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A Review on the Pharmacological Importance of Crimson Passion Flower (*Passiflora vitifolia: Passifloraceae*) - An Endangered Species

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Abstract

Plants are the gifts from nature and this gift is explored widely by the humans in terms of many essential utility such as medicinal, edible, essential oil, etc. Among these uses Pharmacological utilization of plants are one of the most vital one. Plants are used as the medicinal remedies from the ancient times. *Passiflora* species is one of plants that influences the Ayurveda for several remedies such as sedative, anxiety and hypertension etc. But this plant does not have scientific evidence so far. Among the *Passiflora* species *Passiflora vitifolia* is one of the species which is not explored much. Although there are few reports that suggested that there are different chemical constituents present in the plant such as alkaloids, glycosides, flavonoids., volatile oils etc. therefore, the reports also described the various pharmacological important of this an endangered species. This review comprises the medical important of the *Passiflora vitifolia* along with their chemical constituents and their structure.

Keywords: Pharmacological Utilization; Sedative; Anti-inflammatory; Passiflora vitifolia; Flavonoids

Introduction

Passiflora derived from Latin word which was first discovered in 1529 by Spanish discoverers. The word "Passio" was demonstrated as a symbol for "Passion of Christ" [1,2]. The genus *Passiflora*, comprising about 400 species, is the largest in the family Passifloraceae. *Passiflora* is a monophyletic group distributed in the subtropical and tropical regions of the world [1,3-5]. The genus is distinguished by the herbaceous or woody climbers with characteristic three to five angled stem [6,7]. Majority of the species possesses nectar secreting foliar and bracteole glands. Moreover, a wide range of diversity was observed in the foliar features of the genus. Like many *Passiflora* spp., *P. vitifolia* is self-incompatible [3,8,9]. The *P. vitifolia* is called as Crimson Passion flower. *P. vitifolia* belong to the country Colombia with locality Victoria a (Caldas), Ibagué (Tolima), El Cerrito (Valle del Cauca) [6,8]. The plant is evergreen vine type. It is a plant of the lowland tropic. The plant required full light with shade from hot sun [9,10]. The *P. vitifolia* contains a lot of bioactive compounds such as Glycosidically Bound Volatiles [11] Alkaloids, phenols, glycosyl flavonoids and cyanogenic mixes [12-14] that different contains medicinal properties. The descriptive taxonomy of the species named as *Passiflora vitifolia* Kunth [15,16] is given in the table 1. The image of the different parts of passifliora vitifolia is given in the figure 1.

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Kingdom	Plantea	
Subkingdom	Tracheobionta	
Super division	Spermatophyte	
Division	Magnoliophyt	
Class	Magnoliopsida	
Subclass	Dilleniidae	
Order	Violaes	
Family	Passifloraceae	
Genus	Passiflora l.	
Species	Passiflora vitiflolia	

Table 1: The toxinomical dercription of Passiflora vitifolia.



Figure 1: Different parts of plant *Passiflora Vitifolia* (A) Ripe fruit (B) Flower (C) Flower with petals and stem (D) Broken fruit with Seed (E) Leaf (F) Whole plant.

The review focus is to provide information on active constituents and pharmacological activities (Figure 2) of the not much explored species *Passiflora vitifolia*. Also, highlight the fact that a lot of work can be explored on the species and the ayurvedic formulation can be developed using the *P. vitifolia*.



Figure 2: Different Pharmacological activity reported of Passiflora Vitifolia.

Medicinal properties of Passiflora vitifolia

Pal and co-worker reported the in-vitro anti-inflammatory activity of Passiflora vitifolia leaves. The different extract of the leaves was prepared and the phytochemical screen were also performed using ethanol, ethyl acetate, chloroform, pet. ether and acetone. The test results showed that the leaves contain flavonoids, alkaloids, carbohydrates and cardiac glycoside. For the evaluation of anti-inflammatory activity, four different concentrations were prepared (50, 100, 150 and 200 µg/ml). The different concentration was subjected to the HRBC membrane stabilization and inhibition of protein denaturation method. The result showed that 85% stabilisation of hemolysis at the concentration of 150 and 200 μ g/ml which was similar to the reference (aspirin at the dose of $100 \,\mu\text{g}$ / ml) in the HRBC membrane stabilization method. In the inhibition of protein denaturation method, the results revealed that higher percentage of Inhibition of proteinase 86 and 87% at the concentration of 150 and 200 μ g/ml than the reference aspirin at 100 μ g/ ml (85% inhibition) [17].

In 2020 Avila team reported potential uses of the fruit peel and seeds from *Passiflora vitifolia*. The ethanolic extract was used to determine the pharmacological activity. The ethanolic extract was used to determine the total phenolic compounds, protein and fats

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in the seed and peel of the P. vitifolia. The results described that the seed of the plant extract contain almost four folds more phenolic compounds (10 671 mg GAEsnow/100 g sample) than the peel (2817 mg GAE/100 g sample). Similarly, in case of crude protein and fat contents from the seeds are higher (15.5% and 25.6%) than the peel (6.60% and 5.70%, respectively). Nine phytoconstituents were positive for both extracts. The extract was also tested for antioxidant activity using ABTS, DPPH (1,1-Diphenyl-2-picrylhydrazyl Assay), FRAP (Ferric reducing antioxidant power), and ORAC methods. The results described that RSC was increased like this: Peel extract against ABTS. The mean FRAP and ORAC (Oxygen radical absorbance capacity (µmol TEAC [Trolox equivalent antioxidant capacity) were found to be 95.50 and 502.60 µmol TEAC (Trolox equivalent antioxidant capacity) 100/g values, respectively. Additionally, the extracts were also tested for anti-hyperglycaemic activity using alpha-amylase inhibition assay. The results showed that the ethanolic extracts of *P. vitifolia* fruits also exhibited significant inhibition activities on α -amylase enzyme between the seed and the peel with inhibitory percentage 55.10 and 11.00% respectively [18].

Summary of the *Passiflora vitifolia* reported for the medical uses

S.NO.	Pharmacologi- cal Activity	Part used	Extract	References
1.	Anti-inflamma- tory	Leaves	Ethanolic	[17,19]
2.	Antioxidant	Fruit peel and seeds	Ethanolic	[18]
3.	Anti-hypergly- caemic	Fruit peel and seeds	Ethanolic	[18]
4.	Against snake bites	-	-	[20,21]

 Table 2: Summary of Passiflora vitifolia reported for the medical use.

Summary of the other *Passiflora species* reported for the medical uses

S.NO.	Pharmacological Activity	Part used	Extract	Refer- ences
1.	Antioxidant, Anti- inflammatory, and Hypoglycemic	Leaves	Hydroethanolic	[22]
2.	Anti-anxiety	Aerial parts	Hydroalcoholic	[23]
3.	Modulation of the γ-aminobutric acid (GABA)	-	Dry extract	[24]
4.	Anxyolitic activity	Aerial parts	Methanol extract	[25]
5.	Anxyolitic activity	Aerial parts and underground parts	Methanol extract	[24]
6.	Anxyolitic activity	-	Petrol, CHCl3, MeOH and water extract	[26]
7.	Anxyolitic activity	Aerial parts	Mother tincture vs methanol extract	[27]
8.	Sedative effect	-	0.5% Carboxy- methyl cellulose (CMC)	[28]
9.	Anti-asthmatic effect	Leaves	Methanol extract	[29,30]
10.	Antibacterial	Leaf and fruit	Ethanol and Acetone extract	[31]
11.	Anti-inflamma- tory	Leaves	aqueous extract	[32]
12.	Antioxidant and Antiglycation	Leaf	Hydroalcoholic	[33]

 Table 3: Summary of the other Passiflora species reported for the medical uses.

Chemical constitutes of *Passiflora vitifolia* Free volatile compounds of *Passifora vitifolia* [11]

The different free volatile compounds founded in the *Passifora vitifolia* is tabulated in table 4 and the chemical structure is given in the figure 3.

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S.NO.	Compounds
1.	Methylcyclohexane
2.	Acetone
3.	Methyl butyrate
4.	Methyl hexanoate
5	Limonene
6.	Methyl 5-hexenoate
7.	Methyl (E)-2-hexenoate
8.	4-Hydroxy-4-methyl-2-pentanone
9.	Tetradecane
10.	Methyl 3-hydroxybutyrate
11.	(E)-2-acetoxy-3- butanol
12.	Methyl benzoate
13.	Methyl 4-oxo-hexanoate
14.	Methyl 3-hydroxyhexanoate
15.	γ-Hexalactone
16.	Methyl 3-hydroxyoctanoate
17.	δ-Octalactone
18.	P-CresoL
19.	4-Ethyl-5-methylthiazol
20.	Benzoic acid
21.	Benzophenone
22.	Methyl zingerone
23.	Methyl 5-oxo-hexanoate
24	Methyl 5-hydroxyhexanoate

Table 4: Free volatile compounds of Passiflora vitifolia



Figure 3: Chemical structures of free volatile compounds of Passiflora vitifolia.

Glycosidically Bound Volatiles compounds in Passiflora vitifolia

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The different glycosidically bound volatiles compounds in *Passiflora Vitifolia* are tabulated in table 5 and the chemical structure is given in the figure 4.

S.NO.	Compounds
1.	3-Methyl-2-butenone
2.	Acetic acid
3.	Benzaldehyde
4.	Methyl 3-hydroxyhexanoate
5.	Methyl salicylate
6.	Methyl 5-hydroxyhexanoat
7.	Benzyl alcohol
8.	2-Phenylethanol
9.	(E)-Isoeugenol
10.	4-Vinylguaiacol
11.	Benzoic acid
12.	3-(4-Hydroxy-3-methoxyphenyl)-1-propanol
13.	3,4-Dimethoxyphenol
14.	Hexadecan00oic acid
15.	Methyl 4-hydroxybenzoate

 Table 5: Glycosidically Bound Volatiles compounds in Passiflora

 vitifolia



Figure 4: Chemical structures of glycosidically bound volatiles compounds in *Passiflora vitifolia*.

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Flavonoids found in in hydroethanolic extract of *Passiflora* vitifolia

S.NO.	Compounds	References
1.	Luteolin-7-0-dirhamnoside 3'-0- glucoside	[34]
2.	Luteolin-3'-O-dirhamnoside-7-O- rhamnoside	[34]
3.	Orientin-7-O-glucoside	[35]
4.	Vitexin-7-0-glucoside	[35]
5.	Isoorientin	[36]
6.	Apigenin-7-O-diglucoside	[37]
7.	Vitexin	[38,39]

 Table 6: Flavonoids found in hydroethanolic extract of Passiflora

 vitifolia.





Future prospective

The retrospective studies of different researcher revealed that the species *Passiflora vitifolia* possessed number of chemical constituents with number of pharmacological activities. Similarly, with the *Passiflora vitifolia*, although the plant is not explored that much but still the study insight that this species of *Passiflora* also have number of chemical constituents. The study also described the pharmacological aspects of the plant. This encourages about the more research on the particular species. The results of the different researcher also insight that the plant can also be investigated for the formulation development of anti-inflammatory and anti-hypoglycaemic. The results also demonstrated the valuable antioxidant effect of the plant. Therefore, the plant can also be subject to anticancer effect, and neurovegetative studies.

Conclusion

The plant named *Passiflora Vitifolia* possess different chemicals such as volatile oils, glycosides, flavonoids, etc. The plant gives the valuable effect on the examination of anti-inflammatory, antioxidant, antihyperglycemic effects. The reports suggest that the plants contain valuable chemical constituents. These chemical constituents are valuable for many pharmacological purposes. Therefore, the plant is highly important to explored on large extent as the revealed the pharmacognostic and ayurvedic value of the plant *Passiflora vitifolia*.

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