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HERBS IN INDIAN FESTIVE RITUALS AND COMMUNITY HEALTH

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ABSTRACT

Indian festivals are unique, seasonal with an importance to ecofriendly practices thus respecting the environment and value the seasonal flora and fauna. Festivals may vary with regions, revere different gods and goddesses but with a message to community and the community health as top priority. Current study is aimed at understanding the importance of Ekavinshati Patra offered to Lord Ganesh on Ganesh Chaturthi. This festival is celebrated at the beginning of every year during rainy season for Pratham (Ganesh) in India. The specified Ekavinshati Patra i.e 21 different types of herbal leaves were analyzed for the cumulative phytochemical components and assessed for the antioxidant and antibacterial activities. The results were compared with ekavinshati Patra whose studies were undertaken individually for their medicinal value. The study revealed the mix of 21 types of leaves indicated a richness of phytochemicals both qualitatively and quantitatively represented by Quinones, Terpenoids, Saponins, Cyco glycosides, Alkaloids, Total phenols, and Tannins . The combination of 21 phytal extracts showed a peculiar, combined effect against selected bacteria and effective at lower concentrations. The hidden environmentally friendly message is festival rituals are medicinally oriented practices keeping in view of the health and immunity of the people considering the seasonally available medicines in the form of flora of environment.

Keywords: Rituals, plants, ekavinshati puja, phytochemicals, antibiotics

INTRODUCTION:

Religious rituals are ancient, associated with beliefs and intend to be for the welfare of the community. India is a country with different religions and perform festivals revering different Gods and Goddesses. The festivals are unique, eco-friendly with an importance to seasonal flora and faunal requirements and often with an epic attached.

The medicinal properties of plants have been investigated throughout the world and identified for their potent antioxidant activities. Plants are considered in ayurvedic medicine due to the non-nutritive plant chemicals which have protective or disease preventive properties. The phytochemicals comprise Phenols, Tannins, Terpenoid, saponins etc.

Indian festivals and rituals are performed based on Vedic culture and seasons. The first and most important festival in India, celebrated at the beginning of every year for Prathama is Ganesh puja during the rainy season. The specificity of the festival involves Ekavinshati puja where 21 different types of herbal leaves as per ayurveda are used to appease Lord Ganesh. 21 plant leaves are used as part of puja procedure- comprise 1. Machi pathram (*Artemisia vulgaris*); 2. Bruhathi Patram

(*Solanum xanthocarpus*); 3. Bilva Patram (*Aegle marmelos*); 4. Arjuna- *Terminalia arjuna*; 5. Ashwattha – *Ficus religiosa*; 6. Sindhu Vara (Vavilaku) – *Viex nigunda*; 7. Shamee (Vanni) – *Prosopis spicigera*; 8. Gandaki – *Solanum Nigrum*; 9. VishnuKrantha – *Evolvulus alsinoide*; 10. Maruvaka – *Origanum marjoram*; 11. Dhadimi(Mathulai) – *Punica granatum*; 12. Jaji (Jaji Malli) – *Jasminum grandiflorum*; 13. Devadaru – *Cedras deodara*; 14. Karaveera (Arali) – *Nerium oleander/indicum*; 15. Chootha – *Mangifera indica*; 16. Tulasi – *Ocimum sanctum*; 17. Apaamaarga (Nayuruvi) – *Achyranthes aspera*; 18. Badhari (Ilandai) – *Zizyphus jujuba*; 19. Durthaara (Umathai) – *Datura metel*; 20. Dhurvayugmam (Aruham pul) – *Cynodon dactylon*; 21. Arka – *Calotropis gigantea*. Previous studies indicated some of the plants have medicinal value and are capable of healing different health problems such as digestive, respiratory and reproductive problems individually [1-21]. The current study is aimed to assess phytochemical composition of these ekavinshati patra and the cumulative antibiotic and antioxidant activity.

Table 1: Ekavinshati patra and their individual activity

Plants Name	Leaf Activity	Phytochemicals in leaves	Antioxidant activity
1.Machi pathram <i>Artemisia vulgaris</i>	cure the nerves and stomach related problems, headache, eases dry mouth, increases the appetite.	Ethanol extract-saponins, flavonoids, phenols, tannins, quinones, steroids Water extract -saponins, phenols, tannins, quinones, carbohydrates, Steroids. [1]	-
2.Bruhathi Patram <i>Solanum xanthocarpum</i>	used to treat cough, heavy breathing and mucous	Methanol extract - Flavonoids, Carbohydrate, Steroids, Terpenoids, Phenols, Quinones. [2]	Activity increased with increasing concentrations of samples. solvents extraction efficiency follow the order: chloroform> methanol> ethyl acetate > acetone >hexane. [2]
3. Bilva Patram <i>Aegle marmelos</i>	essential oil effective against 21 types of bacteria, prescribed for constipation and gastrointestinal problems.	chloroform leaf extract -Alkaloids, Amino acids, Anthocyanin, Carbohydrates, Cardial Glycosides, Coumarins, Diterpenes, Emodins, Fatty acids, Flavonoids, glycosides, Leucoanthocyanin, Phlobatannin, Phytosterol, Proteins, Phenols, Saponin, Steroids, Tannin, Terpenoids. [3]	-
4. Arjuna – <i>Terminalia arjuna</i>	controls heart failures, treats wounds, hemorrhages and ulcers applied topically as a powder.	Terminalia arjuna leaves showed the presence of saponins, coumarins, emodins, phenols, quinones, leucoanthacyanins and phlobatannins. [4]	-
5. Ashwattha – <i>Ficus religiosa</i>	traditional medicine treats 50 types of disorders including asthma, diabetes,diarrhea, epilepsy, gastric problems and inflammatory disorders, infectious and sexual disorders.	aqueous extract-carbohydrates saponins, phenols, flavonoids, tanins and terpenoid. Methanol extract -carbohydrates saponins, phenols, flavonoids, tanins,protein, and terpenoid. [5]	
6. Sindhuvara – <i>Vitex nigundo</i>	Leaves reduce headache. Ground leaves paste reduce sinus problem	all the extracts of Vitex negundo are flavonoids, Terpenoids and steroids. [6]	
7. Shamee (Vanni) <i>Prosopis spicigera</i>	Tree associated with legendary stories of mahabharat	Proteins, carbohydrates, tannins, saponins, alkaloids,flavonoids are present [7]	
8. Gandaki – <i>Solonum nigrum</i>	Leaves used to treat mouth ulcers the boiled extracts of leaves for liver-related ailments, including jaundice.	ethanolic leaf extracts-alkaloid, flavonoids, phenols, Saponins, tannins and Terpenoids. [8]	DPPH assay of chloroform methanol (3:2) leaf extract indicated highest value of 79.75%. [32]
9.VishnuKrantha – <i>Evolvulus alsinoides</i>	Significant in Ayurveda enhances memory and intelligence.	methanolic extract of the leaves - flavonoids, steroids, glycosides, saponnins, phenols, aminoacids (proteins), reducing sugars (carbohydrates), alkaloids, tannins, triterpenoids, gums and mucilages. [9]	DPPH radical scavenging activities increased with an increased content of total Phenolics in the extracts[33]
10.Maruvaka – <i>Origanum marjoram</i>	leaves used to make garlands for its aroma. essential oils for joint pains and perfume	Leaves - glycosides, flavonoids, tannins are prominent while cardiac glycoside, alkaloid and phenol in least [10]	
11.Dhadimi <i>Punica granatum</i>	Importance of leaf is not mentioned	Extract-alkaloids, carbohydrates, coumarins, flavonoids, proteins, phenols, reducing sugars and tannins. [11]	
12. Jaji – <i>Jasminum grandiflorum</i>	leaves - Ayurvedic herbal medicine	extracts - alkaloids, tannins, saponin, flavonoids, steroids and glycosides. [12]	Both ethanol and Methanol solvents showed a similar kind of DPPH scavenging activity 100ul showed an activity of 39%. [35]
13. Devadaru – <i>Cedras deodara</i>	Cedar Tree with medicinal qualities.	Extracts- alkaloids, tannins, saponins, flavonoids and steroids. [13]	
14. Karaveera – <i>Nerium Oleander/indicum</i>	‘Ganneru’. - most poisonous commonly grown garden plants.	methanol extracts - tannins, flavonoids, saponins, terpenoids, cardiac glycosides, phenols, alkaloids, carbohydrates and steroids. [14]	
15. Chootha – <i>Mangifera indica</i>	Mango -.Leaves seem to possess good antiseptic properties.	aqueous, ethanolic,chloroform extracts-Alkaloids,Tannins and	

Flavonoids.[15]			
16. Tulasi – <i>Ocimum sanctum</i>	medicinal properties and easily available.	extract -Alkaloids, Terpenoids and Carbohydrate.[16]	The antioxidant activity of the <i>O. sanctum</i> solvents extracts was high to be Methanol followed by Benzene, Acetone, Water extracts. [37]
17. Apaamaarga – <i>Achyranthes aspera</i>	used to make tooth powder, control. Stomach pain, indigestion and skin eczemas .	extract -Glycosides, Tannins and Carbohydrate. [17]	
18. Badhari <i>Zizypus jujuba</i>	'Regu'- tasty fruit, develops appetite. - helps to develop immunity towards cuts and bruises.	Nine Flavonoids are present [18]	The antioxidant activity of the aqueous extract was better than that of the ethanol extract. [38]
19. Durthaara – <i>Datura metel</i>	<i>Datura</i> plants contain dangerous levels of tropane alkaloids and fatal if ingested.	alkaloids, flavonoids, saponins, tannins, glycosides, and amino acids. [19]	
20. Dhurvayugmam- <i>Cynodon dactylon</i>	improves digestion. Cures stomach ailments used as pesticide/pest control and skin diseases.	alkaloids, terpenoids, flavonoids, tannins, polyphenols, saponins, cardiac glycoside and quinonines [20]	
21. Arka – <i>Calotropis gigantea</i>	Leaves used for Arka Lavana, to treat gastritis. treat leprosy, paralysis and 64 different diseases.	extracts - Carbohydrates, glycosides.[21]	

MATERIALS AND METHODS

Collection and identification of Plant material :

The leaf samples were collected during Ganesh puja and the taxonomic identification was confirmed by Botany dept. Mithibai College. 21 types of leaf samples were shade dried and ground to powder.

Extract preparation :

4g powder sample was considered to prepare extracts in 80% Methanol and water as solvent systems of 50ml each. After an incubation period of 24 hrs at room temperature, the samples were filtered. The filtrates were considered qualitative and quantitative phytochemical analyses, antioxidant and antibacterial assessments.

Qualitative phytochemical screening

Both the 80% Methanol and water extracts of mixed leaves were considered for

qualitative assessment of major phytochemicals. The detection of carbohydrates (Molish's test); reducing sugar (Fehling's test); alkaloids (Mayer's test); saponins; tannins, flavonoids, terpenoids, phlobotannins, coumarins, cycloglycosides, total phenol, quinones, anthraquinones and steroids was carried using standard procedure [22].

(i) Detection of carbohydrates : To 2 ml of the extract, 2 ml each of Molish's reagent and concentrated Sulphuric acid were added. The formation of a reddish ring indicated the presence of carbohydrate.

(ii) Detection of reducing sugar : 2 ml of Fehling's solution was added to 2 ml of the extract and boiled for 5 minutes. Presence of a brick red precipitate indicated reducing sugar.

(iii) Detection of alkaloids: The stirring of 1ml of methanol extract with Mayer's reagent (Potassium mercuric iodide) results

in the formation of cream coloured precipitate confirms the presence of alkaloids.

(iv) Detection of saponins : 2 ml of the extract was diluted 10 times with distilled water and shaken in a graduated cylinder for 15 minutes. Formation of 1 cm layer of foam indicated the presence of saponins.

(v) Detection of tannins : 2 ml of the extract was added with few drops of 1% lead acetate. Formation of yellowish precipitate confirms the presence of tannins.

(vi) Detection of flavonoids : A small quantity of the extract was added with dilute Sulphuric acid, the appearance of orange colour indicated the presence of flavonoids.

(vii) Detection of terpenoids : 2 ml of extract was added with 2 ml of acetic acid and Sulphuric acid. The formation of bluish green ring indicated the presence of terpenoids.

(viii) Detection of coumarins : 3 ml of 10% sodium hydroxide was added to 2 ml of extract. Formation of yellow colour indicated the presence of coumarin.

(ix) Detection of cycloglycosides : To 5 ml of extract, 2 ml of acetic acid, 1 drop of 1% ferric chloride and 1 ml of Sulphuric acid was added. Formation of greenish ring indicated the presence of cycloglycosides.

(x) Detection of total phenol : Extract was treated with 3-4 drops of ferric chloride solution. Formation of deep blue colour indicated the presence of phenol.

(xi) Detection of quinones : The extract with 5 ml of hydrochloric acid resulted in yellow precipitate, indicating the presence of quinones.

(xii) Detection of steroids: 2 ml of the extract was dissolved in 2 ml of chloroform. To this equal volume of acetic acid and concentrated Sulphuric acid was added by the sides of test tube the formation of bluish green indicated the presence of steroids.

Quantitative Phytochemical screening:

Phytochemical analysis of the 21 bilwas complex mixture was carried out using the following standard methods.

Total terpenoid : Dried plant extract 100mg was taken and soaked in 10 mL of ethanol for 24 hours . The extract was filtered, and the filtrate was extracted with 10mL of petroleum ether . Using a separating funnel, the ether extract was separated and dried. The yield (%) of Total terpenoids contents was measured by the formula $(w_i - w_f / w_i \times 100)$ [23].

Alkaloids : 1 g of the sample was added with 40 ml of 10% acetic acid in ethanol in a stoppered flask and allowed to stand for 4 hrs. The extract was filtered and concentrated on a water bath till it reached

one-quarter of the original volume. Concentrated Ammonium Hydroxide was added drop wise till the precipitation was complete. The solution was allowed to settle and precipitate was collected. It was washed with dilute Ammonium hydroxide and then filtered the alkaloid, residue was dried and weighed [24].

Saponin: 10g of leaf powder sample was added to 100ml of 20% ethanol to prepare suspension. The sample suspension was heated over water bath for 4 hours at 55°C with continuous stirring. Sample was filtered and extract was collected in a separate container. The residue was re-extracted with 100ml of 20% ethanol. The filtrate were heated over water bath at about 90°C till the volume reduced to 40ml to which 10 ml of diethyl ether was added and shaken vigorously. After the separation of layers, the aqueous layer was recovered. 30 ml of n-butanol was added to aqueous layers and washed twice with 10 ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath. After evaporation the sample was dried in the oven and weighted [25].

% of saponin= weight of saponin/weight of sample*100.

Phenols: The total phenolic content of dry extracts was performed with Folin-Ciocalteu assay. 1 ml of sample (1 mg/ml) was mixed with 1 ml of Folin Ciocalteu's

phenol reagent. After 5 minutes, 10 ml of 7% sodium carbonate solution was added to the mixture followed by the addition of 13ml of deionized distilled water and mixed thoroughly. The mixture was kept in the dark for 90 minutes at 23 °C, and the absorbance was read at 760 nm. The total phenolic content was determined from extrapolation of the calibration curve using Gallic acid as standard. The estimation of the phenolic compounds was carried out in triplicate. The TPC was expressed as milligrams of Gallic acid equivalents (GAE)/g of dried sample [26].

Tannins: The tannins were determined by the Folin-Ciocalteu method. About 0.1 ml of the sample extract was added to a volumetric flask (10ml) containing 7.5 ml of distilled water and 0.5 ml of Folin Ciocalteu phenol reagent, 1 ml of 35% sodium carbonate solution and dilute to 10 ml with distilled water. The mixture was shaken well and kept at room temperature for 30 min. a set of reference standard solutions of tannic acid (20, 40, 60, 80, 100 µg/ ml) were prepared in the same manner as described earlier. Absorbance for test and standard solutions were measured against the blank at 700 nm with an UV/Visible spectrophotometer. The estimation of the tannin content was carried out in triplicate. The tannin content was expressed

in terms of mg of tannic acid equivalents/ g of dried sample [26].

Antibacterial assays

Bacterial Cultures considered: Clinical isolates of *Escherichia coli*, *Klebsiella pneumonia*, *Salmonella para typhi B*, *Salmonella typhi*, were considered for antibacterial activity studies based on agar well diffusion methods

Agar-well diffusion: Selected test microorganisms were grown on nutrient agar slants and incubated at 37⁰C and overnight. An inoculum of these test organisms was prepared in 0.85% saline solution was considered to prepare MH agar spread plates using sterile cotton swab. 9 mm diameter wells were punched in the spread plates and 100 µL of extract was added into each. The plates were incubated at 37⁰C for 24 h. Antibacterial activities were evaluated by measuring inhibition zones. The experiments were conducted in triplicates [27].

Determination of Antioxidant Activity:

The radical scavenging activities of the plant extracts against 2,2-Diphenyl-1-picrylhydrazyl radical (Sigma-Aldrich) were determined by UV spectrophotometer at 517nm. 1 ml of the extract was placed in a test tube, and 3 ml of methanol was added followed by 0.5 ml of 1mM DPPH in methanol. A blank solution was prepared containing the same amount of methanol

and DPPH. The radical scavenging activity was calculated using the following formula:

$$\% \text{ inhibition} = [\{Ab-Aa\} / Ab] \times 100$$

Where Ab is the absorption of the blank sample (without the extract) and Aa is the absorption of the extract [28].

RESULTS AND DISCUSSION

Ganesha Chaturthi is an exclusive divine ritual puja of Lord Ganesha where selected 21 different types of plant leaves known as Ekavinshati patra are considered for performing the rituals. Ethnobotanical studies of these plants indicated that each one is characterized with medicinal applications and comprise a combination of different phytochemicals (**Table 1**). Earlier studies indicated that each type of medicinal plant has certain qualitative and quantitative composition of phytochemicals viz., total phenols, flavonoids, tannins, sterols, quinones, alkaloids, glycosides, and terpenoids [1-21].

Qualitatively, the overall phytochemical composition varied in both 80% Methanol and aquatic extracts of the leaves. The methanolic extracts represented Terpenoids, Cycoglycosides and Alkaloides. In contrast, tannins were noticed only in aquatic extracts; quinones, Saponins and phenols were observed in both methanolic and aquatic extracts during the current studies (**Table 2**).

The 21 plants species qualitatively represented the presence of the phytochemicals which varied 81 %- Flavonols and Quinones, 66% -Tannins, 57%-Alkaloids, 48%-Phenols and Saponins each, 43%- Glycosides, 38%-Terpenoids and 34%-Sterols of the trees when studied individually. However, Quinones, Terpenoids, Saponins, Cycoglycosides, Alkaloids, Total phenols and Tannins were the observed phytochemicals qualitatively in the Ekavinshati mixture.

The earlier studies observed that a number of medicinal plants that represented phytochemicals showed a peculiar relation with reference to the concentration of the phytochemical in the mixture. For eg. 38% of medicinal parts could contribute Terpenoid (60mg/g ekvinshati mixture). On the contrary 57% medicinal plants were the reason for Alkaloids (10mg/g of mixture) and Tannins (3.8mg/g) were contributed by 66% of the 21 medicinal plants [Figure 1]. The Saponins (42.2mg/g) and phenols (3.8mg/g) were contributed by 48% of the 21 plants whose plants composition differed. Quantitatively, a high concentration of Terpenoids (60 ± 0.03 mg/gm), Saponins (42.2 ± 0.04 mg/gm) and alkaloids (10 ± 0.03 mg/g m) phytochemicals were observed in the cumulative extract. The phenols and tannins were represented in low concentrations ($3 - 4 \pm 0.05$ mg/gm) (Figure

1). The reason could be the size, shape and type of the leaf of the medicinal plant

Plants are equipped with self protection mechanisms against the microbes, pathogens as well as animals which is possible due to certain of the phytochemicals they produce as secondary metabolites. The antibiotic capability of the plants varies with each plant depending on the environment it grows.

Detailed studies of these 21 plants were carried out individually by researchers considering the different solvent systems for extraction from leaves to assess the antibacterial activities. Of which Machi, Brahmi, Bilwa, Ashwatha, Sindhurva, Gandaki, Jaji, Chuta, Tulsi, and Datura showed antibacterial activity against chosen bacterial species such as *C. diphtheriae*, *Salmonella paratyphi*, *Staphylococcus aureus*, *Shigella dysenteriae*, *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Escherichia coli*, *Bacillus cereus*, *Salmonella typhi*, *Klebsiella pneumonia* and *Corynebacterium diphtheriae* [1, 2, 29-40]. During the current study, the 80% methanol extract of 21 leaves mixture with a concentration of 2.5mg/gm indicated effective antibacterial activity. The methanol extract of indicated control against *Escherischia coli*, and *S.typhi* and moderate control against *Klebsiella pneumonia* and *S aureus* among the selected ATCC cultures. The

zone of inhibitions were found to be >10mm for *S typhi* and *E.coli*.

30% of the selected Ekavinshati such as Bruhati, Gandaki, Vishnukanta, Jaji, Tulasi and Badhari leaves indicated antioxidant activity when assessed individually using DPPH method in the earlier studies [2, 32, 33, 35, 37, 38]. The

current study indicated the cumulative antioxidant activity of these leaves represented only 16% which could be due to the mixture of different plant varieties and their antioxidant activity of the leaves such as Bruhati, Gandaki, Vishnu, Jaji, Tulasi and Bhadari became dormant.

Table 2: Quantitative Analysis of phytochemicals in cumulative Bilva patra Extract

S. No.	Phytochemicals	Water extract	Methanol extract
1	Quinones	+	+
2	Terpenoids	-	+
3	Saponins	+	+
4	Cycoglycosides	-	+
5	Alkaloids	-	+
6	Total phenol	+	+
7	Tanins	+	-
8	Cumarins	-	-
9	Flavonoids	-	-
10	Carbohydrates	-	-
11	Steroids	-	-
12	Anthraquinones	-	-

Key Words : Present(+), Absent(-)

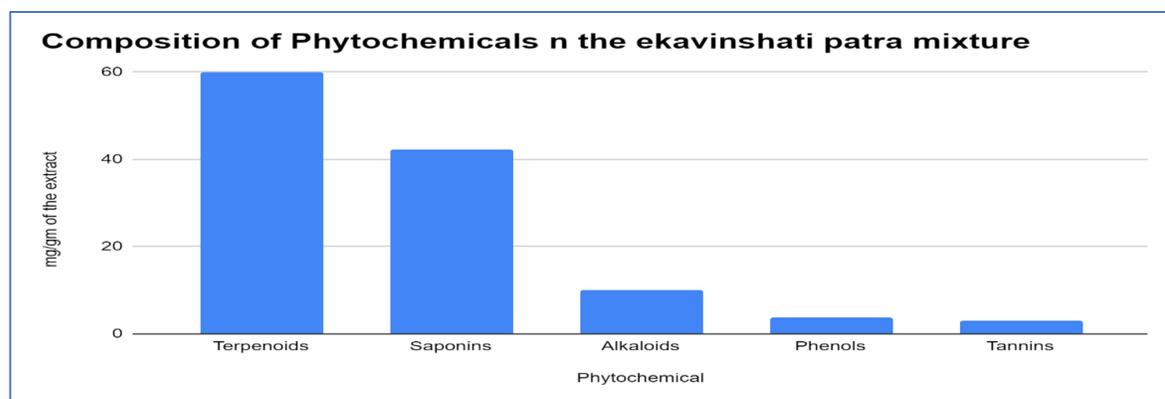


Figure 1: Phytochemical composition of Ekavinshati Patra mixture extract

CONCLUSIONS:

Hindu culture and Scriptures highlight the interdependency and relationship of the human beings with the surrounding environment. The well-being of humankind is determined by the balance between nature and biotic compounds. It

subtly educates us to have love towards fellow creatures explicitly mentioning the “vahana” of different deities which are usually animals. Similarly the Hindu festivals, rituals technologically assure that the medicinal value of the flora and fauna is utilized by mankind for their survival and

promote environmental friendly nature . Ganesh puja is one important festival that makes us realize that we should have smart, keen eyes towards worldly developments, knowledge as the deity and to maintain a balanced healthy life. The prayers performed with ekavinshati patra (rich with phytochemicals such as Quinones, Terpenoids, Saponins, Cycoglycosides, Alkaloids, Total phenol and Tannins) increase our resistance against bacteria fungi and virus with their medicinal, antibiotic and antioxidant properties. Further extensive studies of this complex mixture may enable us to develop certain drug candidates against cancer, asthma etc.,

No conflict of Interest

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