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Review Article on Phytochemical and Pharmacological Properties of *Tabebuia rosea* (Bertol.) D

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ABSTRACT

Tabebuiarosea (Bertol.) DC. is commonly known as "Pink Trumpet Tree" belonging to family *Bignoniaceae* were selected to study phytochemical screening and pharmacological properties. To study about taxonomical classification of *Tabebuia rosea* (Bertol.) DC. Alcoholic extracts of *Tabebuia rosea* contains various phenols, glycosides, flavonoids and aromatic compound. Ethanolic extract of flower of *Tabebuia rosea* contains lots of phytochemical which shows anticancer activity, larvicidal activity, etc. whereas ethanolic extract of leaf of *Tabebuia rosea* shows antibacterial activity. Hence extracts from different parts of *Tabebuia rosea* (Bertol.) DC shows various medicinal use and pharmacological activity of such as anticancer, antiulcer, antidiabetic, etc.

KEY WORDS *Tabebuiarosea* (Bertol.) DC, Taxonomy, phytochemicals,pharmacological properties, etc.

INTRODUCTION

Nature is the biggest source for lots ofmedicines. Now a day's numbers ofmodern drugs extracted from natural source. In the traditional days, different part of plants was used for various medicinal purposes. Natural products play major and important role in the development of drugs.[1] *Tabebuia rosea* (Bertol.) DC belonging to family is commonly known as "Pink Trumpet Tree" well known for its beautiful flowers. They are mostly found in tropical region. The phytochemical analysis of *Tabebuia rosea* shows the presence of phenols, flavonoids, sugar glycoside, heterocyclic quinoline, aromatic compound, etc. The timber is widely used for general construction in many European countries. [2,3] Tea made from the leaves and bark shows fever reducing effect. The herbal products obtained from the bark of *Tabebuia rosea* tree are knownastaheebo, lapacho, pandarco and iperoxo.[4]
A decoction of the cortex of the *Tabebuia rosea* utilized for anaemia and constipation. The flowers, leaves and roots also were used to reduce fever, pain, cause sweating, tonsil inflammation and many other disorders. A lapacholisa botanical product that has been isolated from *Tabebuia rosea* which is considered to be an anticancer drug and also recommended for anti-malarial and anti-panasomal effects. [7,8] The phytochemical found in *Tabebuiarosea* are generally used for treating cancer, ulcer, syphilis, gastrointestinal problem, diabetics, candidiasis, prostatitis, constipation and allergies.[4]

Image 1: *Tabebuiarosea* Flower

Image 2 : Tabebuiarosea Leaf

Image 3: Tabebuiarosea seed

TAXONOMIC CLASSIFICATION

Kingdom: Plantae
Sub Kingdom: Viridiplantae
Division: Tracheophyte
Sub division: Spermatophyte
Class: Magnoliopsida
Order: Lamiales
Family: Bignoniaceae
Genus: Tabebuia
Species: Rosea.[5]

Image 4: *Tabebuiarosea* fruit

Image 5: Tabebuiarosea Tree

TAXONOMIC DESCRIPTION

This plant is belonging to family *Bignoniaceae* is flowering plant. *Tabebuia rosea* can grow up to 15 meter and well known for its beautiful flowers. They are mostly found in tropical region. The fruits are green, long and bean pod-like with a length of 20-40 cm (8-16 inches). The fruits turn brown when ripe and contain flat, heart shaped seeds with tiny wings.[2] *Tabebuiarosea* is propagated by seed and can grow in moderate water.

Leaves: Leaves are oppositely arranged, palmately compound with 5 leaflets on each stalk. Leaflets are nearly 5 - 22cm by 2 - 11cm in dimension. Leaflets are elliptic in shape, with pointed ends.

Flowers: Flowers are trumpet shaped with 5 petals, nearly 5 - 8cm long, large and showy. They are polycarpic in habitat and pink in colour. They are thin and bilateral. Flowering period of *Tabebuiarosea* is hot and dry such as in moths of March, April, August and September.

Fruits: Fruits split open when matured. Mature fruits are yellow or golden in colour. They are dehiscent dry fruit.

Seeds: The seeds are attached to the central wall. Seeds have winged features, which are dispersed by wind.[6]

PHYTOCHEMICAL SCREENING

The leaf of *Tabebuiarosea* were washed in tap water and completely shade dried. Dried leaves are made into fine powder of 40 mesh size. 100gm of powder was filled in the thimble and extracted using 500ml ethanol in Soxhlet apparatus for 8-10 hours. The extract was filtered using Whatman No. 1 filter paper to remove all unextractable matter. The entire extract was dried and different concentrations are made for further process.[10] The flowers of *Tabebuia rosea* were extracted by similar process as leaf extraction.

Different parts of the *Tabebuiarosea* were extracted using alcoholic (ethanolic) solvent. GC-MS analysis of *Tabebuiarosea* showed presence of alkane, sugar glycoside, phenol, alkane ethanol, flavonoid, heterocycle quinoline, phenolic aldehyde, aromatic compound, coumarin, organo borane, epoxide, fatty alcohol, terpenoid, essential oil, aromatic carboxylic acid.

Phytocomponents identified in the ethanolic extracts of the whole plant of *Tabebuia rosea* by GC-MS are cyclopentane methyl, 1,6:2,3-dianhydro-4-o-acetyl-beta-d- allopyranose,3-hydroxy phenyl acetylene, cyclohexaneethanol,4-methyl-beta-methylene- trans, 4H-pyran-4-one,2,3-dihydr-3,5-dihydroxy-6-methyl, 7-quinolinol, cinnamaldehyde, benzene, 1-methyl-2-nitro, benzofuran, 2,3-dihydro, cyclohexane,1-ethyl-4-methyl,cis, 2- furancarboxaldehyde,5(hydroxymethyl), 9-borabicyclo(3.3.1)nonane, phenol,2-(2- methylpropyl), D-erythro pentose,2-deoxy, oxirane, hexadecyl-, 1-hexacosanol, santolina triene, 2-methyl benzoic acid.[3]

Table 1: The phytochemical profile of *Tabebuiarosea*

Phytochemicals	Presence/Absence
Alkane	+
Sugar glycoside	+
Phenol	+
Flavonoid	+
Heterocyclic quinoline	+
Phenolic aldehyde	+
Aromatic compound	+
Coumarin	+
Ester	-
Resin	-
Steroid	-
Phenolic acid	+
Sugar	+
Fatty alcohol	+
Epoxide	+
Essential oil	+

Table 1: Phytochemical compounds identified in the ethanolic extracts of *Tabebuiarosea* by GC- MS analysis.

No	Name of the compound	Molecular Formula	MW	Peak Area(%)
1.	**Cyclopentane methyl**	**C6H12**	**84.17**	**3.46**
2.	**1,6:2,3-dianhydro-4-o-acetyl-beta-d- allopyranose**	**C8H10O5**	**186.16**	**3.22**
3.	**3-hydroxy phenyl acetylene**	**C_8H_6O**	**102.13**	**1.44**
4.	**Cyclohexaneethanol,4-methyl-beta-methylene-trans**	**C10H16O**	**152.24**	**0.73**
5.	**4H-pyran-4-one,2,3-dihydro-3,5-dihydroxy-6- methyl**	**$C_6H_8O_4$**	**144.13**	**6.07**
6.	**7-Quinolinol**	**C_9H_7NO**	**145.16**	**6.01**
7.	**Cinnamaldehyde**	**C_9H_8O**	**132.16**	**2.42**
8.	**Benzene, 1-methyl-2-nitro**	**$C_7H_7NO_2$**	**137.14**	**1.79**
9.	**Benzofuran, 2,3-dihydro**	**C_8H_8O**	**120.15**	**3.18**
10.	**Cyclohexane, 1-ethyl-4-methyl,cis**	**C9H18**	**126.24**	**2.89**

11.	**2-Furancarboxaldehyde,5(hydroxymethyl)**	**$C_6H_6O_3$**	**126.11**	**19.39**
12.	**9-Borabicyclo(3.3.1)nonane**	**$C_8H_{15}B$**	**244.03**	**2.57**
13.	**Phenol,4-(2-methylpropyl)**	**C10H14O**	**150.22**	**5.41**
14.	**D-erythropentose,2-deoxy**	**C5H10O4**	**134.13**	**11.01**
15.	**Oxirane, hexadecyl**	**C18H36O**	**268.48**	**3.34**
16.	**1-hexacosanol**	**C26H54O**	**382.71**	**2.03**
17.	**Santolinatriene**	**C10H16**	**136.23**	**8.28**
18.	**2-methyl Benzoic acid**	**$C_8H_8O_2$**	**136.2**	**2.31**

Table 2: Activity of phytochemical compounds identified in the ethanolic extracts of *Tabebuiarosea* by GC-MS analysis.

No	Name of the compound	Compound Nature	Activity
1.	**Cyclopentane, methyl-**	**Alkane**	**Precursor for cyclopentane mono terpenoid synthesis**
2.	**1,6:2,3-dianhydro-4-o-acetyl-beta-d- allopyranose**	**Sugar glycoside**	**Preservative**
3.	**3-hydroxy phenyl acetylene**	**Phenol**	**Antibacterial**
4.	**Cyclohexaneethanol,4-methyl-beta-methylene- trans**	**Alkane ethanol**	**Antibacterial**
5.	**4H-pyran-4-one,2,3-dihydro-3,5-dihydroxy-6- methyl**	**Flavonoid**	**anti-proliferative**
6.	**7-Quinolinol**	**Heterocyclic quinoline**	**Metal chelator, antifung al**
7.	**Cinnamaldehyde**	**Phenolic aldehyde**	**Flavoring, anti-cancer, antimicrobe**
8.	**Benzene, 1-methyl-2-nitro-**	**Aromatic compound**	**Anthelmintic**
9.	**Benzofuran, 2,3-dihydro-**	**Coumarin**	**Anti-inflammatory, anti-diarrheal**
10.	**Cyclohexane, 1-ethyl-4-methyl,cis**	**Alkane**	**Antibacterial**
11.	**2-Furancarboxaldehyde,5(hydroxymethyl)**	**Aldehyde**	**Antimicrobial,**
			preservative
12.	**9-Borabicyclo(3.3.1)nonane**	**Organo Borane**	**Antimicrobial**
13.	**Phenol,2-(2-methylpropyl)-**	**Phenol**	**Antibacterial**
14.	**D-erythropentose,2-deoxy**	**Sugar**	**Preservative**
15.	**Oxirane, hexadecyl-**	**Epoxide**	**Adhesives**
16.	**1-hexacosanol**	**Fatty alcohol**	**Antibacterial**
17.	**Santolinatriene**	**Terpenoid essential oil**	**Cytotoxic, antifungal**
18.	**2-methyl Benzoic acid**	**Aromatic carboxylic acid**	**Antimicrobial**

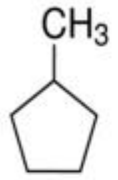

Figure 1: Methyl cyclopentane

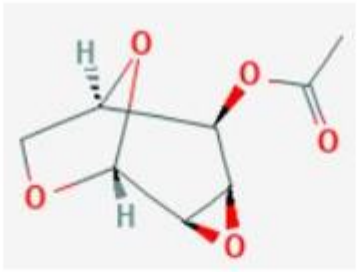

Figure 2: 1,6:2,3-dianhydro-4-o-acetyl-beta-d-allopyranose

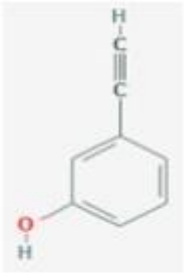

Figure 3: 3-hydroxy phenyl acetylene

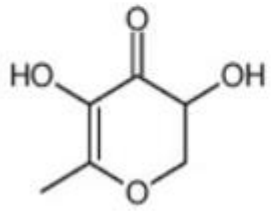

Figure 4: 4H-pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl.

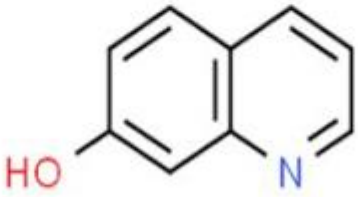

Figure 5: 7-Quinolinol

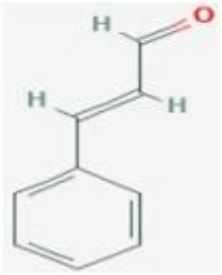

Figure 6: Cinnamaldehyde

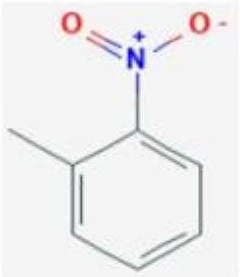

Figure 7: 1-methyl-2-nitro benzene

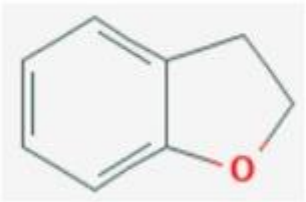

Figure 8: 2,3-dihydro-benzofuran

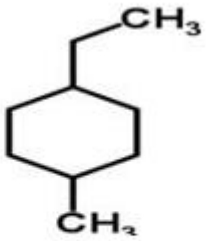

Figure 9: 1-ethyl-4-methyl cyclohexane

Figure 10: 2-Furan-carboxaldehyde 5(hydroxymethyl)

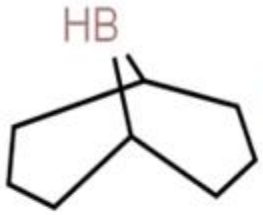

Figure 11: 9-Borabicyclo (3.3.1) nonane

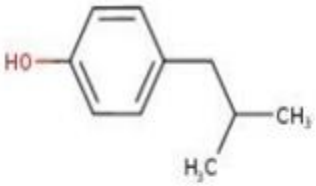

Figure 12: Phenol 2-(2-methylpropyl)

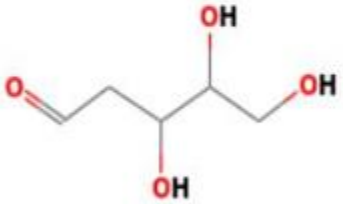

Figure 13: D-erythropentose, 2-deoxy

Figure 14: hexadecyl oxirane

Figure 15: 1-hexacosanol

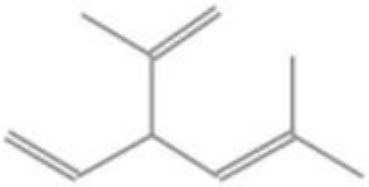

Figure 16: Santolina

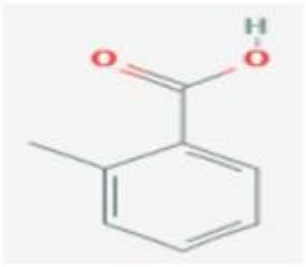

Figure 17: 2-methyl benzoic acid

Structure of active constituent

PHARMACOLOGICAL ACTIVITY

Anti-cancer activity

Cancer is an abnormal type of tissue growth in which the cells exhibit an uncontrolled division, relatively in an autonomous fashion, leading to a progressive increase in the number of dividing cells. Cancer is the one of the ailments which cannot be completely subdued by chemotherapy. The

flower of *Tabebuiarosea* was tested for its anticancer activity against liver cancer HePG2 cell line by MTT assay. The CTC_{50} value of the sample was 205.3µg/ml against liver cancer HePG2 cell lines.[9]

Table 3: The CTC50 values of compound isolated from *tabebuia rosea* flower against human liver cell line

Sr. No.	Concentration of test sample (µg/ml)	%CTC50 Cytotoxicity (µg/ml)	CTC50 (µg/ml)
1	1000	74.95	205.3
2	500	69.43	
3	250	58.12	
4	125	49.52	
5	62.5	43.86	

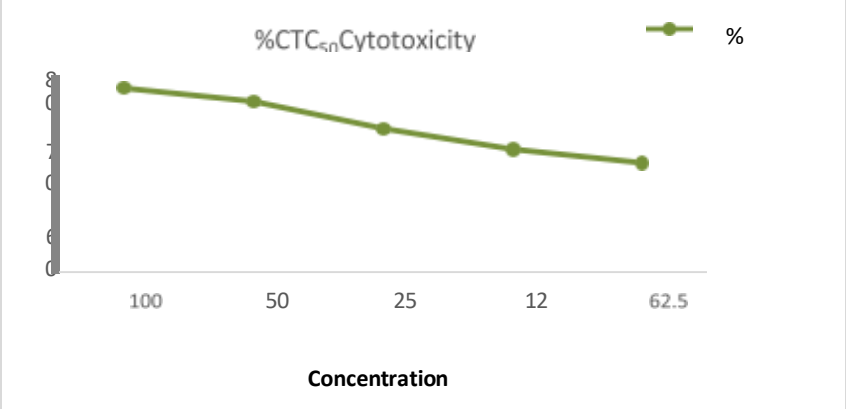

Figure 18: Graphical representation of the CTC50 values of the compound isolated from *tabebuiarosea* flowers against human liver cancer HePG2 Cell line.

Antibacterial Activity

The preliminary phytochemical analysis of the leaf extract revealed the presence of sugars, tannins, flavonoids, saponins, terpenoids, glycosides and acids are present, which results that it showed the antibacterial activity. The leaf extracts were tested for antibacterial activity using agar disc diffusion assay. The strains ofmicroorganism obtained were inoculated in conical flask containing 100ml of nutrient broth. Media were prepared using Muller Hinton Agar, poured on petri dishes and incubated with the following gram-positive bacteria: *Staphylococcus epidermis*, *Micrococcus luteus*, *Staphylococcus aureus*, *Streptococcus* sp. and *Bacillus subtilis* and gram-negative bacteria *Salmonella typimurium*, *Pseudomonas aeruginosa*, *Klebsiellapneumonia*, *Escherichia coli*, *Pseudomonas* sp.

Antibacterial activity was assigned by measuring the inhibition zone formed around the discs. The experiment was done three times and mean values were presented. [10]

Table 4: Antibacterial activity of ethanolic extract of *tabebuiarosea*

Sr. No.	Bacterial strains used	Zone of Inhibition in mm					
		Streptomycin	Penicillin	50mg/ml	100mg/ml	200mg/ml	300mg/ml
1.	*Salmonella Typhimurium*	16.80±0.81	19.70±0.35	09.85±0.66	11.65±0.47	13.55±0.66	14.90±0.89
2.	*Pseudomonas Aeruginosa*	10.30±0.33	16.90±0.47	08.95±0.09	11.78±0.45	13.95±0.90	15.55±0.68
3.	*Klebsiella Pneumonia*	12.10±0.25	17.60±0.71	09.90±0.68	12.12±0.76	13.80±0.88	16.04±0.66
4.	*Escherichia Coli*	14.70±0.60	10.10±0.25	08.90±0.75	11.98±0.44	14.90±0.65	16.88±0.78

5.	***Pseudomonas* sp.**	**18.70±0.15**	**21.60±0.19**	**08.70±0.50**	**10.88±0.77**	**13.48±0.68**	**15.76±0.47**
6.	***Staphylococcus Epidermis***	**24.10±0.19**	**22.10±0.33**	**08.40±0.60**	**10.33±0.66**	**12.64±0.60**	**13.78±0.65**
7.	***Micrococcus Luteus***	**20.80±0.61**	**19.10±0.55**	**08.55±0.88**	**10.12±0.56**	**12.70±0.55**	**14.87±0.70**
8.	***Staphylococcus Arius***	**22.80±0.25**	**24.40±0.35**	**09.64±0.44**	**10.24±0.80**	**11.60±0.77**	**12.67±0.55**
9.	***Streptococcus* Sp.**	**24.10±0.50**	**20.80±0.45**	**09.09±0.38**	**11.22±0.87**	**13.86±0.60**	**15.75±0.58**
10.	***Bacillus subtilis***	**19.50±0.25**	**22.60±0.40**	**08.96±0.44**	**10.76±0.55**	**12.50±0.44**	**15.06±0.46**

Antioxidant activity

In vitro study of ethanolic extract of *Tabebuia rosea* showed the strong antioxidant activities. The scavenging activities observed against DPPH, hydroxyl radicals, metal chelating, ferric thiocyanateas well as the thiobarbituric acid assay, leads to propose *Tabebuia rosea* as promising natural sources of antioxidants.

Ethanolic solution ofDPPH was added 40µl ofextract solution ofdifferent concentration. The mixture was left to stand for 5 min and absorbance was measured spectrophotometrically at 517nm. A blank sample containing the same amount ofethanol and DPPH was also prepared. All determination were performed in triplicate. The radical scavenging activities of the tested samples, expressed as percentage of inhibition were calculated.

Assay of nitric oxide-scavenging activity was performed to check antioxidant activity. Also, superoxide anion scavenging, reducing power assay and total antioxidant activity by phosphomolybdenum method.[11]

Table 5: % of Antioxidant Scavenging Activity of *Tabebuia rosea* at different concentrations.

Name of sample	**Concentrations of Plant Extract (µg)**	**% of Scavenging Activity**				
		DPPH	**Reductant Activity**	**Nitrous Oxide**	**Super Oxide**	**Total Antioxidant**
	100	**21.11**	**36.67**	**31.67**	**13.33**	**21.00**
	200	**33.38**	**50.00**	**33.33**	**20.00**	**23.00**
	300	**50.69**	**58.33**	**36.67**	**25.00**	**30.00**
Tabebuia rosea	**400**	**51.47**	**65.00**	**40.00**	**33.33**	**32.00**
	500	**59.02**	**68.33**	**41.67**	**40.00**	**44.00**
	600	**77.79**	**75.00**	**46.67**	**46.67**	**77.00**
	700	**80.43**	**80.00**	**53.33**	**53.33**	**80.00**
	800	**84.69**	**83.33**	**56.67**	**61.67**	**82.00**
	900	**87.91**	**86.67**	**60.00**	**70.00**	**84.00**
	1000	**89.92**	**86.67**	**63.33**	**73.33**	**86.00**

Anti-inflammatory activity

Inflammation is the body's immune system's response to an irritant. The irritant might be a germ, but it could also be a foreign object. Murine macrophages were selected for the in vitro studies of anti-inflammatory activity. The potential of *tabebuia rosea* extracts to inhibit the production of key inflammatory mediators such as NO, PGE2, and TNF-ά. From this study it shows that the anti-inflammatory activity ofthe methanol extract obtained from the stems of *Tabebuiarosea* and the isolation ofnew iridoid esters from the inner ofbark of *Tabebuiarosea* with anti-inflammatory activity. The study of different species from the genus *Tabebuia* is important to evaluate new natural sources ofbiologically active molecules that could be used for drug development.

Antiproliferative activity

Proliferation is rapid production of new parts or cells. Antiproliferative activity was determined with the MTT assay. Chloroform extract of the inner bark of *Tabebuiarosea* were tested against tumour cells such as HepG2, B16F10, MCF7 and HeLa cell lines which showed anti-proliferative activity.[12]

Table 6: Antiproliferative effect of extracts obtained from the inner bark and leaves of *Tabebuiarosea*

Part of plant	Extract	CC50±SEM (µg/mL) HEK-293	IC50±SEM (µg/mL)			
			B16F10	MCF7	HepG2	HeLa
Inner bark	*n*-hexane	178.4±1.4	125.6±1.6	172.2±1.5	>200	173.2±1.2
	Chloroform	115.9±1.3	36.4±1.7 (SI=3.18)	45.5±1.2 (SI=2.55)	21.1±1.4 (SI=5.50)	57.6±1.2 (SI=2.01)
	Ethyl acetate	137.1±1.4	>200	155.08±1.3	>200	>200
	n-butanol	>400	>200	>200	>200	>200
	Water	>400	>200	>200	>200	>200
Leaves	*n*-hexane	164.5±1.3	182.0±1.8	114.4±1.2	>200	119.1±1.3
	Chloroform	1.1±1.2	17.6±1.3 (SI=0.06)	5.0±1.2 (SI=0.22)	17.3±1.3 (SI=0.06)	24.7±1.4 (SI=0.05)
	Ethyl acetate	24.9±1.2	187.8±1.7	112.4±1.3	175.2±1.4	>200
	n-butanol	49.0±1.4	>200	>200	>200	>200
	Water	>400	>200	>200	>200	>200

Larvicidal activity

The flower extract of *Tabebuia rosea* showed larvicidal activity against the larvae, *Culexquinquefasciatus* and *Anopheles subpictus*. To check the activity larvicidal bioassay was performed, one gram of crude extract was first dissolved in 100ml of methanol (stock solution). From stock solution, different concentration was prepared. Polysorbate80 was used as as an emulsifier. Experiment was conducted for 24hr at room temperature.
To check the activity, larvae were taken in 5 batches of 20 in 249ml of water and0.1ml of desired plant extracts concentration. The number of dead larvae were counted after 24hr of exposure and the percentage mortality was reported from the average of five replicates. The regression value of *Culexquinquefasciatus* was 0.974 and LC50 were 586.68, and for *Anopheles subpictus* regression value was 0.981 and LC50 were 241.72.[13]

Table 6: Larvicidal activity of methanol extract of *tabebuiarosea*

Larvae name	Concentrations (ppm)	Percent mortality (ppm)±SE	LC50 (ppm)
Culexquinque fasciatus	1000	69±0.78	586.68 (475.43-723.96)
	500	31±0.45	
	250	24±1.02	
	125	14±0.84	
	62.5	06±0.32	
	1000	90±1.32	
Anopheles subpictus	500	74±0.79	241.72 (206.60-282.80)
	250	51±1.01	
	125	27±0.83	
	62.5	14±2.87	

Traditional Use of Tabebuiarosea

Tabebuiarosea (Bertol.) DC. considered to bean anticancer drug and also recommended anti-malarial and anti-panasomal effect. The flowers, leaves and roots also were used to reduce fever, pain, cause sweetening, tonsil, inflammation and many other disorders. The flowers of *Tabebuiarosea* shows the larvicidal activity. [7,8]

CONCLUSION

Plants are natural sources of bioactive compound to treat life threatening disease. *Tabebuia rosea* has showed various phytochemical properties, which can be used for treating various health ailments. The article makes us bound for further study on *Tabebuia rosea* in future.

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