent
	Mayer's test	Absent
Triterpenoids	Liebermann-Burchard's test	Absent
Starch		Absent
Resin		Absent
Ellagic acid		Absent

Table 4: Ash analysis

Ash analysis	Result
Test for Carbonates	Absent
Test for Fluorides	Absent
Test for Chloride	Present
Test for Sulphate	Absent
Test for Phosphate	Absent
Test for Potassium	Absent
Test for Sodium	Absent
Test for Aluminium	Absent
Test for Calcium	Absent
Test for Chromate	Absent

Table 5: HPTLC interpretation at 250 nm

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %
1	0.01	0.2	0.03	31.0	3.07	0.04	0.9	437.2	1.02
2	0.05	0.0	0.08	59.8	5.92	0.11	0.5	1316.0	3.06
3	0.12	0.3	0.16	110.8	10.97	0.21	0.2	3778.2	8.79
4	0.21	0.1	0.23	17.5	1.74	0.27	7.5	554.2	1.29
5	0.28	9.3	0.32	53.7	5.31	0.36	1.4	1881.8	4.38
6	0.39	2.9	0.43	13.2	1.30	0.44	11.2	365.4	0.85
7	0.50	37.0	0.60	207.9	20.58	0.64	85.7	11841.0	27.55
8	0.64	84.6	0.67	126.7	12.54	0.73	36.0	6382.6	14.85
9	0.74	37.3	0.77	45.3	4.48	0.80	24.6	1741.9	4.05
10	0.83	26.3	0.86	39.1	3.87	0.87	35.7	1015.8	2.36
11	0.87	36.1	0.94	305.4	30.22	0.99	2.2	13667.7	31.80

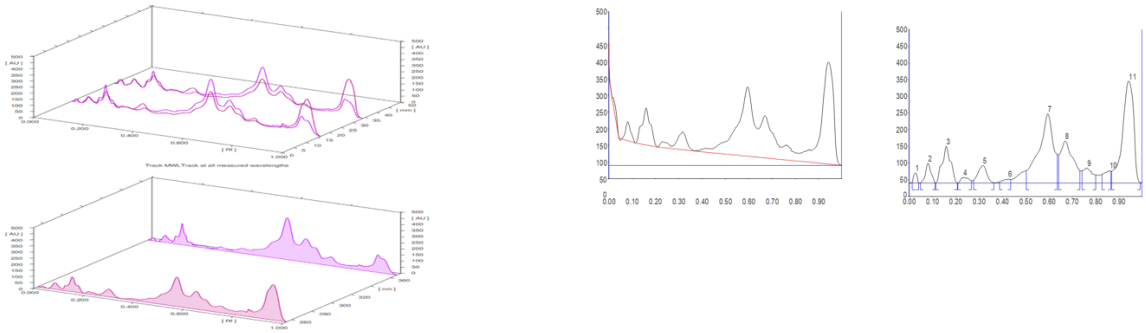


Table 6: HPTLC interpretation at 366 nm

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Analysis
1	0.01	0.0	0.02	24.1	1.78	0.03	3.3	290.5	0.60	Phenolics
2	0.04	5.2	0.07	58.5	4.32	0.09	25.2	1210.9	2.49	Carbohydrate/ bound carboxylic acid
3	0.10	13.9	0.14	174.5	12.90	0.16	28.2	3961.0	8.14	Carboxylic acid
4	0.17	30.4	0.17	33.7	2.49	0.18	9.4	363.4	0.75	Carbohydrate /bound carboxylic acid
5	0.23	17.8	0.23	18.0	1.33	0.24	8.2	181.1	0.37	Carboxylic acid
6	0.27	7.8	0.29	29.3	2.17	0.33	14.5	982.6	2.02	Bound carboxylic acid
7	0.35	20.1	0.38	41.0	3.03	0.40	35.1	1499.5	3.08	Amines of various molecular weight
8	0.44	51.0	0.56	343.1	25.36	0.59	139.6	19752.5	40.58	Amines of various molecular weight
9	0.61	134.0	0.64	194.3	14.36	0.66	129.4	7284.1	14.97	Carbohydrates
10	0.66	129.8	0.67	134.0	9.90	0.70	49.6	3239.6	6.66	Carboxylic acids
11	0.71	53.9	0.73	74.2	5.49	0.78	22.2	2634.0	5.41	Amines
12	0.84	27.9	0.85	42.4	3.13	0.86	37.4	616.8	1.27	Carbohydrates/bound carboxylic acid
13	0.86	38.7	0.86	41.2	3.05	0.87	30.0	318.4	0.65	Carbohydrates/bound carboxylic acid
14	0.89	38.8	0.93	144.8	10.70	0.97	45.3	6335.8	13.02	Carbohydrates/bound carboxylic acid

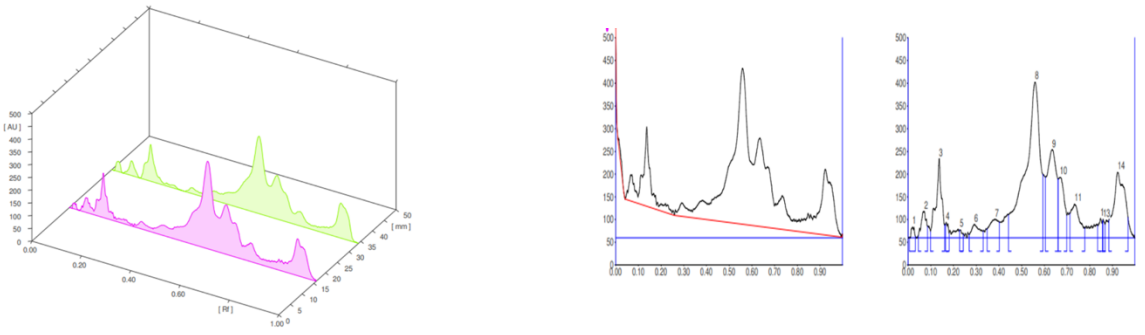
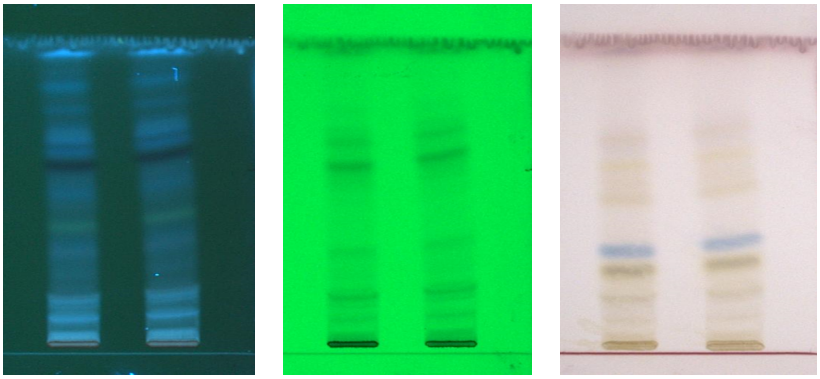


Table 7: HPTLC interpretation at 550 nm

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Analysis
1	0.01	0.5	0.02	19.2	2.60	0.04	0.4	248.7	0.84	Phenolics
2	0.04	0.1	0.07	44.1	5.95	0.11	14.5	1055.7	3.57	Phenolics
3	0.11	13.7	0.15	81.5	10.99	0.20	24.4	3196.5	10.82	Phenolics
4	0.20	23.6	0.25	205.9	27.78	0.28	70.3	7377.0	24.98	Amines
5	0.28	70.6	0.32	225.4	30.41	0.39	4.1	9013.6	30.52	Indoles
6	0.44	3.4	0.49	57.3	7.74	0.52	45.0	2496.1	8.45	Phenolics
7	0.52	45.0	0.53	47.7	6.43	0.57	35.7	1640.7	5.56	Phenolics(aldehyde/ ketone/alkaloids)
8	0.61	34.0	0.68	60.1	8.10	0.77	3.9	4503.0	15.25	Phenolics



254 nm **366 nm** **550 nm**

Figure 4: HPTLC Fingerprint of *Lantana camara* L.

DISCUSSION

Standardization is the need of the hour to establish the identity, purity, and safety of medicinal plants. The identification features of *Lantana camara* L.: It is a much-branched, erect, arching, or scrambling shrub. The stems are four-angled with short, stiff hairs and recurved prickles. The leaves are simple, opposite, and decussate with rough lamina.

Physicochemical analysis determines the nature of interactions between the components of the sample. Loss on drying indicates moisture and other volatile matter. And it plays a crucial role in stability, shelf life, and microbiological safety. The moisture content of *Lantana camara* L. was found to be 74%.

Ash value is essential in determining the quality, purity, and detection of adulteration in raw drugs. And these values are important for qualitative standards. It denotes the inorganic components and impurities present in drugs.

The total ash indicating total inorganic content was found to be 5.14%. Water-soluble ash was 4.74%, and acid-insoluble ash was 0.18%. It suggests that adulteration of the raw drug by substances such as silica, mud, etc., is significantly less. It has also been noticed that water-soluble ash content is more than acid-insoluble ash content.

Determination of extractive values helps evaluate the nature of chemical constituents present in the crude drug. The extractive value result of *Lantana camara* L. showed that different solvents resulted in different extraction yields. A higher extraction yield was observed in methanolic extract (24.36%), ethanolic extract (23.2%), and water extract (20%) compared to chloroform, acetone, and petroleum ether.

The present study contributes valuable information on bioactive compounds in *Lantana camara* L. Preliminary phytochemical investigation of the drug showed the presence of protein, carbohydrates, Gallo tannin, saponin, flavonoids, steroids, and phenols. Tannins have anti-inflammatory activity by inhibiting the production and the effect of inflammatory mediators[7]. The flavonoids from plant extract have been found to possess antioxidant, antimicrobial, and anti-inflammatory properties in various studies. And have a beneficial effect on inflammatory conditions due to their radical scavenging activities and interaction with enzyme function.[8] Flavonoids also modulate the function of inflammatory cells such as lymphocytes, natural killer cells, monocytes, neutrophils, mast cells, and macrophages. The significant ameliorative activity of the saponins may be due to the inhibition of the mediators of inflammation, such as histamine, serotonin, and prostaglandin, along with their antioxidant properties[9]. Phenolic compounds tend to act in a complimentary manner with NSAIDs, but some phenolic compounds can also inhibit proinflammatory mediator's activity or gene expression, such as cyclooxygenase. Phenolic compounds can also up or down-regulate transcriptional elements involved in antioxidant pathways, such as nuclear factors Kb (NF-Kb)[10].

Some evidence suggests that phytosterols may have anti-inflammatory activity. *In- vitro* studies showed inhibition of secretion of inflammatory markers such as interleukin-6 or tumour necrosis factor-alpha by monocytes[12]. Folklore people are effectively using the leaf of *Lantana camara* in inflammatory conditions. The anti-inflammatory action of the drug may be due to the presence of these components in the leaf. Ash analysis of *Lantana camara* L. leaves showed the presence of chlorides. Chloride is an essential electrolyte in the blood. It helps keep the amount of fluid inside and outside of human cells in balance. It also helps to maintain proper blood volume, blood pressure, and pH of the body fluids.

HPTLC showed the presence of carbohydrates, bound carboxylic acids, phenolics, amines of various molecular weights, indoles, aldehydes, ketones, and alkaloids.

CONCLUSION

Medicinal plants play an essential role in drug discovery. Recent studies have focused on drug discovery from unexplored ethnobotanical sources worldwide. *Lantana camara* L. is a well-known drug with various pharmacological properties. Owing to its ethnomedicinal importance, proper identification and evaluation are vital for drug development and preventing adulteration. The present study analysed the pharmacognostic characteristics which help identify the leaf of *Lantana camara* L. macroscopically and microscopically, along with the physical parameters, preliminary phytochemical analysis, and fingerprint profile.

REFERENCES

1. Sir JD Hooker, C.B, K.C.S.I, Flora of British India vol-4, Authority of the secretary of state for India in Council; 1984. p.562
2. K. Gopala Krishna Bhat, Flora of Udupi,1st edition, Indian Naturalist Udupi; 2003. p. 502
3. Lt. Colonel KR Kirtikar, Major BD Basu and An I.C.S., Indian medicinal plants, 2nd edition, vol-3, International book distributors; 2005. p. 1914.
4. Ayurveda Pharmacopeia of India, Part 2, Vol 1, The controller of publications, Ministry of H and FW, Dept of AYUSH;2004. p. 159
5. Ayurveda Pharmacopeia of India, Part 2, Vol 1, The controller of publications, Ministry of H and FW, Dept of AYUSH;2004. p. 160
6. Ayurveda Pharmacopeia of India, Part 2, Vol 1, The controller of publications, Ministry of H and FW, Dept of AYUSH;2004. p. 160
7. Sharma K, Kumar V, Kaur J, Tanwar B, Goyal A, Sharma R, Gat Y, Kumar A. Health effects, sources, utilization, and safety of tannins: A critical review. Toxin Reviews. 2019 Sep 13:1-3.
8. Serafini M, Peluso I and Raguzzini A. Flavonoids as anti-inflammatory agents. Proceedings of the Nutrition Society. 2010; 69(3): 273-278. DOI:10.1017/S002966511000162X
9. Desai SD, Desai DG, Kaur H. Saponins and their biological activities. Pharma Times 2009;41:13–16
10. Dulce L. Ambriz-Pérez, Nayely Leyva-López, Erick P. Gutierrez-Grijalva and J. Basilio Heredia | Fatih Yildiz (Reviewing Editor). Phenolic compounds: Natural alternative in inflammation treatment. A Review, Cogent Food and Agriculture. 2016;2:1. DOI: 10.1080/23311932.2015. 1131412
11. Elke A. Trautwein, and Isabelle Demonty. Phytosterols: natural compounds with established and emerging health benefits. Oléagineux, Corps gras, Lipides, 2014;14(5). DOI:10.1051/ocl.2007.0145

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