Technoarete®
e-ISSN: 2583-3480
Technoarete Transactions on
Recent Research in Applied Microbiology and Biotechnology
Vol-2, Issue-1, February 2023

Biochemical Activities, *In Silico* Antifungal and Anticancer Activities of *J. Excisa*

Satish Kumar Kenar[1*], Dowluru SVGK Kaladhar[2]

[1]Research Scholar, Microbiology, Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur, Chhattisgarh, India
[2]Professor, Microbiology and Bioinformatics, UTD, Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur, Chhattisgarh, India
*Corresponding Author Email: kenarsatish506@gmail.com

Abstract

Jatropha excisa (family Euphorbiaceae) is an ornamental shrub that grows in subtropics and tropics regions. In the present work J. excisa flower oil has been extracted and conducted for phytochemical, antifungal and anticancer activities. The present experiment shows that J. excisa seed oil contains proteins, carbohydrates, fatty acids, terpenoids, tannins, cardiac glycosides, and saponins. The flower oil contains proteins, carbohydrates, fatty acids, phenols, cardiac glycosides, saponins and coumarins. The leaf ethanolic extract contains proteins, carbohydrates, phenols, terpenoids, cardiac glycosides and coumarins. The stem ethanolic extract contains carbohydrates, terpenoids, tannins, coumarins and flavonoids. The root ethanolic extract contains carbohydrates, phenols, tannins, coumarins and flavonoids. The in silico analysis shows gossipidien acid, gossipifan and gossypiline from Jatropha has good antifungal and anticancer activities.

Keywords

Anticancer activities, biochemical activity, flower oil, in silico antifungal, Jatropha.

INTRODUCTION

Drugs in barks, fruit bodies, seeds, flowers and other parts of the medicinal plants shows written documents that are preserved monuments from ancient times in healing several diseases [1]. Medicinal plants are commonly used in Sidda, Homeopathy, UNANI and Ayurveda systems of medicine [2].

The non-edible like Jatropha oils, residual like waste frying oils, coconut oil, corn oil, palm oil, olive oil, and other vegetable oils like acid oil from soybean soapstock are non-edible are used as fuels and are promoting a circular economy [3,4]. Different waste frying oil, raw materials like commercial sunflower and soybean oils, and acid oil from soybean soapstock, and pork fat are using to produce first- and second-generation biodiesel [5]. *Jatropha excisa* flower oil may promote as first- and second-generation biodiesel along with healthcare [6,7]. The present work on *Jatropha excisa* flower oil is applied for analysis of biochemical activities along with *in silico* anticancer and antifungal activities.

MATERIALS AND METHODS

Material Collection

Fresh seeds, flowers, root, stem and leaf of *J excisa* (Family: Euphorbiaceae) was collected and tested for Biochemical, antifungal and *in silico* anticancer activities.

Figure 1. *Jatropha excisa* seeds and flower

Oil/Sample Extraction

The seeds and flowers of *J excisa* were air-dried and were used for oil extraction. Oil extraction machine was used for the extraction process of oil. Leaf ethanolic extract, Stem ethanolic extract, Root ethanolic extract, seed ethanolic waste, and Flower ethanolic waste (Figure 2).

Figure 2. Samples and extracts

Phytochemical Screening

For Phytochemical screening, seven different sample were collected and perform biochemical tests from Seed oil, flower oil, leaf ethanolic extract, Stem ethanolic extract, Root ethanolic extract, seed ethanolic waste, and flower ethanolic waste.

Protein, Cardiac glycosides, Carbohydrate, Phenols, Fattyacids, Tannins, Saponins, Terpenoids, Phlobatanins, Coumarin, Flavonoids and Quinone are analyzed in the present experimentation.

To perform antifungal activity by zone method

The experimentation on antifungal activity by zone method was conducted based on protocol given by Kaladhar et al., 2023 [8].

Technoarete®
e-ISSN: 2583-3480
Technoarete Transactions on
Recent Research in Applied Microbiology and Biotechnology
Vol-2, Issue-1, February 2023

In silico docking activity

The oil extract collected from plants *jatropha* has been searched further compounds based on previous research based on the search result, the selected compound has been absorbed as gossipidien acid, gossipifan, gossypiline and n – demethyl ricinine. Few *Jatropha* seed compounds has been design as 3D molecule in mol format using chemSketch software (Figure 3).

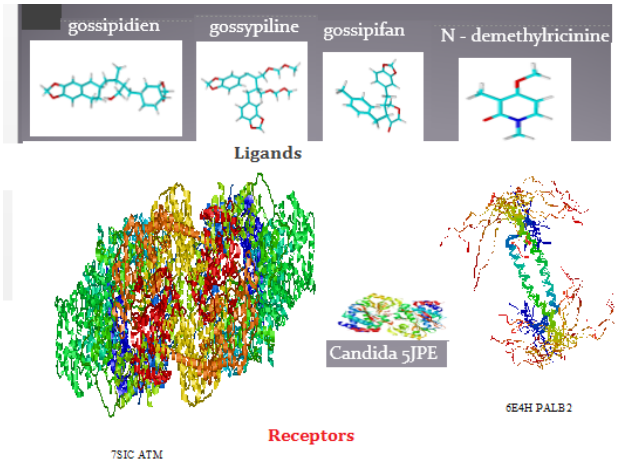

Figure 3. Molecules in present study

RESULTS AND DISCUSSUON

Previous experimentation on *Jatropha curcus oil* has promising antifungal effect on organisms like *Aspergillus niger* and *Penicillium glabrum* [9]. The *Jatropha* oil is commonly using in India to cure skin disease [10]. The compounds like jatrophone, spruceanol and jatrophatrione has shown antitumor effects [11].

Phytochemical activity

The Phytochemical screening of seven different sample were tested for Seed oil, Flower oil (Figure 4). Leaf ethanolic extract, stem ethanolic extract, root ethanolic extract, seed ethanolic waste, and flower ethanolic waste has been also analysed for phytochemical activity (Table 1).

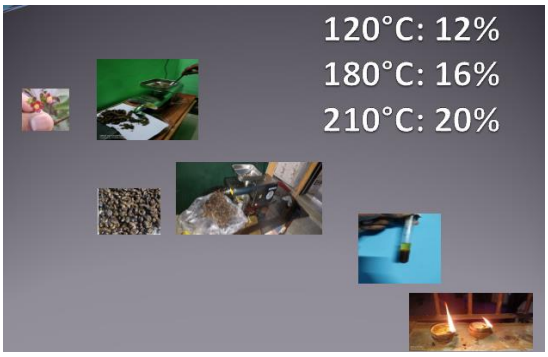

Figure 4. Process of oil extraction and % oil extracted

Test for Proteins

About 2 ml of the concerned sample mixed with 2 ml of Biuret reagent has showed appearance of violet color ring that indicates the presence of protein (Figure 5).

Figure 5. Protein identification

Test for Carbohydrate

About 2 ml of concerned sample mixed with 2 drops of Molisch's reagent and 2 ml of Conc. H_2SO_4 (drop by drop from the sides of the test tube), a reddish violet color ring appearance at the junction of two layers indicates the presence of carbohydrates (Figure 6).

Figure 6. Carbohydrate identification

Test for fattyacid

About 0.5 ml of concerned sample, add 5 ml of ether and allowed for evaporation on a filter paper and dried. The development of transparence on the filter paper indicates the presence of fattyacids (Figure 7).

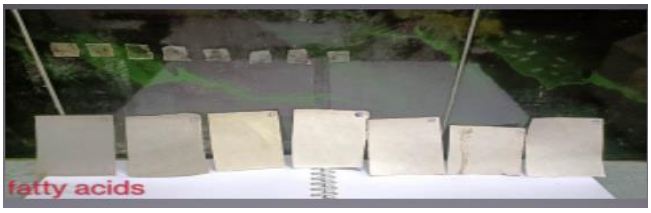

Figure 7. Fatty acid identification

Test for Phenol

When 2 ml of concerned sample mixed with 3ml of ethanol and a pinch of $FeCl_3$, formation of greenish yellow color solution shows the presence of phenols (Figure 8).

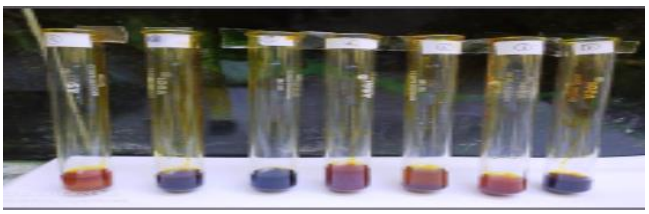

Figure 8. Phenol identification

Test for Terpenoid

When 2 ml of concerned sample added with 2 ml of chloroform and 3 ml of Conc. H_2SO_4, the formation of a monolayer of reddish brown coloration in the solution indicates presence of terpenoids (Figure 9).

Technoarete®
e-ISSN: 2583-3480
Technoarete Transactions on
Recent Research in Applied Microbiology and Biotechnology
Vol-2, Issue-1, February 2023

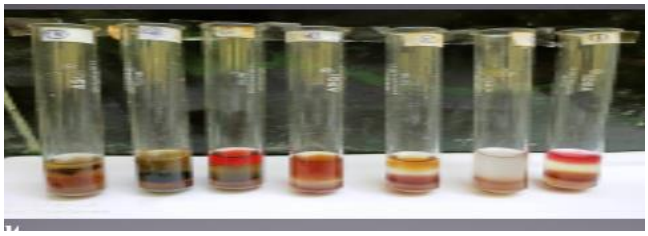

Figure 9. Terpenoid identification

Test for Tannins

When 5 ml of concerned sample added with few drops of 1% of lead acetate, formation of yellow colored precipitate in the test tube shows the presence of tannins (Figure 10).

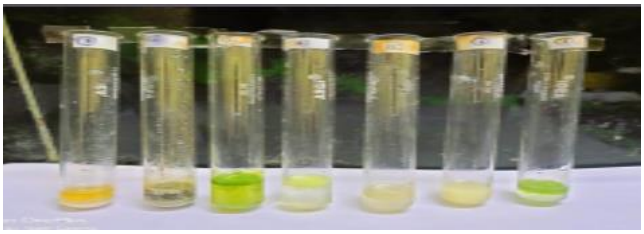

Figure 10. Tannin identification

Test for Phlobatinin

When 2 ml of concerned sample is added with 1% aqueous HCl and boiled for few minutes, a red colored precipitate formed or deposited in the test tube indicates presence of phlobatinins (Figure 10).

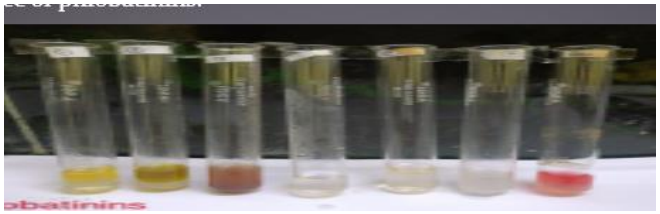

Figure 11. Phlobatinin identification

Test for Cardiac glycosides

When 5 ml of concerned sample is added with 2 ml of glacial acetic acid, one drop of ferric chloride solution and 1ml of Conc. H_2SO_4., a violet ring appearing under the brown ring indicates and a greenish ring might form further indicates presence of cardiac glycosides (Figure 12).

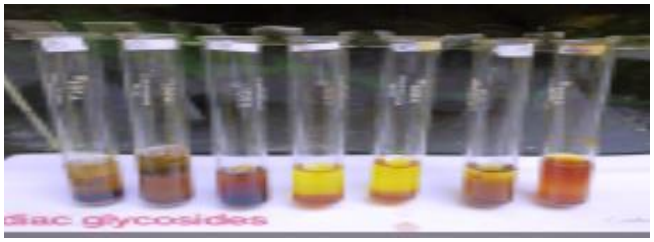

Figure 12. Cardiac glycosides identification

Test for Saponin

When 5 ml of concerned sample mixed with 20 ml of distilled water and kept in waterbath at 80°C for 15 minutes, development of 1cm layer of foam in the test tube observed presence of saponins (Figure 13).

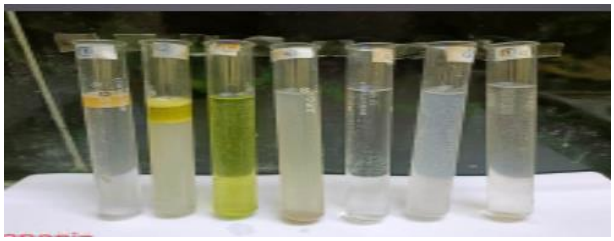

Figure 13. Saponin identification

Test for Coumarin

When 3 ml of 10% NaOH added with 2 ml of concerned sample, an yellow color solution formation in test tube indicates the presence of coumarins.

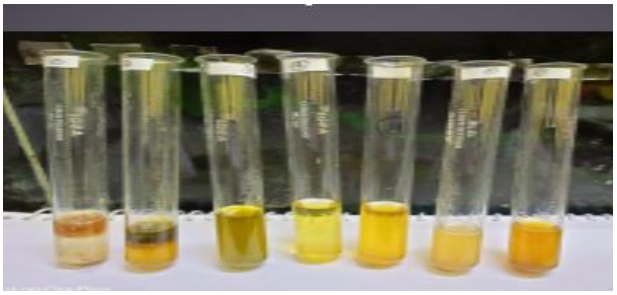

Figure 14. Coumarin identification

Test for Flavonoid

When 2ml of concerned sample added with 5 ml of dilute ammonia solution and a few drops of Conc. H_2SO_4, a yellow colored solution produced that confirmed the presence of flavonoids (Figure 15).

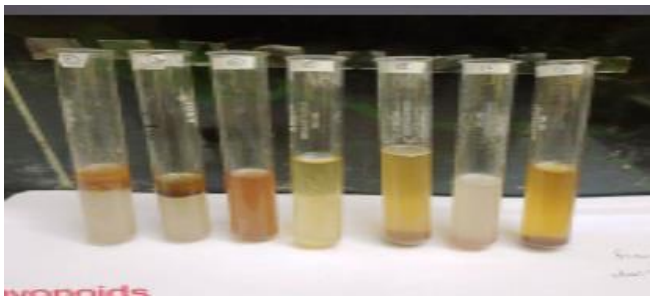

Figure 15. Flavonoid identification

Test for Quinone

When 2 ml of concerned sample added with 3 ml of Conc. HC, a green color solution formation indicates the presence of Quinone's (Figure 16).

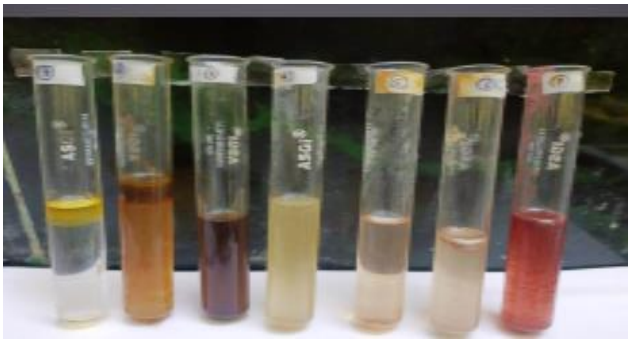

Figure 16. Quinone identification

Technoarete®
e-ISSN: 2583-3480
Technoarete Transactions on
Recent Research in Applied Microbiology and Biotechnology
Vol-2, Issue-1, February 2023

Table 1. Biochemical activity on *Jatropha excisa oil*

S.No	Biochemical compound	Seed oil	Flower oil	Leaf extract	Stem extract	Root extract	Seed waste	Flower waste
1.	Protein	+	+	+	-	-	-	+
2.	Carbohydrate	+	+	+	+	+	+	+
3.	Fattyacid	+	+	-	-	-	-	-
4.	Phenol	-	+	+	-	+	-	+
5.	Terpenoid	+	-	+	+	-	-	+
6.	Tannin	+	-	-	+	+	+	-
7.	Phlobatinin	-	-	-	-	-	-	+
8.	Cardiac glycosides	+	+	+	-	-	+	+
9.	Saponin	+	+	-	-	-	-	-
10.	Coumarin	-	+	+	+	+	+	+
11.	Flavonoid	-	-	-	+	+	-	+
12.	Quinone	-	-	-	-	-	-	-

Note: + means PRESENT; - means Absent

Test for Quinone

When 2 ml of concerned sample was added with 3 ml of Conc. HCl, green color solution formation indicates the presence of quinones (Figure 17).

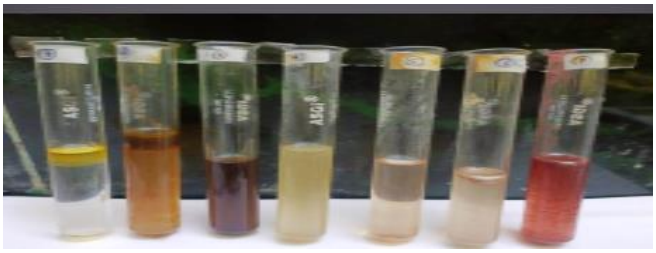

Figure 17. Quinone identification

Antifungal activity

The ethanolic extract of flower oil (12mm) has shown good activity compared with petroleum ether (11mm) with *Candida albicans*. The ethanolic seed oil (13mm) has shown good activity petroleum ether extract of flower oil (11mm) with *Candida albicans* (Table 2).

Table 2. Antifungal activity

Microorganism	Sample (zone in mm)				Standard
	Oil Flower		Oil Seed		Fluconazole
	E	PE	E	PE	
Candida albicans	12	11	13	11	20

***In silico* docking activity**

The *in silico* docking studies of gossipidien acid, gossipifan, gossypiline and n – demethylricinine from Jatropha species was analysed against Candida protein (5JPE). Gossypiline (-124 kcal/mol) has shown good activity followed by Gossipifan (-118.4kcal/mol) and Gossipidien (-108.7kcal/mol).

Table 3. *in silico* antifungal and anticancer activity

COMPOUND NAME	Fungi (Candida)	Cancer (ATM)	Cancer (PALB2)
Gossipidien	-108.7	-93.22	-94.41
Gossipifan	-118.4	-98.37	-87.91
Gossypiline	**-124**	**-108.74**	**-106.44**
N - demethylricinine	-77	-66.74	-64.26

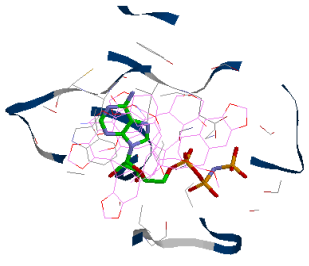

Figure 18. Interaction profile of ATM with selected molecules

The *in silico* docking studies of gossipidien acid, gossipifan, gossypiline and n – demethylricinine from Jatropha species was analysed against omcoprotein (ATM) (7SIC). Gossypiline (-108.74 kcal/mol) has shown good activity followed by Gossipifan (-98.37 kcal/mol) and Gossipidien (-93.22 kcal/mol) (Table 3 and Figure 18).

The *in silico* docking studies of gossipidien acid, gossipifan, gossypiline and n – demethylricinine from Jatropha species was analysed against omcoprotein (PALB2) (6E4H). Gossypiline (-106.44 kcal/mol) has shown good activity followed by Gossipidien (-94.41 kcal/mol).and Gossipifan (-87.91 kcal/mol).

N – demethylricinine has not shown good interaction antifungal or anticancer activity.

CONCLUSION

The search for plants with several medicinal properties continue to focus on scientific studies on plants, particularly on ethanobotanical significance, for a complete range of biochemical and biological activities that range from antifungal to anticancer properties. The present experiment shows that *J. excisa* seed oil contains proteins, carbohydrates, fatty acids, terpenoids, tannins, cardiac glycosides, and saponins. The flower oil contains proteins, carbohydrates, fatty acids, phenols, cardiac glycosides, saponins and coumarins. The leaf ethanolic extract contains proteins, carbohydrates, phenols, terpenoids, cardiac glycosides and coumarins. The stem ethanolic extract contains carbohydrates, terpenoids, tannins, coumarins and flavonoids. The root ethanolic extract contains carbohydrates, phenols, tannins, coumarins and flavonoids. The study also shown anti-candida activity and *in silico* anticancer activity with Seed and flower oil.

Acknowledgement

The authors thank the management of Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur (CG) for providing opportunity to conduct research (Ph.D No. 229/Acad/PhD2015-RDC-11/2021 and startup grant 206/Admin/2021 dated 3-7-2021).

Conflict of interest

There is no conflict of interest.

REFERENCES

[1] B. B. Petrovska, “Historical review of medicinal plants usage,” Pharmacognosy reviews, vol. 6 no. 11, pp. 1, 2012.
[2] S. G. Joshi, and S. G. Joshi, “Medicinal plants,” Oxford and IBH publishing, 2000.
[3] G. O. Ferrero, E. M. S. Faba, and G. A. Eimer, “Biodiesel production from alternative raw materials using a heterogeneous low ordered biosilicified enzyme as biocatalyst,” Biotechnology for Biofuels, vol. *14*, no.1, pp.1-11, 2021.
[4] A. Sanjid, H. H. Masjuki, M. A. Kalam, S. A. Rahman, M.J. Abedin, and S. M. Palash, “Impact of palm, mustard, waste cooking oil and Calophyllum inophyllum biofuels on performance and emission of CI engine,” Renewable and sustainable energy reviews, vol. *27*, pp. 664-682, 2013.
[5] G. O. Ferrero, E. M. S. Faba, and G. A. Eimer, “Biodiesel production from alternative raw materials using a heterogeneous low ordered biosilicified enzyme as biocatalyst”. Biotechnology for Biofuels, vol. 14, no. 1, pp. 1-11, 2021.
[6] M.A. Carriquiry, X. Du, and G. R. Timilsina, “Second generation biofuels: Economics and policies,” *Energy policy*, vol. *39*, *no*.7, pp. 4222-4234, 2011.
[7] M. Puri, R. E. Abraham, and C. J. Barrow, “Biofuel production: prospects, challenges and feedstock in Australia,” Renewable and Sustainable Energy Reviews, vol.16, no. 8, pp. 6022-6031, 2012.
[8] D. S. Kaladhar, S. K Kenar, S.Meesala, and S.Sahu, “Biofuel Production, Phytochemical Analysis and In Silico Analysis For Active Compound Valorization From Jatropha gossypifolia Seeds,” Journal of Pharmaceutical Negative Results, pp. 1555-1565, 2023.
[9] S. Srivastava, R. Kumar and A.Sinha, “Antifungal Activity of Jatropha curcas Oil Against Some Seed-borne Fungi,” Plant Pathology Journal, vol. 11, pp.120-123, 2012.
[10] N. Srinivasan, K. Palanisamy, and S. Mulpuri, “Jatropha: phytochemistry, pharmacology, and toxicology,” In Jatropha, Challenges for a New Energy Crop, Springer, Singapore, pp. 415-435, 2019.
[11] A. Kumar, and S. K. Tewari, “Origin, distribution, ethnobotany and pharmacology of Jatropha curcas,” Research Journal of Medicinal Plant, vol. 9, no.2, pp.48-59, 2015.