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## PHARMACOLOGICAL PROFILE OF PATHA (*CISSAMPELOS PAREIRA* LINN.): A REVIEW

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### ABSTARCT:

*Patha* is one of the most widely used herbs in *Ayurveda*. Botanical source of *Laghupatha* is *Cissampelos pareira* Linn. which is commonly known as Velvet leaf. This is climbing shrub having green leaves, red drupe berries, horseshoe shaped seeds and brownish roots. Ancient texts like *Bruhatrayee* (*Charaka samhita*, *Sushruta samhita* and *Ashtang hridaya*) and *Nighantus* have mentioned various uses of *C. pareira* in *Atisara*, *Prameha*, *Arsha*, *Bastivikara* etc. Research conducted on *C. pareira* also proves its pharmacological actions like diuretic, antidiabetic, antiasthmatic, hepatoprotective, anti inflammatory, antioxidant etc. This review aims to compile all information regarding its various traditional uses, pharmacognosy, phytochemical constituents and pharmacological activities to enrich our knowledge about *C. pareira*. It will surely give new direction for the researchers and pharmaceutical industries to develop a new drug.

**Keywords-** *Cissampelos pareira* Linn., Indian Traditional uses, *Patha* Pharmacological actions.

## INTRODUCTION

*Ayurveda* is a traditional system of Indian medicine used over thousands of years for healing and well being of body. Treatments in *Ayurveda* are given to cure the body and also to maintain its homeostasis. This can be achieved with the help of numerous medicinal plants mentioned in Ancient *Samhitas*. *Cissampelos pareira* Linn. commonly known as *Laghupatha* is one of the medicinal plants having tremendous effects on various diseases. It belongs to the family Menispermaceae. Number of species are found all over the world but only one can be found in India i.e. *Cissampelos pareira* Linn. It is a perennial climbing herb having small greenish-yellow flowers. It is commonly found in tropical and subtropical region including Himachal Pradesh, Rajasthan and Bihar. Roots and leaves are useful parts of *Cissampelos pareira* Linn. which are administered in treatment of many diseases like inflammation, pain, haemorrhage, gastro toxicity, cancer, diarrhoea, diabetes, wounds and also works as hepatoprotective.<sup>[1]</sup>

### Synonyms-

*Patha*- (praised by people and respected everywhere); *Prachina*-(plant growing mostly in eastern parts); *Kuchelika*-(spreads on ground or is a climber); *Vruttaparnika*-(having round leaves); *Aviddhakarnika*-(having peltate leaves); *Trisira*-(with three or more prominent nerves); *Ekashthila*-(fruit has single stony seed); *Varatiktika*-(one of the best bitters); *Mahaujasi*, *Vira*-(potent drug); *Shreyasi*, *Ambashtha*-(providing alround well being of people); *Varuni*, *Sthapani*-(stabilizes body fluid); *Raktaighni*-(purifies blood).<sup>[2]</sup>

### Vernacular names-

**English** - Velvet leaf; **Hindi** - Patha, Padh, Akanadi; **Marathi** - Pashadvel, Paharrel, Pahadavel, Padali; **Bengali** - Akanadi, Patha; **Kannada** - Pahadavela, Agalushunthi; **Gujrati** - Kalipath, Karondhium, Karondium, Venivel, Karedhium; **Telugu** - Adivibankatiga, chiru boddi, Boddi tiga; **Tamil** - Vatta tiruppi; **Oriya** - Kanabindhi, Patha; **Assamese** – Tuprilata; **Malayalam** – Patha.<sup>[3]</sup>

### Habitat-

*Patha* is found in all over India especially in Aasam, Konkan, Matheran, Mahabaleshwar. It also found in Shrilanka.<sup>[4]</sup>

**Taxonomy**<sup>[5]</sup>

Kingdom	Plantae
Subkingdom	Viridiplantae
Infrakingdom	Streptophyta
Superdivision	Embryophyta
Division	Tracheophyta
Subdivision	Spermatophytina
Class	Magnoliopsida
Superorder	Ranunculanae
Order	Ranunculales
Family	Menispermaceae
Genus	Cissampelos L.
Species	<i>Cissampelos pareira</i> L.

Table no.-1: Taxonomy of *Cissampelos pareira* Linn.**Morphology-**

A climbing shrub is having branches striate, pubescent or subglabrous. Leaves are peltate, 3.8-10 cm. diameter, orbicular or reniform, often slightly broader than long, cordate or truncate or truncate at the base, mucronate, pubescent on both surfaces when young, at length glabrous, underside pale or subglabrous, margins ciliate; petiole 3.8-10 cm. long, pubescent, inserted 3-6 mm. within the basal margin. Flowers are minute, yellowish. Male flowers are pedicelled in nearly axillary cymes; peduncles filiform, 18 mm. long, pubescent; bracts small, subulate. Sepals 4, hairy outside, obovate-oblong, concave. Petals combined into cyathiform corolla, hairy without, glabrous within, half the length of the sepals. Filaments are longer than the corolla. Female flowers in elongate, solitary or twin, axillary racemes; pedicels very short, pubescent or villous; bracts foliaceous, more or less stalked or nearly sessile, orbicular or reniform, mucronate, usually softly villous (sometimes glabrous), ciliate, persistent. Sepal is one ovate-oblong, villous on the outside. Petal is one, subrotund, about half the

length of the sepal. Drupe subglobose, compressed, hairy, red; endocarp transversely ridged.<sup>[6]</sup>

### **Classification of *Patha* in *Ayurvedic Samhitas*-**

***Charak Samhita***- Classified under *Stanyashodhana*, *Jwarahara*, *Sandhaniya Gana*.<sup>[7]</sup>

***Sushrut Samhita***- Classified in *Aaragvadhadi*, *Pippalyadi*, *Bruhatyadi*, *Patoladi*, *Ambashthadi* and *Mustadi Gana*.<sup>[8]</sup>

***Ashtang Hriday***- Classified in *Patoladi*, *Aaragvadhadi*, *Vatsakadi*, *Ambashthadi* and *Mustadi Gana*.<sup>[9]</sup>

***Nighantus***- There is the mention of *Patha* in the following *Vargas* of various *Nighantus*.

***Bhavprakash nighantu***- *guduchyadi varga* <sup>[4]</sup>

***Raj nighantu***- *Pippalyadi varga* <sup>[10]</sup>

***Madanpal nighantu***- *Abhayadi varga* <sup>[11]</sup>

***Dhanvantari nighantus***- *Guduchyadi varga* <sup>[12]</sup>

***Kaiyadeva Nighantu***- *Aushadhi varga* <sup>[13]</sup>

***Aadarsh Nighatu***- *Guduchyadi varga*<sup>[14]</sup>

***Shaligram Nighantu***- *Guduchyadi varga*<sup>[15]</sup>

***Raspanchaka***-<sup>[16]</sup>

*Rasa – Tikta*

*Guna - Laghu, Tiksha*

*Veerya – Ushna*

*Vipaka – Katu*

### ***Patha*-Effect on *Tridosha*-**

With its *Tikta rasa* it alleviates *Pitta dosha*. Its *Katu vipaka*, *Ushna virya* and *Tikshna guna* alleviates *Kapha dosha*. Due to *Tikshna guna*; it alleviates *Vata dosha*. Overall *Patha* alleviates *Tridosha*. It is traditionally used as *Mutrara* (diuretic), *Stanyashodhana* (purifies breast milk), *Deeapan* (appetizer), *Pachana* (digestive), *Shoolahara* (reduces pain), *Jwarahara* (anti-pyretic), *Chardinigrahana* (suppresses vomiting), *Kushthaghna* (useful in skin disorders), *Atisaraghna* (reduces diarrhea), *Dahaprashamana* (pacifies

burning), *Kandughna* (reduces itching), *Vishaghna* (reduces effects of poison), *Vranaropana* (heals wound).<sup>[17][18]</sup>

### **Ethno-botanical study of *Patha*-**

In traditional system of medicine; root extracts were used against lot of ailments. These extracts are in possession of bitter taste and contain diuretic, purgative properties. They were proved to be good against dyspepsia, diarrhea, dropsy, cough, urinary difficulties like cystitis, dysentery, asthma and heart diseases.<sup>[19]</sup>

Leaves are used effectively against inflammation and can be put on wounds in order to heal sores.<sup>[20]</sup>

In Assam, India was come discussion about family planning with *C. pareira*. It is applied together with other indigenous plants.<sup>[21]</sup>

It was also found to treat malaria, fever, sexually transmitted diseases, snake bites and conjunctivitis in new screening.<sup>[22]</sup>

### **Traditional uses-**

*Patha* is used in *Kupachana* (improper digestion), *Atisara* (diarrhoea), *Jwara* (fever), *Mutravikara* (urinary diseases), *Shofa* (inflammation), *Kasa* (cough), *Aartava vikara* (menstrual diseases), *Arsha*(piles).<sup>[18]</sup>

*Patha* is also used externally in *Dushtavrana* (chronic wound), *Nadivrana* (pilonidal sinus), *Kandu* (itching) and *Kushtha* (skin diseases)<sup>[16]</sup>

### ***Prayojyanga***

Root and leaves <sup>[23]</sup>

1. Root- Powder of root is given with curd in *Arsha*. Alongwith *tandulodaka* and *Madhu* (Honey); it decreases *antarvidradhi* (abscess). In *Atisara* (diarrhoea), *Daha* (burning sensation) and *Parikartika* (fissure-in-ano); powdered root is used with gow's curd. *Nasya* of *pathamula* is used in *Ardhavabheda* (Migraine).

2. Leaves- Powder of dried leaves is given with curd and juice of *Dadima* in *Pittatisara*.<sup>[24]</sup>

**Dose-** Decoction: 50-100 ml; Powder: 1-3 gm <sup>[25]</sup>

**Formulations-** *Shadadharana churna, Pushyanuga Churna, Gangadhara churna, Kutajashtaka kwatha, Pradarantaka Lauha, Saraswata ghuta, Stanyashodhan kashaya churna*<sup>[3][25]</sup>

**Combined with other herbs-**

1. Decoction of *Patha* and *Gokshura* is used in *Sheetameha*.
2. Decoction of *Patha* and *Agaru* is used in *Lavanameha*.
3. In *Granthibhuta artava*(clotting in menses), decoction of *Patha, Trikatu* and *Kutaj* is given.
4. *Patha* along with one of the *Dhamasa, Bilvamula, Jeeraka* and *Shunthi* reduces pain of *Arsha* (Piles).
5. In urinary diseases; *Patha* is used with *Yashtimadhu* and *Guduchi*.<sup>[24]</sup>

**Different Varieties-**

*Aacharya Charaka* mentioned two varieties of *Patha* (*Patha dve*) whereas *Sushruta* and *Vagbhata* described one variety only. *Charakacharya* mentioned *Patha* and *Ambashtha* separately in the *Pushyanuga churna*. *Kaiyadev Nighantu* describes two varieties as:

1. *Cyclea peltata* (*Rajpatha*)
2. *Cissampelos pareira* (*Laghupatha*)<sup>[26]</sup>

**Specific botanical description of *Cyclea peltata* is as follows-**

1. *Cyclea peltata* (Lam) Hook. F. & Thomas belongs to Menispermaceae family, which is known as *Rajpatha* in various parts of India. A much-branched, climbing shrub found throughout South and East India and in the Andaman and Nicobar Islands.<sup>[27]</sup> Roots are tuberous; Leaves are deltoid or ovate, acute, truncate or slightly sinuate at the base. They have rounded angles mucronate, more or less hairy on the nerves and veins, margin often ciliate; flowers in axillary panicles. Male flowers are subsessile, interruptedly spicate or collected into heads. Female flowers racemose, sepals oblong, glabrous. Petals are orbicular, much shorter than the sepal; ovary pilose; berries drupaceous.<sup>[28]</sup>

## Cultivation-

*Cissampelos pareira* is mostly collected from the wild. Although it is occasionally cultivated in some places. [29]

## Description-

### 1. Macroscopic

Roots are cylindrical, often tortuous having 1-1.5 cm in diameter, light brown to yellowish in colour. The surface is rough and at places rugged due to transverse wrinkles, cracks and fissures, fracture short and splintery. Odour is faint aromatic and taste is bitter.[3]

### 2. Microscopic

Transverse section of root shows, 6-10 layers of thin-walled, rectangular cork cells secondary cortex, 1-3 layered of oval to tangentially elongated cells, discontinuous ring consisting of 2-3 rows of stone cells and group of phloem fibres, stone cells variable in shape with simple pits, vascular strands as radiating strips usually 8-12 of xylem and phloem some reaching up to the centre, phloem consists of small strands of sieve elements and parenchyma just below the ring of stone cells, xylem consists of vessels, tracheids, fibres and xylem parenchyma, vessels and tracheids show simple pits on the walls, xylem parenchyma usually thick-walled and lignified but due to delignification patches of thin-walled parenchyma appear in the xylem region., medullary rays 1-3 seriate appear to be very wide at a number of places due to addition of delignified xylem parenchymatous cells, ray cells thin-walled, a few lignified and thick-walled while some show reticulate thickening, plenty of starch grains present in some of ray cells.[3]

### 3. API Standards

#### 1. Identity, Purity, Strength

Foreign matter	Not more than 02 per cent	Appendix 2.2.2
Total ash	Not more than 07 per cent	Appendix 2.2.3
Acid-insoluble ash	Not more than 01 per cent	Appendix 2.2.4
Alcohol-soluble extractive	Not less than 11 per cent	Appendix 2.2.6
Water-soluble extractive	Not less than 13 per cent	Appendix 2.2.7

Table no.2: Identity, Purity, Strength of *Cissampelos pareira* Linn.[3]

## 2. TLC:

The wavy epidermis with unicellular trichomes was shown in The microscopic characteristics. Lignified xylem vessels, radial medullary rays and prismatic calcium oxalate crystals had also been observed. *Cissampelos pareira* root extract proved to contain terpenoids, alkaloids, tannins, amino acid, proteins and carbohydrates in phytochemical screening. *Cissampelos pareira* root extract detected to have Alkaloids and essential oil in TLC of the developed using blends of methanol: concentrated ammonia (200:3) and n-butanol:acetone:water (3:1:1) and benzene: ethyl acetate:formic acid(9:7:4) as solvent systems for alkaloid whereas chloroform(100%), benzene(100%), chloroform:benzene(1:1), and ether:benzene(1:1) as a solvent systems for essential oil.<sup>[30]</sup>

## Phytochemistry (Chemical composition)-

1. Root- Deyamittin, Cissamine, isochondrodendrine, *l*-curine, menismine,, pareirine, hayatinine, berbeerines, essential oils, fixed oils, sterols, tetrandine, cycleanine, , dihydrodicentrine, insularine, , bisbenzylisoquinoline, dicentrine.<sup>[31]</sup>
2. Rhizomes- hayatine, hayatidine, d-4''o-methylberbeerine, L- bebeerines, isochondrodendrine, dicentrine, dehydrodicentrine, insularine.<sup>[32]</sup>
3. Aerial parts- polyphenolic compounds like flavonoids and tannins.<sup>[33]</sup>
4. Leaves- Kaempferol3-mono-glycosides, Quercetin3-mono or di- glucosides, cycloanine.<sup>[34]</sup>
5. Whole plant- tropoloisoquinoline alkaloids like pareirubrine A and B, grandirubrine, isoimerubrine, Pelosine, cissampareine.<sup>[35]</sup>

## Pharmacological activities-

### 1. Anti-diabetic activity:

(1) The aqueous extract of leaves of *C. pareira* showed anti-diabetic activity. The dose of *C. pareira* extract 250 mg/kg and 500 mg/kg body were given in male albino mice. It was given over the period of 14 days. Body weight Random blood glucose level and were observed periodically in this study which was resulted as decreased than previous. Liver glycogen level and other biochemical parameters were also determined in the study. <sup>[36]</sup>



(2) Antihyperglycemic activity of methanolic extract of *Cissampelos pareira* Linn. roots on blood glucose levels of Streptozotocin-Induced diabetic rats was studied and it was found that the oral administration of extract at the dose 200 and 400 mg/kg body weight showed significant decrease in blood glucose level. They also established that the dose of 400 mg/kg body weight was more effective with the highest glycemic change of 36% at 8<sup>th</sup> hour of extract administration. [37]

## **2. Diuretic activity:**

Methanolic root extract of *C. pareira* was administrated in saline primed normal rats orally. Study proved significant increase in urinary excretion of Na<sup>+</sup> and K<sup>+</sup> along with increased urinary output with dose of 200 mg/Kg. [38]

## **3. Antioxidant activity:**

The 50% ethanol extract of roots of *C. pareira* were found to contain a large amount of polyphenols (1, 1-diphenyl-2-picrylhydrazyl) and it exhibit potent antioxidant ability in vitro and in vivo.[39]

## **4. Hepatoprotective activity:**

The hydroalcoholic extract of roots of *C. pareira* showed the presence of higher concentration alkaloids (bebeerines, hayatidin, hayatinin, hayatin) and flavonoids which showed the hepatoprotective activity against CCl<sub>4</sub> induced hepatotoxicity in rats.[40]

## **5. Cardioprotective activity:**

*C. pareira* root extract was administrated on isoproterenol-induced cardiac dysfunctioned albino rats. These animals showed increase in heart weight/ body weight ratio, serum calcineurin, nitric oxide, lactate dehydrogenase and thiobarbituric acid reactive substance levels. These were significantly ( $p < 0.05$  and  $p < 0.01$ ) improved by *Cissampelos pareira* treatment.[41]

## **6. Anti-inflammatory activity:**

The 50% ethanolic extract of roots of *C. pareira* shows anti-inflammatory activity in acute, subacute and chronic models of inflammation in rats.[42]

### **7. Anti haemorrhagic activity:**

The skin of mice was injected with a mixture of extract and venom to establish the antihemorrhagic activity of aqueous extract from leaves of *C. pareira*. The extract produced a total inhibition of hemorrhage.<sup>[43]</sup>

### **8. Anti-fertility activity:**

The leaf extract of *C.pareira* administered orally, altered the estrous cycle pattern in female mice. The extract prolonged the length of estrous cycle with significant increase in the duration of diestrus stage and reduced significantly the number of litters in albino mice. The analysis of the principal hormones involved in estrous cycle regulation showed that the plant extract altered gonadotropin release (LH, FSH and prolactin) and estradiol secretion.<sup>[44]</sup>

### **9. Anti-nociceptive and anti-arthritic activities:**

The 50% aqueous ethanolic extract of *C.pareira* roots at the dose levels of 100–400 mg/kg, once daily for three days exhibited significant ( $P < 0.001$ ) resistance against mechanical pain after 30 min in analgesimeter induced pain in mice.<sup>[45]</sup>

### **10. Anti-asthmatic activity:**

The aqueous fraction of the ethanolic extract from the leaves of *C. pareira* exerts an immunomodulatory activity in different animal models of asthma. This study shows the aqueous fraction of *C. pareira* increase the levels of anti-inflammatory cytokines, a decrease in the production of antigen-specific immunoglobulin, a decrease in mucus production and deposition in the airways.<sup>[46]</sup>

### **11. Anti-diarrhoeal activity:**

The antidiarrhoeal activity of the Ethanolic extract of *Cissampelos pareira* roots were assessed on experimental animals. The hydroethanolic extract (25-100 mg dry extract kg<sup>-1</sup> body mass, p.o.) exhibited. A dose dependent decreases in the total number of faecal droppings (Control 65, reduced to 26-46) and 29.2-60.0% inhibition in castor oil-induced diarrhea. Further, *C. pareira* produced a significant ( $p < 0.01$ ) and dose dependent reduction in intestinal fluids accumulation (26.0- 59.0%). The extract showed a greater inhibitory effect on the concentration of Na<sup>+</sup> (20.0 and 34.5%) than on the concentration of K<sup>+</sup> (6.7 and 9.4%).<sup>[47]</sup>

### **12. Anti-protozoal activity:**

A chalcone-flavone dimer has been isolated from the aerial parts of *Cissampelos pareira* L. which has been assigned the trivial name Cissampeloflavone. The compound has good activity against *Trypanosoma cruzi* and *T. brucei rhodesiense* and has a low toxicity to the human KB cell line.<sup>[48]</sup>

### **13. Anti-Plasmodial activity:**

The *Cissampelos pareira* extract 5.8µg/ml was tested against chloroquinone sensitive (NF54) and resistant (ENT30) *P. falciparum* strains in vitro using hypoxanthine assay. The drug was reported for having antiplasmodial activity.<sup>[49]</sup>

### **14. Anti-helmintic activity:**

The extract of *Cissampelos pareira* not only demonstrated paralysis but also caused death of worms especially at higher concentration of 50 mg/ml in shorter time as compared to reference drug Piperazine citrate. The two concentrations (50, 100 mg/ml) of this plant show good antihelmintic activity as compared to standard drug.<sup>[50]</sup>

### **15. Antidengue activity:**

Extract of *Cissampelos pareira* have anti dengue activity. Fractionation approach for plant material was guided by a bioassay and that lead to identification of active extracts. Fraction is provided by this method. Process includes preparation of different extracts of *Cissampelos pareira* and subjecting extracts for bioactivity. Primary screening-conventional plaque reduction neutralization test (PRNT/assay). Secondary screening-modified plaque reduction neutralization test (PRNT) assay and tertiary screening-virus titer reduction assay. Active extracts were further subjected to fractionation by one or more of solvents and each fraction was evaluated for bioactivity.<sup>[51]</sup>

### **16. Immunomodulatory activity:**

Plant extract's effect was tested on humoral and cell mediated immunity. It was done by measuring haemagglutination antibody titre and DTH response respectively. The effect was tested on four different dose levels ranging from 25 to 100 mg/kg. Results obtained during present investigation showed significant ( $p < 0.01$ ) reduction in antibody production in response to SRBC's at doses 25 and 50mg/kg. With further increase in

dose AFCP had no suppressive effect on antibody production and values obtained were more or less equal to control animals.<sup>[52]</sup>

#### **17. Anti-cancer activity:**

The *C. pareira* contain stropone-isoquinoline alkaloid, named pareitropone, which showed potent cytotoxic activity. A new alkaloid, cissampareine where is obtained from *C. pareira* have reproducible inhibitory activity against human carcinoma of the nasopharynx carried in cell culture.<sup>[53]</sup>

#### **18. Anti-tumor activity:**

The extract (primarily proteins and polysaccharides) inhibited tumour growth in the dose dependent fashion when administrated orally. At the highest dose tested, 200 mg/kg/day, tumour growth was inhibited by roughly 70%. Subcutaneous or intraperitoneal administration at 50 mg/kg/day also inhibited tumor growth by over 70%.<sup>[54]</sup>

#### **19. Antileukemic activity:**

The *C. pareira* contain tropoisoquinoline alkaloids, pareirubins A and B showed antileukemic activity.<sup>[55]</sup>

#### **20. Anti-ulceractivity:**

The *C. pareira* contain flavonoid Qurectein which showed anti-ulcer property against 100% ethanol, aspirin, cold resistant stress and pylorus ligation induced acute gastric ulcer in rats at doses of 25-100 mg/kg.<sup>[56]</sup>

#### **21. Anti-anxiety activity:**

The 70% hydroethanolic extract of leaves of *C. pareira* showed that it contains alkaloids, flavanoids, terpenoids and steroids. The extract showed significant anti-anxiety activity in Elevated Plus Maze test (EPM), Light Dark (Land D) model, and Forced Swim test (FS) for rats.<sup>[57]</sup>

#### **22. Memory enhancing activity:**

Three doses of hydrochloric extract of *Cissampelos pareira* were administrated (100, 200 and 400 mg/kg p.o.) for 7 successive days in separate groups of mice. The dose of 400 mg/kg p.o. of extract significantly improved learning and memory of animals.

Furthermore this dose reversed the amnesia induced by scopolamine (0.4 mg/kg, p.o.) and ageing induced amnesia.<sup>[58]</sup>

### **Toxicity-**

In the acute and subacute toxicity test, oral administration of *C. pareira* did not produced any changes in behaviour and physiological activities on experimental animals. Biochemical and hematological analysis did not show any changes.<sup>[59]</sup>

### **Conclusion-**

Studies mentioned above shows that *Cissampelos pareira* Linn. is easily available plant with numerous medicinal properties and can be used for treating various diseases. By studying literature review; we have found that different phytochemicals are present in different parts of the *C. pareira* responsible for pharmacological activities. In *Ayurveda Patha* (*Cissampelos pareira* Linn.) is mentioned with combination of other herbs and several *Anupanas* to treat different diseases. Though pharmacological activities are proved on basis of phytochemicals; furthermore research is needed regarding classical claims of using *C. pareira* for accepting this herbal drug in modern science.

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