World Journal of Science and Research. 9 (2): 10-16 (2024)

ISSN: 2455 2208

Available online at http://www.harmanpublications.com

World Journal of Science and Research

Article Biotechnology

EVALUATION OF PHYTOCHEMICAL ANALYSIS AND *IN VITRO* ANTI-OBESITY PROPERTY OF *Delonix elata* LEAVES

Sushmitha M and Jayaramanathan V

Department of Biotechnology, JJ College of Arts and Science (Autonomous), Pudukkottai, Tamil Nadu

Received on 20th May. 2024; Revised on 30th May. 2024 Online 13th June. 2024

ABSTRACT

Plants have long been considered as a basis of medicines for different indigenous cultures around the globe. They continue as a prominent source of important phytoconstituents which exhibit significant biological activities. The present study aimed to investigate the phytochemical analysis and *in vitro* anti-obesity property of *Delonix elata* leaves. Phytochemical tests were performed on the plant, and 10 types of phytochemicals were identified. Ultraviolet–visible spectrophotometry was used to evaluate the active components and anti-obesity activity of *Delonix elata* proved by inhibition of lipase. Overall, it can be concluded from the present study that *Delonix elata* leaves contains rich source of phytochemicals and possess anti-obesity activity.

Keywords: *Delonix elata*, Phytochemicals, Ultraviolet–visible, anti-obesity

INTRODUCTION

Delonix elata Linn. is a medicinal plant belong to the family of Fabaceae, (Ghada and El-Hegazi, 2011), its common name is white gulmohar, the tamil name is vaadhana araayanana (Samvatsar and Diwanji, 1999). It is a small deciduous tree with about 2.5-15 m in height. This plant is used for the treatment of rheumatism, abdominal pains, anti-inflammatory and flatulence. The bark of this plant is considered as an antiperiodic and anti-inflammatory agent (Ghada and El-Hegazi, 2011). Ancient Indians have been using *Delonix elata*to to cure many ailments. The leaves are used for the treatment of mammary tumor, abscesses, pneumonia and infantile diarrhea (Khare, 2007). Medicinal plants contain medicinally important bioactive phyto compounds include tannins, alkaloids, carbohydrates, terpenoids, steroids, flavonoids and phenols are synthesized by primary or rather secondary metabolism of living organisms. These organic compounds are primary metabolites and Secondary metabolites. Secondary metabolites are chemically and taxonomically extremely diverse compounds with obscure function. They are widely used in the human therapy, veterinary, agriculture, scientific and clinical researches (Anup and Shivanandappa 2010).

The prevalence of obesity has been increasing worldwide, which has a great impact on lifestyle-related disorders such as coronary heart disease, atherosclerosis, and diabetes. Excess visceral abdominal fat accumulation appears to be a key feature of abdominal obesity contributing to the development of the metabolic syndrome. Therefore, preventing abdominal fat accumulation is an ideal option for the treatment

of obesity and related diseases. Plant and plant products play a wide range of biological properties. Plant produces these chemicals to protect itself but recent research demonstrates that many phytochemicals can protect humans against diseases. Keeping in view, the present study aimed to investigate the phytochemical analysis and anti-obesity activity of *Delanix elata* leaves extract.

MATERIALS AND METHODS

Collection of plant materials

The leaves of *Delanix elata* powder were purchase in May 2024 from Traditional medicine shops in Thanjavur, Thanjavur district, Tamil Nadu, India.

Preparation for extract

Take one gram of *Delanix elata* leaves powder in each extract prepared in 50 ml of aqueous and ethanol solvent, the extract shake it well for 30 minutes by free hand and wait for 24 hours. After extracts were filtered using whatman filter paper No.1 and filtrate used for further analysis.

Phytochemical screening

Chemical tests were carried out on the extract using standard procedures to identify the constituents as described by Sofowara (1993), Trease and Evans (1989) and Harborne (1973).

Quantitative analysis of phytochemicals Total phenols estimated by the method of Edeoga *et al*., (2005), Flavonoid determine by the method of Boham and Kocipai-Abyazan (1994)

Histochemical Tests (John Peter Paul, 2014; Gersbach *et al*., 2001). The powder of plant powder was treated with specific chemicals and reagents. The treated plant powder further analysed in light microscope. The plant powder treated with diluted ammonia and H_2SO_4 gave yellow colour indicates flavonoids. Plant powder treated with Toludine blue to gave Blue green/Red colour indicates the presence of polyphenol. Plant powder treated with Dinitrophenol hydrazine (few drops) to gave Orange colour indicates the presence of Terpenoids.

UV-Visible Spectroscopic analysis

The extracts were examined under visible UV-Visible spectrum. The extract was scanned in the wavelength ranging from 300-800 nm using Systronic Spectrophotometer. These solutions were scanned in turn at intervals of 5 nm and the characteristic peaks were detected. The peak value of the UV-Visible was recorded.

Thin layer chromatography

Thin layer of alumina or silica gel to which they are absorbed by different physical forces (Harborne, 1973).

Lipase inhibition assay

Antilipase activity carried out by Rashmi Shivanna *et al.,* (2017).

RESULTS AND DISCUSSION

Phytochemicals derived from the Greek word phyto, meaning plant. They are organically active, naturally occurring chemical compounds present in plants, which gives health benefits for humans more than those endorsed to macronutrients and micronutrients. Present study was carried out to screen qualitative analysis of phytochemicals in the leaf extract of plant. Table 1 represent the qualitative analysis of phytochemicals in *Delonix elate* extract. The phytochemical screening *Delonix elate* showed that the presence of tannin, saponin, flavonoids, steroids, terpeniods, anthroquinone, polyphenol, glycoside, coumarins in both extract while alkaloids was presence in ethanol extract.

Table 2 represent the TLC analysis of *Delonix elata* extract. The TLC analysis showed the rutin which was nearest to the Rf value of the standard. The present study was performed to evaluate the total content of phenols and flavonoids in *Delonix elata*. The highest amount present in the phenol followed by flavonoids. Table 3 represent the quantitative analysis of phytochemicals in *Delonix elata* extract.

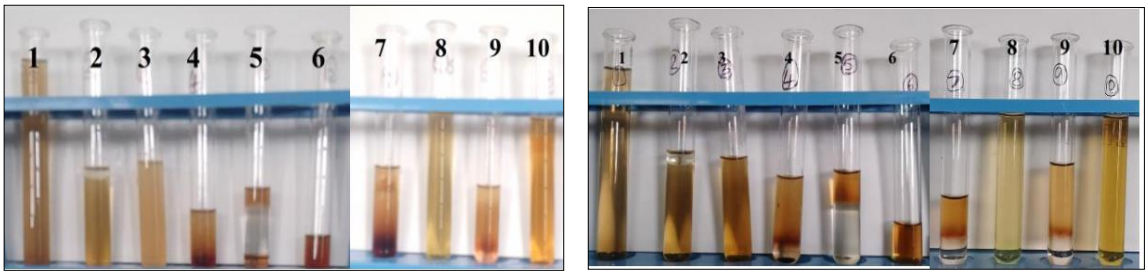
Anthraquinones present in plants are responsible for the regulation of immunity and play therapeutic role in autoimmune diabetes (Rastogi *et al.*, 2015). Anthocyanin possess anticancer and neuroprotective properties (Chien *et al.*, 2015). Phenolic compounds and phytosterol present in plants are responsible for antimicrobial, antiallergic, antidiabetic, antioxidant, anti-inflammatory, antimutagenic and anticarcinogenic properties (Khan *et al.*, 2015).

Glycosides play role in the anticoagulant activity and antitumor activity (Xiao, 2017). Terpenoids were well known for antibacterial, anti-inflammatory and anticancer properties (Chung *et al.*, 1998). Alkaloids were known to be possessing analgesic as well as antibacterial properties (Nassar *et al.*, 2010). The presence of saponins in plant is very important because of their anticancer, antifungal, antioxidant, antibacterial activity (Lira *et al.*, 2017).

Table 1: Qualitative analysis of Phytochemicals in *Delonix elate* extract

S. No	Phytochemicals	Extract	
		Aqueous	Ethanol
1	Tannin	++	++
2	Saponin	++	++
3	Flavonoids	++	++
4	Steroids	++	++
5	Terpenoids	+	++
6	Alkaloids	-	+
7	Antroquinone	++	+
8	Polyphenol	++	++
9	Glycoside	++	++
10	Coumarins	++	++

(+) Presence, (++) High concentrations and (–) Absences



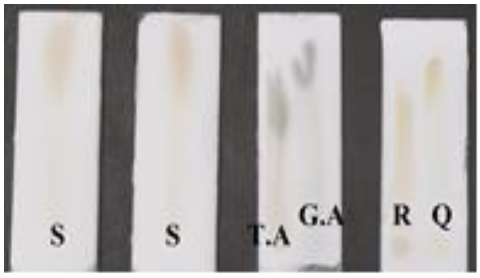
Aqueous extract **Ethanolic extract**

(1.Tannin, 2. Saponin, 3. Flavonoids, 4. Steroids, 5. Terpenoids, 6. Alkaloids, 7. Anthroquinone, 8. Polyphenol, 9. Glycoside and 10. Coumarins)

Plate 1: Qualitative analysis of Phytochemicals *Delonix elata* extract

Table 2: TLC analysis of *Delonix elata* extract

Sample	RF
Delonixelata 1	0.98
Delonixelata 2	0.98
Tannic Acid(T.A)	0.76
Gallic acid (GA)	0..87
Quercetin (Q)	0.67
Rutin (R)	0.81



(Sample, Sample, Tannic Acid, Gallic Acid, Rutin, Quercetin)

Plate 2: Identification of flavonoids using thin layer chromatography (TLC) from *Delonix elata* extract

Table 3: Quantitative phytochemical analysis of *Delonix elata* extract

S. No	Phytochemicals	Results (mg/gm)
1	Flavonoids	60
2	Total phenol	327.23

Values are expressed as mean ± SD for triplicates

Histochemistry is the study of identification and distribution of bioactive compounds within the biological cells, using stains, indicators and light microscopy and this analysis is important for the study of plant secretory structures whose classification is based, on the composition of their secretion. The leaf powder treated with with diluted ammonia and H_2SO_4 gave yellow colour indicates flavonoids. Plant powder treated with ferric chloride to give Dark blue to black indicates the presence of tannin. Plant powder treated with Toludine blue to give Blue green/Red colour indicates the presence of phenol. Plant powder treated with Dinitrophenol hydrazine (few drops) to give orange colour indicates the presence of Terpenoids (Table 4).

Table 4: Histochemical localization of phytochemicals in *Delonix elata extract* powder

S. No	Phytochemicals	Results
1	Tannin	++
2	Flavonoids	++
3	Polyphenol	++
4	Terpenoids	++

Note: (+) Presence; (++) present with high colour

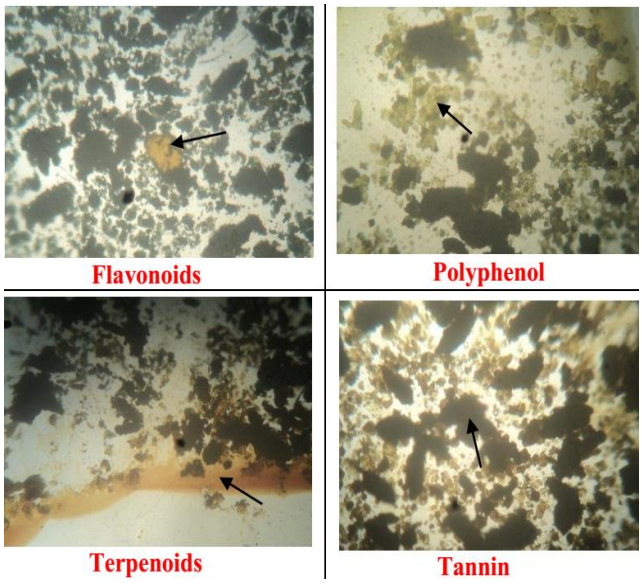


Plate 3: Histochemical analysis of powder in *Delonix elata* powder

The sample was scanned in the wavelength ranging from 340-800nm using Systronic spectrophotometer. These solutions were scanned in turn at intervals of 10 nm and the characteristic peaks were detected. The peak value of the UV-Visible was recorded. The UV spectrum profile showed the peaks at 340, 390 and 640 nm and identified phytochemicals are Flavonoids and their derivatives, Carotenoids, and chlorophyll respectively.

Table 5: UV visible spectrum analysis *Delonix elata* extract

S.no	Absorbance (Wavelength ranges)nm	Phyto chemical compounds (metabolites)
1.	340	Flavonoids and their derivatives
2.	390	carotenoids
3.	640	chlorophyll

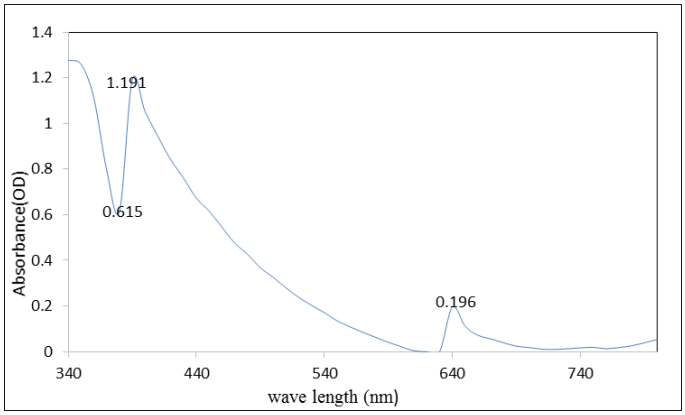


Figure 1: UV visible spectrum analysis *Delonix elata* extract

Pancreatic lipase (PL) is a key lipolytic enzyme in humans for the digestion and absorption of dietary fats. Thereby, PL is a well-recognized target in the management of obesity and its inhibition attracts the interest of researchers globally. The screening of new natural PL inhibitors as alternative strategy to the synthesis of chemical ones represents nowadays a hot topic in research. The main challenge in this matter is the lack of a universal analytical method allowing the monitoring of PL activity and the reliable quantification of lipid digestion products. Table 6 showed the dose dependent inhibition of lipase activity indicate the antiobesity activity of plant.

Table 6*: In vitro* anti-obesity activity of *Delonix elata*

Concentrations (µg/ml)	% of inhibitions	
	Delonix elata	**Std. (Orlistat)**
100	20.66±1.44	22.17±1.55
200	26.74±1.87	37.84±2.64
300	37.69±2.63	49.73±3.48
400	49.62±3.47	58.79±4.11
500	57.16±4.00	77.88±5.45

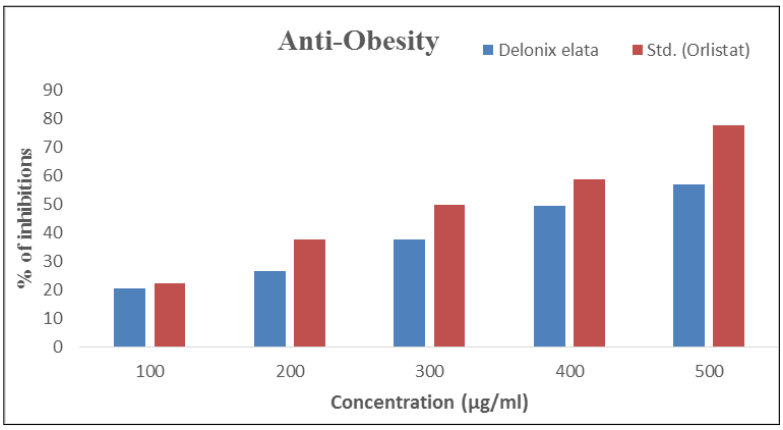


Figure 2: *In vitro* anti-obesity activity of *Delonix elata*

In the present scenario, obesity is the major public health problem with about 1.9 billion adults (18 years and older) worldwide are overweight and about 600 million of them are clinically obese (Centre, 2015). Obesity is characterized by increase in adipose cell size which is determined by amount of fat accumulated in the cytoplasm of adipocytes. This change in the metabolism in the adipocytes is regulated by various enzymes such as fatty acid synthase, lipoprotein lipase and adipocyte fatty acid-binding protein (Rosen *et al.*, 2000). Actually, various studies have shown that there is a positive correlation between the presence of tannin, flavonoid, and simple phenol compounds and inhibitory potentials on pancreatic lipase and α-amylase. Also, high levels of polyphenolic compounds have been shown to reduce the potency of α-amylase and lipase by either inhibiting or interacting with a specific component of these enzymes (Unuofin *et al.*, 2018). Sosnowska *et al.* (2016) revealed that herbal polyphenols are not necessary for lipase inhibition.

CONCLUSION

Overall, it can be concluded from the present study that *Delonix elata* leaves contains rich source of phytochemicals and possess anti-obesity activity. As herbs are natural products they are free from side effects, they are comparatively safe, eco-friendly and locally available. Traditionally there are lot of herbs used for the ailments related to different seasons. There is a need to promote them to save the human lives.

REFERENCES

Anup, S., & Shivanandappa, T (2010). Hepato protective effect of the root extract of *Decalepis hamiltonii* against carbon tetrachloride-induced oxidative stress in rats. Food Chemistry, *118*(2), 411-417.

Boham, B. A., & Kocipai-Abyazan, R. Flavonoids and condensed tannins from leaves of *Hawaiian vaccinium vaticulatum* and *V. calycinium. Pacific Sci., 48*, 458-463, 1994.

Centre, W. M. (2015). Obesity and overweigh. World Health Organization, 1-10.

Chien, S. C., Wu, Y. C., Chen, Z. W., & Yang, W. C. (2015). Naturally occurring anthraquinones: chemistry and therapeutic potential in autoimmunediabetes. *Evidence-Base d Complementary and Alternative Medicine*, *2015*(1), 357357.

Chung, K. T., Wong, T. Y., Wei, C. I., Huang, Y. W., & Lin, Y. (1998). Tannins and human health: a review. *Critical reviews in food science and nutrition*, *38*(6), 421-464.

Edeoga, H. O., Okwu, D. E., & Mbaebie, B. O. (2005). Phytochemical constituents of some Nigerian medicinal plants. *African journal of biotechnology*, *4*(7), 685-688.

Gersbach, P. V., Wyllie, S. G., & Sarafis, V. (2001). A new histochemical method for localization of the site of monoterpene phenol accumulation in plant secretory structures. *Annals of Botany*, *88*(4), 521-525.

Ghada, A., & El-Hegazi, M. (2011). *In vitro* studies on *Delonix elata* pL. an endangered medicinal plant. *World Appl. Sci. J*, *14*(5), 679-686.

Harborne J. B. (1973). Phytochemical Methods; A guide to modern techniques of plant Analysis.2nd Edition, London New York.

John Peter Paul J. (2014). Histochemistry And Fluorescence Analysis Of *Turbinaria Ornata* (Turner) J.Ag. –An Imp)ortant Brown Seaweed (Phaeophyceae). *Indian Journal of Plant Sciences*, *3* (1), 40-44.

Khan, H., Amin, H., Ullah, A., Saba, S., Rafique, J., Khan, K., & Badshah, S. L. (2015). Antioxidant and antiplasmodial activities of bergenin and 11-O-Galloylbergenin isolated from *Mallotus philippensis*. *Oxidative Medicine and Cellular Longevity*, *2016*(1), 1051925.

Khare, C. P. (2007). Indian Medicinal Plants-An illustrated Dictionary. *First Indian Reprint, Springer (India) Pvt*. Ltd. New Delhi, India, 717-718.

Lira, S. M., Canabrava, N. V., Benjamin, S. R., Silva, J. Y. G., Viana, D. A., Lima, C. L. S., & Guedes, M. I. F. (2017). Evaluation of the toxicity and hypoglycemic effect of the aqueous extracts of *Cnidoscolus quercifolius* Pohl. *Brazilian Journal of Medical and Biological Research*, *50*, e6361.

Nassar, E. Vianna, M. E., & Naidoo. (2010). Synthesis, (*in vitro*) antitumor and antimicrobial activity of some pyrazoline, pyridine, and pyrimidine derivatives linked to indole moiety. *J. Am. Sci*, *6*(8), 463-471.

Rashmi Shivanna., Hengameh Parizadeh., Rajkumar, H., & Garampalli. (2017). *In vitro* anti-obesity effect of macrolichens *Heterodermia leucomelos* and *Ramalina celastri* by

pancreatic lipase inhibitory assay. *Int j pharm pharm sci*, *9*(5), 137-140

Rastogi, R., Saxena, M., Sharma, S. K., Muralidharan, S., Beriwal, D. V. K., Singhal, P., & Shrivastava, R. (2015). Evaluation of Efficacy of Yagya Therapy on T2-Diabetis Mellitus Patients. *Proceedings of Industry Interactive Innovations in Science, Engineering & Technology (I3SET2K19)*.

Rosen, E. D., Walkey, C. J., Puigserver, P., & Spiegelman, B. M. (2000). Transcriptional regulation of adipogenesis. Genes Dev, 14, 1293-1307.

Samvatsar, S. And Diwanji, V.B. 1999. Plants used by the tribals of western M.P. *J. Econ. Taxon. Bot.* 23:305-314

Sofowara, A. (1993). Medicinal plants and Traditional medicine in Africa. Spectrum Books Ltd, Ibadan, Nigeria. p. 289.

Sosnowska, D., Podsędek, A., Kucharska, A. Z., Redzynia, M., Opęchowska, M., & Koziołkiewicz, M. (2016). Comparison of in vitro anti-lipase and antioxidant activities, and composition of commercial chokeberry juices. *Eur Food Res Technol*, *242*(4), 505–515.

Trease, G. E., & Evans, W. C. (1989). Pharmacognsy.11th edn. Brailliar Tiridel Can. Macmillian publishers.

Unuofin, J. O., Otunola, G. A., & Afolayan, A. J. (2018). In vitro α-amylase, α-glucosidase, lipase inhibitory and cytotoxic activities of tuber extracts of *Kedrostis africana* (L.) Cogn. *Heliyon*, *4*(9).

Xiao, J. (2017). Dietary flavonoid aglycones and their glycosides: Which show better biological significance?. *Critical reviews in food science and nutrition*, *57*(9), 1874-1905.