



Preliminary Phytochemical Screening, Quantitative Estimation of Total Phenolic & Flavonoid Content of *Jatropha gossypifolia* (L.)

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Received: 16-02-2020; Revised: 21-03-2020; Accepted: 28-03-2020.

ABSTRACT

The current work has been carried out for the screening of the phytochemicals and for estimating total phenolic and flavonoid content in *Jatropha gossypifolia* (L.). The plant is a native from Central and South America and is a member of the family Euphorbiaceae. It is a well-known ornamental and medicinal plant. Methanolic extracts of the leaves, flowers and fruits were selected for the study. The preliminary screening was done for alkaloids, tannins, terpenoids, glycosides, steroids, saponins, phenols and flavonoids. The total phenolic content (TPC) was determined by Folin-Ciocalteu method and the total flavonoid content (TFC) was determined by Aluminium chloride calorimetric method.

Keywords: *Jatropha gossypifolia* (L.), Phytochemical screening, Total Phenolic Content and Total Flavonoid Content.

INTRODUCTION

Jatropha gossypifolia (L.) plant is a native from Central and South America. The plant is a member of the family Euphorbiaceae. This shrub has purplish-red coloured leaves which are 16-19 cm long and 10-13 cm wide⁶. The plant bears unisexual small flowers with yellow centres. The pods are cherry like and bear seeds which are extremely poisonous³. *Jatropha gossypifolia* (L.) is well known as bellyache bush and pignut plant. The plant is rich in many chemical compounds such as alkaloids, phenols, terpenoids, lignoids and steroids⁸. These chemical compounds are responsible for the medicinal potential and the pharmacological activities of the plant. *Jatropha gossypifolia* (L.) plant has been used as a traditional medicinal plant since a long time⁷. The plant is cultivated widely as an ornamental plant. In India, traditionally *Jatropha gossypifolia* (L.) has been used for the treatment of diarrhoea and dysentery².

Plants are rich in many phytochemicals and out of these, phenols and flavonoids are universally found in plants. Phenols are responsible for pharmacological activities such as anti-oxidant, anti-mutagenic, anti-carcinogenic and they also have the capacity to modify the expressions of genes. Flavonoids are present in fruits, vegetables, nuts, stems, flowers, tea and honey and are responsible for the colours and flavours in them. Flavonoids are effective for the improvement of the blood circulation in the body. They have properties like anti-inflammatory, anti-spasmodic, anti-allergic and anti-microbial¹ and they protect the plants from abiotic and biotic stresses.

MATERIALS AND METHODS

a. Plant Material Collection:

Jatropha gossypifolia (L.) leaves, flowers and fruits were collected from Vatva area, Ahmedabad, Gujarat.

b. Preparation of the extracts:

Methanolic extracts of the three parts- leaves, flowers and fruits of *Jatropha gossypifolia* (L.) was prepared in a ratio of 1:1.

c. Chemical Requirements:

1. Chemicals for Preliminary Screening:

10% Lead acetate, 5% Ferric chloride, Bromine water, Chloroform, Conc. Sulphuric Acid, Conc. Hydrochloric acid, Metallic Magnesium, Copper acetate, 1N Hydrochloric acid.

2. Chemicals for Total Phenolic Content:

Folin-Ciocalteu, Sodium chloride, Gallic acid, Methanol, Distilled Water.

3. Chemicals for Total Flavonoids Content:

Quercetin, Aluminium chloride, Distilled Water, Sodium acetate.

4. Estimation of Preliminary Screening:

The phytochemical screening was carried out using the established standard procedures according to researcher⁷.

Table 1 Contains the test procedures and inferences for the various phytochemical constituents.

Table 1: Test Procedures and Inferences for the Phytochemical Screening of *Jatropha gossypifolia* (L.).

SR. No	Constituents	Test	Inference
1.	Alkaloids	Plant extracts were treated with 1N Hydrochloric acid, followed by addition of Wagner's reagent	Red or brown colour precipitate
2.	Flavonoids	Plant extracts treated with 5% Ferric chloride solution.	Blackish-red colour
3.	Phenols	To the plant extracts 5ml of water was added in a test tube and was vigorously shaken.	Formation of foam with persistence for 10 min.
4.	Saponins	Plant extracts was treated with 10% Lead acetate.	Yellow colour precipitate formation
5.	Tannins	Plant extracts were treated with 2 ml of Bromine water.	Buff colour formation
6.	Terpenoids	Plant extracts were treated with 5% Copper acetate solution.	Solution turns Emerald green
7.	Glycosides	Plant extracts were treated with 2 ml of Bromine water.	Solution turns Yellow in colour
8.	Steroids	Plant extracts were treated with chloroform, with addition of 2-3 drops of conc. H ₂ SO ₄ . (gradually releasing from the dropper through the inner surface of the test tube)	Red colour formation

Determination of Total phenolic content

Principle: Analysis of the total phenolic content was based on Folin-Ciocalteu method⁵.

Preparation for Standard: 5 mg Gallic acid was dissolved in 5 ml methanol.

Procedure for Total Phenolic content:

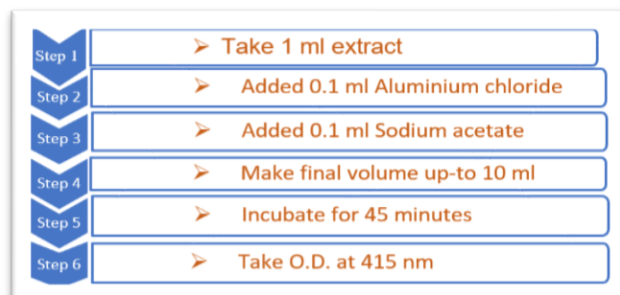
**Figure 1:** Process of estimation Total Phenolic content

Determination of Total flavonoids Content

Principle: The Total flavonoids content was determined by the Aluminium chloride calorimetric method with some modifications⁵.

Preparation for Standard: 5 mg Quercetin was dissolved in 5 ml methanol.

Procedure of Total Flavonoid Content

**Figure 2:** Process of estimation Total Flavonoid content

RESULTS

a. Phytochemical Screening: The result of the qualitative phytochemical screening is shown in Table 2.

Table 2: Phytochemical Screening of *Jatropha gossypifolia* (L.) various parts.

Sr. no.	Compound name	Test	Leaves	Flower	Fruit
1.	Alkaloids	Wegner's test	++	+	-
2.	Flavonoids	Ferric chlorite	++	++	+
3.	Phenols	Lead chloride	+	++	+
4.	Saponins	Foam test	+	+++	-
5.	Tannins	Bromine water	-	-	-
6.	Terpenoids	Copper acetate test	+++	++	+
7.	Steroids	Salkowski's test	-	-	-
8.	Glycosides	Bromine water test	-	-	-

Remark: (+) = present, (-) = absent

The Phytochemical screening of the leaf and the flower extracts displayed the presence of phenols, flavonoids, alkaloids, saponins, and terpenoids. The fruit extract showed the presence of phenols, flavonoids and terpenoids whereas saponins and alkaloids were found absent. Over all tannins, steroids and glycosides were found to be absent in all the three parts of *Jatropha gossypifolia* (L.).

b. Total Phenolic Content Estimation: Gallic acid was used as the standard compound. Different concentrations of Gallic acid were prepared and the absorbance was taken at 765 nm. The total phenolic content was expressed as gallic acid equivalent (GAE) mg/g. The equation obtained from the calibration curve was $y = 6.6133x + 1.104$ and $R^2 = 0.8913$ (Fig-3). Here, y is the gallic acid equivalent; x is absorbance and R^2 is coefficient value.

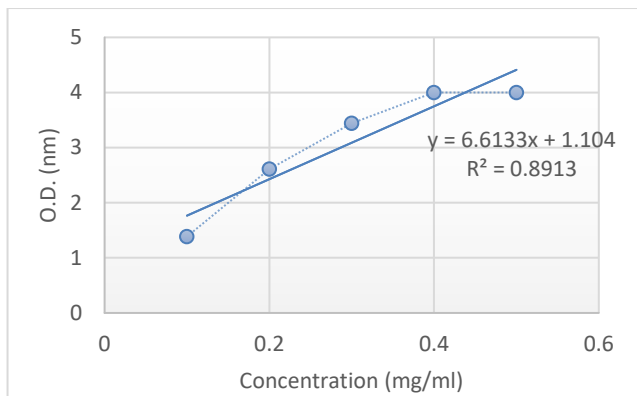


Figure 3: Calibration curve for Gallic acid (standard).

The total phenolic content of the three parts of *Jatropha gossypifolia* (L.), were expressed as gallic acid equivalent mg/g using the equation obtained from the standard curve. In the equation $y = 6.6133x + 1.104$, x is the absorbance (760nm); y is the total phenolic content in the extract of the leaf, flower and fruit (TPC). $R^2 = 0.8913$; here R^2 is coefficient value. Table 3 shows the variation of mean absorbance with concentration of Gallic acid.

Table 3: Total Phenolic Content in leaves, flowers and fruits of *Jatropha gossypifolia* (L.).

Concentration	Absorption at 765 nm		
	leaves	Flower	Fruit
0.1	0.213±0.006	0.300±0.095	0.913±0
0.2	0.237±0.015	0.320±0.010	0.223±0.01
0.3	0.283±0.006	0.393±0.006	0.243±0.01
0.4	0.320±0	0.473±0.012	0.280±0
0.5	0.357±0.006	0.540±0.010	0.303±0.01

value expressed as Mean ± Standard deviation

c. Total Flavonoids Content: Quercetin was used as the standard compound. Different concentrations of Quercetin were prepared and the absorbance was taken at 415 nm. The total flavonoid content was expressed as Quercetin equivalent (QE) mg/g. The equation obtained from the calibration curve was $y = 2.7233x + 0.1923$ and $R^2 = 0.9825$

(Fig-4). Here, y is the quercetin equivalent; x is absorbance and R^2 is coefficient value.

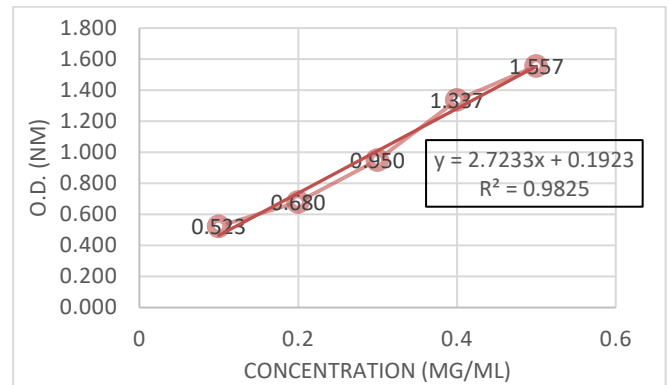


Figure 4: Calibration curve for quercetin (standard)

The total flavonoid content of the three parts of *Jatropha gossypifolia* (L.), were expressed as quercetin equivalent mg/g using the equation obtained from the standard curve. In the equation $y = 2.7233x + 0.1923$, x is the absorbance (415nm); y is the total phenolic content in the extract of the leaf, flower and fruit (TPC). $R^2 = 0.9825$; here R^2 is coefficient value. Table 4 shows the variation of mean absorbance with concentration of Quercetin.

Table 4: Total Flavonoid Content in leaves, flowers and fruits of *Jatropha gossypifolia* (L.).

Concentration	Absorption at 415 nm		
	leaves	Flower	Fruit
0.1	0.077±0.012	0.056±0.001	0.053±0.004
0.2	0.092±0.010	0.058±0.010	0.056±0.008
0.3	0.108±0.023	0.069±0.002	0.088±0.010
0.4	0.160±0.037	0.078±0.001	0.117±0.003
0.5	0.204±0.016	0.086±0.001	0.136±0.001

value expressed as Mean ± Standard deviation

DISCUSSION

Phytochemical Screening

Phytochemical screening of the leaves of *Jatropha gossypifolia* (L.) was performed by the authors^{4,7} using methanol, acetone, petroleum ether, chloroform and distilled water as solvents. The study resulted in the confirmation of alkaloids, flavonoids, tannins, glycosides and terpenoids in leaves in the methanolic extract. In the current study methanol was used as the solvent and alkaloids, flavonoids, phenols and terpenoids were found to be present whereas glycosides, steroids and tannins were completely absent in the leaves. The phytochemical screening of the flowers and fruits has not been reported by any author till date. It is found that both the parts i.e., the flowers and fruits have phenols and flavonoids present in them.



Total Phenolic Content and Total Flavonoid Content

Researcher⁵ reported the total phenolic content (TPC) and total flavonoid content (TFC) of the leaves in the methanolic extract as 0.458 mg/g and 0.358 mg/g. In the current study the TPC and TFC of the methanolic extract of the leaves was calculated as 0.357 ± 0.006 mg/g and 0.204 ± 0.016 mg/g respectively. The TPC and TFC of the flowers and fruits have not been reported previously by any author. In the present study the total phenolic content and total flavonoid of the flower was calculated as 0.540 ± 0.010 and 0.086 ± 0.001 respectively. The result of the TPC and TFC content of the fruits was calculated as 0.303 ± 0.01 and 0.136 ± 0.001 respectively. This study shows that the highest total phenolic content was in the flowers and the highest total flavonoid content was in the leaves of *Jatropha gossypifolia* (L.).

CONCLUSION

Jatropha gossypifolia (L.) plant is a member of Euphorbiaceae family. The plant is native from Central and South America. It is an ornamental as well as an important traditional medicinal plant. The therapeutic properties are due to the presence of various phytochemicals in the different parts of the plant. In the current study the phytochemical screening of the methanolic extract of the leaves and the flowers showed the presence of alkaloids, flavonoids, phenols, saponins and terpenoids. The fruit extract showed the presence of flavonoids, phenols and terpenoids whereas alkaloids, saponins, steroids, glycosides and tannins were found absent. The study for the total phenolic content showed the best result in the flower extract, whereas the total flavonoid content was best found in the leaf extract.

REFERENCES

1. Chitra Jain, Shivani Khatana and Rekha Vijayvergia, Bioactivity of secondary metabolites of various plants: a review; *IJPSR*; Vol. 10:2, 2019, 494-504.
2. Dabur R, Gupta, A, Mandal, TK, Singh, DD, Bajpai, V, Guray, AM, Lavekar, GS, Antimicrobial activity of some medicinal plants. *Afr. J. Tradit. Complement. Altern. Med.* 4:3, 2007, 313–318.
3. Félix-Silva J, Giordani, RB, da Silva-Jr, AA, Zucolotto, SM, de Freitas, FPM, *Jatropha gossypifolia* (L.) (Euphorbiaceae): a review of traditional uses, phytochemistry, pharmacology, and toxicology of this medicinal plant. *Evidence Based Compliment. Altern. Med.* 2014, 1–32.
4. Nwokocha, AB, Agbagwa, IO, Okoli, BE, Comparative phytochemical screening of *Jatropha* L. species in the niger Delta. research. *Journal Phytochem.* 5:12, 2011, 107–114.
5. Renu Mishra and Vijayta Sain., Quantitative Estimation of Total Phenolic & Flavonoid Compounds of Medicinal Plants *Jatropha gossypifolia* and *Tagetes erecta*. *World Journal of Pharmaceutical Research*, 7:1, 2017,1137-114.
6. Sabandar, C.W., Ahmat, N., Jaafar, F.M., Sahidin, I., Medicinal property, phytochemistry and pharmacology of several *Jatropha* species (Euphorbiaceae): A Review. *Phytochemistry*, 85, 2013, 7–29.
7. Vijayta Saini, Dr. Renu Mishra, Sikha Mandloi, Nishi Yadav, Analysis of the Phytochemical Content of *Jatropha gossypifolia* (L.); *Chemical and Process Engineering Research*, 1:35, 2015, 99-104.
8. Zhang XP, Zhang ML, Su XH, Huo CH, Gu YC, Shi QW, Chemical constituents of the plant from genus *Jatropha*; *Chemistry and Biodiversity*, 6, 2009, 2166-2183.

Source of Support: Nil, Conflict of Interest: None.

