

COMPARATIVE STUDY OF PHYSICOCHEMICAL PARAMETERS OF *FICUS BENGALENSIS* LINN. STEM BARK FROM DIVERSE GEOGRAPHIC STATES

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Abstract

Ficus bengalensis Linn. belongs to family Moraceae is regarded as harmless, effective and cost-effective for various diseases in traditional system of medicine of India. It has antidiabetic, hypocholesterolaemic and hypolipidaemic effects etc. We planned our work as to compare stem bark of this plant which are taken from diverse geographic states. Quality of herbal drug depends on its geographic origin, time and phase of growth when collection has been done and post harvest treatment. Quality of herbal drug must be high as other therapeutic medicament. For this purpose the study has undertaken so that a better plant medicines could be made for the human welfare. We have collected stem bark of *Ficus bengalensis* Linn. from three diverse geographic states viz. Delhi (Sangam Vihar), Gujarat (Modasa) and Uttaranchal (Ramnagar). All the drugs were subjected to comparison and evaluation of the effects of geographic states and environment on chemical composition and various pharmacognostical parameters of herbal drug. The acronyms were given for these plant materials as FB/DL, FB/GJ and FB/UA taken from Delhi, Gujarat and Uttaranchal respectively.



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INTRODUCTION

Ficus bengalensis Linn. plant is native to India and belongs to family Moraceae. It is commonly recognized as bargad or banyan or bar. It is accounted to have antidiabetic activity. It is found all over India. [1, 2] Water extract of stem bark of this plant has been shown to have a hypoglycemic, hypocholesterolaemic and hypolipidaemic effects. Leucopelargonidin (a glycoside) isolated from the bark of this plant proved antidiabetic effects. [3]. The therapeutic potential of medicinal plant must be high as that of the other therapeutic medicines for pharmaceutical use. The excellence of a plant medicine depends on the geographic source, time and phase of growing during collection and post-harvest treatment. [4]

In this work the stem barks of plant Linn. Were collected from three different geographical regions were dried, powdered and treated by petroleum ether to remove fat by Soxhlet apparatus. The drugs were thoroughly extracted with 95% v/v ethanol.

MATERIALS & METHODS

The stem barks of plant were taken from New Delhi (Sangam Vihar), Gujarat (Modasa), and Uttaranchal (Ramnagar) and acronyms were given as FB/DL, FB/GJ and FB/UA respectively. The plant sample was given for Authentication in Raw Material Herbarium and laboratory of NISCAIR (National Institute of Science Communication And Information Resources), New Delhi (Voucher number: NISCAIR/RHMD/Consult./-2008-09/1010/41). The stem bark of *Ficus bengalensis* (FB/DL, FB/GJ, FB/UA) were dried at temperature 40°C then these were powdered and passed through 40#. After that they were stored in air tight bottles. Age of the plants was 25 to 30 years as asked by resident individuals.

The physicochemical parameters such as LOD, ash value, extractive value in different solvents [5, 6], alcoholic extraction of plant material by 95% alcohol in Soxhlet apparatus was carried out [7, 8]. The extracts were subjected to different chemical test to find out presence of phytochemicals. Tests for carbohydrates, alkaloids, glycosides, Amino acids & Proteins, flavonoids, phenolic group, saponins, tannins, steroids and triterpenoids had been performed. Total phenolic content, total flavonoid content and total tannin content were determined. [9-12] Determination of microbial contamination, determination heavy metal (cadmium) was carried out [13]. TLC fingerprinting of plant extracts were carried out.

3. RESULT AND DISCUSSION

3.1 Evaluation of Physical Parameters

3.1.1 Loss on Drying (LOD): Results of LOD of stem bark of *Ficus bengalensis* taken from Delhi (FB/DL), Gujarat (FB/GJ) and Uttaranchal (FB/UA) are given in the Table 1.

Table 1: Loss on Drying of FB/DL, FB/GJ and FB/UA

S. No.	Drug	Loss on Drying (% w/w)
1	FB/DL	6.82
2	FB/GJ	6.76
3	FB/UA	4.58

Above results shows that *F. bengalensis* collected from Delhi had maximum moisture content while bark collected from Uttaranchal had minimum.

3.1.2 Determination of ash values: Results of Ash values of Total ash and Acid insoluble ash of stem bark *F. bengalensis* taken from FB/DL (Delhi), FB/GJ (Gujarat) and FB/UA (Uttaranchal) are given in table 2:

Table 2: Ash values of FB/DL, FB/GJ and FB/UA

S. No	Drug	Total Ash (% w/w)	Acid insoluble ash (% w/w)
1	FB/DL	5	1.3
2	FB/GJ	6.5	2.5
3	FB/UA	7.5	3

Results shown in above table illustrate that *F. bengalensis* collected from Uttaranchal had maximum total ash content while bark collected from Delhi had minimum total ash value. Same results were found in acid insoluble ash. Bark collected from Gujarat shown middle values of ash content and acid insoluble ash.

3.1.3 Determination of extractive values: Results of extractive values of stem bark FB/DL, FB/GJ and FB/UA are given in Table 3:

Table 3: Extractive values of FB/DL, FB/GJ and FB/UA

S.No	Drug	FB/DL (% w/w)	FB/GJ (% w/w)	FB/UA (% w/w)
1	Alcohol soluble extractive	6.40	10.40	5.84
2	Chloroform soluble extractive	1.68	4.88	2.40
3	Water soluble extractive	4.80	5.60	5.68

Above results showed that FB/GJ had maximum extractive value in alcohol, chloroform and water while FB/DL had minimum in same solvent.

3.2 Phytochemical Analysis of Stem barks of *Ficus bengalensis*

3.2.1 Extraction of powder of stem bark of plant material

The powder of stem barks of *Ficus bengalensis* viz. FB/DL, FB/GJ and FB/UA taken from Delhi, Gujarat and Uttaranchal respectively were defatted with petroleum ether using Soxhlet apparatus. Plant materials were extracted thoroughly with 95% v/v ethanol by using Soxhlet apparatus. The results obtained are described in Table no 4:

Table 4: Extraction of the *F. bengalensis* stem bark

S. No.	Extract	Yield (%w/w)
1	FB/DL	6.6
2	FB/GJ	9.56
3	FB/UA	7.0

All alcoholic extracts of stem bark of *F. bengalensis* were dark brown in colour and powdered solid in consistency. Above results showed that FB/GJ had maximum yield (9.56 % w/w) while FB/DL had minimum yield (6.6 % w/w).

3.2.2 Preliminary Phytochemical Screening

The alcoholic extracts of stem bark of viz. FB/DL, FB/GJ and FB/UA taken from Delhi, Gujarat and Uttaranchal respectively were screened for presence various phytochemical constituents. The results obtained are given in Table no 5.

**Table 5: Qualitative chemical investigation of *Ficus bengalensis*
Linn. Alcoholic extract of stem bark**

S. No.	Phytochemical Nature	FB/DL	FB/GJ	FB/UA
1	Alkaloids	-	-	-
2	Proteins & Amino acids	+	+	+
3	Carbohydrates	+	+	+
4	Flavonoids	+	+	+
5	Phenolic group	+	+	+
6	Glycosides	+	+	+
7	Saponins	+	+	+
8	Tannins	+	+	+
9	Steroids	+	+	+
10	Triterpinoids	+	+	+

Present (+) Absent (-)

Alkaloids were found absent in all the extracts.

3.2.3 Total Phenolic content determination

For determination of Total phenolic content in the alcoholic extracts of stem bark of *F. bengalensis*, the Folin-Ciocalteu reagent was used and values expressed as mg Gallic acid equivalents per gm dry weight of extracts. This was determined using calibration curve of standard Gallic acid. Results are mentioned in Figure No. 1 and Table no. 6.

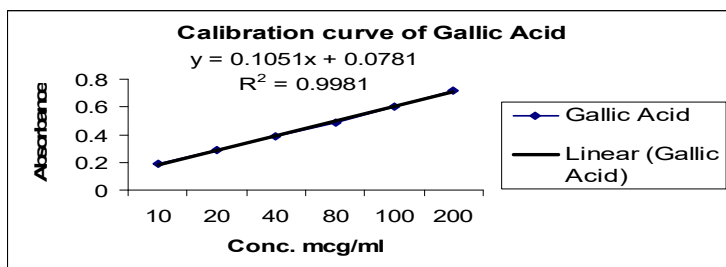


Table 6: Total Phenolic content

S. No	Sample name	Total Phenolic content (% w/w) calculated in terms of Gallic acid
1	FB/DL	5.71
2	FB/GJ	4.67
3	FB/UA	4.85

Above results showed that FB/DL had maximum Phenolic content (5.71 % w/w) while FB/GJ had minimum Phenolic content (4.67 % w/w).

3.2.4 Total Flavonoid content determination: Total Flavonoids of *Ficus bengalensis* Linn. Extracts (FB/DL, FB/GJ, FB/UA) were determined according to Cetkovic G method. Total flavonoid content in the extracts expressed as mg rutin per g dry weight. This was calculated from a calibration curve using rutin as standard.

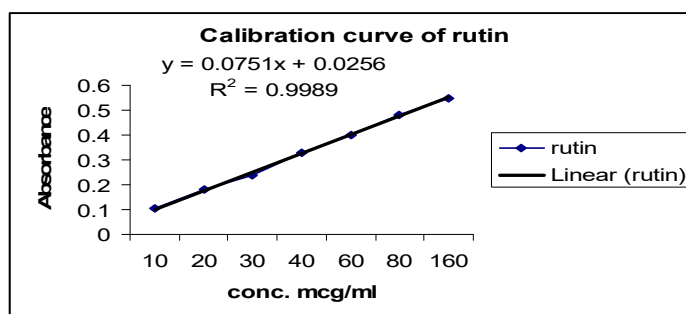


Table 7: Total flavonoid content determination

S. No.	Sample name	Total flavonoid content (% w/w) expressed as equivalent to Rutin
1	FB/DL	1.24
2	FB/GJ	1.16
3	FB/UA	1.35

Above results showed that FB/UA had maximum flavonoid content (1.35 % w/w) while FB/GJ had minimum flavonoid content (1.16 % w/w).

3.2.5 Total tannin content determination: Total tannin content in all the extracts was determined in *Ficus bengalensis*. Results are shown in Table No. 8.

Table 8: Determination of Total tannin content

S. No.	Sample name	Total tannin content (% w/w)
1	FB/DL	3.117
2	FB/GJ	3.242
3	FB/UA	3.367

Above results showed that FB/UA had maximum Tannin content (3.367 % w/w) while FB/GJ had minimum Tannin content (3.117 % w/w).

3.2.6 Microbial Load determination: Plate Count Method, the technique of total aerobic bacterial count was used to determine the count of viable aerobic bacteria. Various culture media viz. Fluid soyabean casein digest agar medium, Fluid soyabean casein digest medium and Sabouraud dextrose agar were used for the study

Table 9: Microbial Count of stem barks of *F. bengalensis*

S. No.	Microorganism	FB/DL	FB/GJ	FB/UA
1	Total bacteria count	>10 ³ CFU/g	>10 ³ CFU/g	>10 ² CFU/g
2	Yeast / Mould	Absent /g	Absent /g	Absent /g
3	E. coli	Absent /g	Absent /g	Absent /g
4	S. typhi	Absent /g	Absent /g	Absent /g
5	P. aeruginosa	Absent /g	Absent /g	Absent /g
6	S. aureus	Absent /g	Absent /g	Absent /g

Results of microbial contamination showed that limit of total bacterial count in *F. Bengalensis* viz. FB/DL, FB/GJ and FB/UA taken from Delhi, Gujarat and Uttaranchal respectively shows that total bacterial count of all the samples not exceeding the limit (10^5 CFU/g) as per European Pharmacopoeia and all the pathogenic microorganism were found to be absent in all the drugs.

3.2.7 Heavy Metal (cadmium) determination: The content of cadmium may be determined by atomic absorption spectrophotometry. The USP NF recommended 500 μ g/dl (5 ppm) permissible daily exposure (PDE) for cadmium.

Table 10: Heavy metal (cadmium) content in samples of *F. bengalensis*

S. No.	Sample name	Cadmium (ppm)
1	FB/DL	0.63
2	FB/GJ	0.65
3	FB/UA	0.49

Results showed that cadmium was present as 0.63 ppm in FB/DL, 0.65 ppm in FB/GJ, and 0.49 ppm in FB/UA.

3.3 TLC fingerprinting of FB/DL, FB/GJ, FB/UA

Thin Layer Chromatography was performed for the presence of compounds using specific solvent systems & detecting reagents. All the alcoholic extracts viz. FB/DL, FB/GJ and FB/UA were evaluated by TLC to ensure the presence of phytoconstituents. **Toluene: ethyl acetate: formic acid** in the ratio **10: 6: 0.2** was used as mobile phase. Several visualizing methods like UV 254, UV 366 nm were applied for best TLC fingerprinting and R_f values were determined. Plates were photographed. Results are illustrated in Figure No. 3 and Table No. 11.

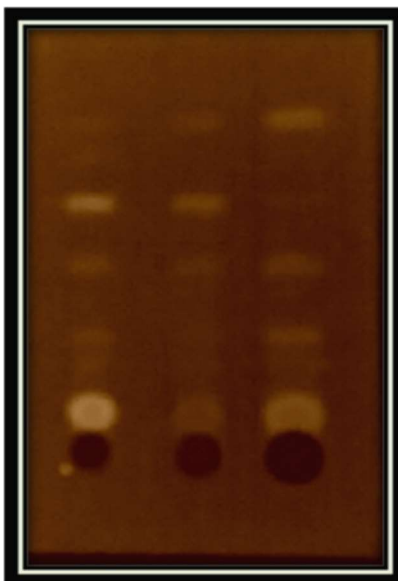


Figure 3: TLC of FB/DL, FB/GJ, and FB/UA

Table 11: TLC fingerprinting of stem barks of *F. Bengalensis*.

Extracts	No. Of spots	Visualising agent	R _f
FB/DL	5	UV ₃₆₆	0.12,0.24,0.41, 0.58,0.70
FB/GJ	4	UV ₃₆₆	0.12,0.24,0.41, 0.58
FB/UA	5	UV ₃₆₆	0.12,0.24,0.41, 0.58, 0.75

Results of TLC of ethanolic extracts of stem bark of *F. bengalensis* exhibited 5, 4 and 5 spots in FB/DL, FB/UA and FB/GJ respectively. R_f values are given.

4. CONCLUSION:

On the basis of results of study carried out it was concluded that geographical diversity and climatic conditions have a great impact on chemical composition and various parameters on plant drugs. There is a need of standardization of plant drugs collected from different geographical regions where climatic and atmospheric conditions differs from each other. So it is concluded that standardization of plant material collected from a particular area must be carried out for safe, effective and better quality of drugs.

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