

A Review on Genus *Passiflora*: An Endangered Species

Tulsi Bisht^{1*}, Vinod Rana², Himani Bajaj³

¹ Kingston Imperial Institute of Science and Technology, Dehradun

² Siddhartha Institute of Pharmacy, Dehradun

³ AVIPS, Shobhit University, Saharanpur

Corresponding Author: Dr. Tulsi Bisht, Associate Prof.,
Kingston Imperial Institute of Science and Technology, Dehradun, Uttarakhand, India;

Abstract

The focus of this review is to provide information on *Passiflora* plant which is used since ancient time for various remedies, but much work is needed to prove its pharmacological evidences. Plants from this genus known to contain various active principals of therapeutic value and possesses biological activity against number of diseases. Plants of the genus *Passiflora* are shrubs and herbs, mostly climbers with auxiliary tendrils. Other than medicinal uses, the plant is widely used as a flavouring agent and ornamental flower. Literature survey reveals *Passiflora* contain so many phytochemicals that can be used as remedies for treatment of various diseases. Therefore, further studies may be carried out to prove the potential of these plants. This review focusses on ancient history, various properties and species of *Passiflora*.

Keywords: *Passiflora*, remedies, species, genus

Date of Submission: 23-06-2020

Date of Acceptance: 11-07-2020

I. Introduction

Passiflora was introduced into medicine in 1839 or 1840 by Dr. L. Phares, of Mississippi, who, in the New Orleans Medical Journal, records some trials of the drug made by Dr. W. B. Lindsay, of Bayou Gros Tete, La. The use of the remedy has been revived within recent years, Prof. I. J. M. Goss, M. D., of Georgia, having introduced it into Eclectic practice. Prof. Goss, who introduced it to the Eclectic profession, employed the root and its preparations [1]. *Passiflora* comes from Latin word "Passio" that was first time discovered by Spanish discoverers in 1529 and was described as a symbol for "Passion of Christ" [2] The genus *Passiflora*, comprising about 400 species, is the largest in the family Passifloraceae [3]. A large genus of herbaceous or woody tendril climber [1], mostly distributed in the warm temperate and tropical regions of the World, but they are much rarer in Asia, Australia, and tropical Africa [2]. Many of the species are of ornamental value and a few are cultivated for their edible fruits [4] The plant is believed to possess some of the medicinal properties like hypnotic, analgesic, antidepressant and anti-inflammatory etc. but more scientific research is needed for evidence [5].

Grape-leaved passion plant is a vigorous climbing plant with a perennial rootstock. It produces annual to perennial stems that scramble over the ground or clamber into other plants, supporting themselves by means of tendrils. The plant is sometimes cultivated for its fruit and is also often grown as an ornamental, where it is particularly valued for its free-flowering habit [4]. It is a vine with cylindrical stems covered in red-brown hairs when young. The leaves are serrate, three-lobed, up to 15 cm long and 18 cm broad. The lobed leaves' resemblance to grape leaves gives this passionflower its specific epithet, "vitifolia," meaning "grape leaves" after the Latin for grape "vitis." The flowers are bright red, up to 9 cm diameter. The fruit is a berry 5 cm long and 3 cm broad, with green flesh speckled with white, slight downy hairs, containing numerous seeds. The fruit is quite sour when it falls off the plant and can take a month to ripen to its full flavour of sour strawberries. Due to the fragrant fruit, it is in small-scale cultivation in the Caribbean [5].

A comprehensive literature survey on *Passiflora* revealed that there are a lot of secondary metabolites present in the different species of passifloraceae. The work on *Passiflora vitifolia* not yet done to that extent. It has been reported that plant of family passifloraceae are rich source of flavonoid. These chemical constituents are of great importance in respect to medicinal use. So far, the literature review of *Passiflora* holds a great potential in phytochemical, Pharmacognostic and pharmacological investigation [3-4].



Fig.1 The plant of *Passiflora vitifolia*



Fig. 2: Image of immature fruit

, cut open to reveal seeds and flesh

The unusual flowers are up to 6 inches (15 cm) across and have red outer filaments, white inner filaments, and 10 red tepals (5 petals and 5 petal-like sepals) [6]. The flowers are followed by yellow-speckled to white-speckled, bright green, egg-shaped fruit with soft, juicy, whitish pulp. The grape-like leaves have 2 saucer-shaped nectaries at the base of the petioles and are dark green, alternate, fuzzy-haired below, and deeply 3-lobed with 3 lanceolate, toothed to scalloped lobes. The stems are slender and have coiling tendrils[7].

The ripe fruits have a spongy partition, interesting in texture, which bears the ripe whitish yellow edible flesh surrounding the black hard seeds. The edible fruit is sometimes gathered from the wild and consumed locally, though it is not widely appreciated. Literature review suggest the fruit was eaten and perhaps cultivated by Native Americans [7-8].

Habitat

Lowland forest edges and shrubby areas. Most *Passiflora* species are indigenous to South America, eastern Asia, southern Asia, and New Guinea. Nine species are native to the United States, the most northerly of which are found in Ohio, others in west California and south Florida. Australia and New Zealand are also rich in *Passiflora* species [6-7]. The vast majority of *Passiflora* are found in Mexico, Central and South America, although there are additional representatives in the United States, Southeast Asia, and Oceania. New species continue to be identified: for example *P. xishuangbannaensis* and *P. pardifolia* have only been known to the scientific community since 2005 and 2006, respectively [8]

Habitat	Perennial Climber
Planting time	Spring or autumn
Height	2-10 m.
Self- fertile	No
Common Names	Passionflower, passion vine, maypop, granadilla
Cultivation - status	Cultivated, Ornamental, Wild
Plant Type	Most are perennial vines; some are annuals or woody shrubs/trees
Flower Color	Blue, purple, pink, white and red
Native Area	Mostly Central and South America, North America, Southeast Asia, Oceania[6]
Medicinal Properties	<ul style="list-style-type: none"> • Insomnia, anxiety, adjustment disorder, attention deficit-hyperactivity disorder (ADHD), pain, fibromyalgia, relieving opioid withdrawal symptoms, reducing anxiety and nervousness before surgery, and heart failure* • It is also applied on skin for hemorrhoids and burns • In foods and beverages, passion flower extract is used as a flavouring agent.[9]
Other Uses	<ul style="list-style-type: none"> • Passion flower tea. • Passion flower tincture for Sleeping. • Soothing passion flower herbal mix[11]. • <i>Passiflora</i> as a fragrant in food products and beverage industry. • Various species of <i>Passiflora</i> are used for ornamental plant.

Table 1: Properties of *Passiflora*

* In addition to the World Health Organization (WHO), Commission E of the former German Health Office also positively assessed the use of passion flower for alleviating nervousness[12]. The European Association of Scientific Practitioners in the Field of Phytotherapy (ESCOP) also recommends the passion flower for sleep

disorders and irritability. In German folk medicine, Passionflower is also recommended for use in treating gastric or intestinal disorders, depression, and nerve pain [13].

*The use of *Passiflora* as a medicine was lauded for the first time by a Spanish researcher Monardus in Peru in 1569 as the beautiful flowers of *Passiflora* appeared to him to be symbolic of the passion of Christ [11-12]

* In Brazil, the said species, known as ‘Maracuja’ has been use as an anxiolytic, sedative, diuretic and an analgesic [14].

*In Argentine folk medicine, the aerial parts of *Passiflora caerulea* are used as mild anti-microbial agents in diseases like catarrh and pneumonia [15]

Cultivation Details

A plant of the lowland tropics Succeeds in a wide range of soils, so long as they are well-drained. *Passiflora* species tend to flower and fruit more freely when grown in soils of only moderate fertility. Suited to a sunny sheltered spot in mild regions of the UK, in colder areas it can be grown under cover of a greenhouse or conservatory [11-12]. *Passiflora* plant can be grown in full sun, on well-drained soil and fertilize in spring and mid-summer to get the best growth and blooms. Keep the soil moist with mulch. The mulch also can protect the roots in winter in cold areas [16].

Species of *Passiflora*:

Passiflora species are classified as part of the Passifloraceae family and are all in the genus *Passiflora*. *Passiflora* is the most species rich genus of both the family Passifloraceae and the tribe Passifloreae. With over 550 species, The New World species of *Passiflora* were first divided among 22 subgenera by Killip (1938) in the first monograph of the genus (Killip et. al. 1938). More recent work has reduced these to 4, which are commonly accepted today (in order from most basally to most recently branching) [17].

- *Astrophea* (Americas, ~60 species), trees and shrubs with simple, unlobed leaves.
- *Passiflora* (Americas, ~250 species), woody vines with large flowers and elaborate corolla.
- *Deidamioides* (Americas, 13 species), woody or herbaceous vines.
- *Decaloba* (Americas, Asia and Australasia, ~230 species), herbaceous vines with palmately veined leaves [18].

Table 2: Phyto-constituents of various *Passiflora* species (Patel et. al., 2011)

Species	Phytoconstituents
<i>Passiflora adenopoda</i> Moc. & Sesse	Cyanogenic glycosides linamarin (38), Iotaustrian (39) (Spencer et al., 1986)
<i>Passiflora alata</i> Dryand.	C-glycosyl flavonoids 2''-xylosylvitexin and small amount of vitexin, isovitexin and orientin, 3-O-β-D-glucopyranosyl-stigmasterol, 3-O-β-D-glucopyranosyl oleanolic acid, 3-O-β-D-glucopyranosyl-(1->3)-β-D-glucopyranosyl-oleanolic acid, 3-O-β-D-glucopyranosyl-(1->2)-β-D-glucopyranosyl-oleanolic acid; 9, 19cyclostan-24Z-en-3β,21,26-trihydroxy-3,26-di-O-gentiobiose [16]
<i>Passiflora ambigua</i> Linn.	Flavonoid saponarin [14]
<i>Passiflora apetala</i> Linn.	Cyanogenic glycoside passibiflorin [6, 11]
<i>Passiflora biflora</i> Domb.	O- and C-glycosylflavones, 4'-O-rhamnosylswertisin, luteolin-7-Oneohesperidoside together with swertisin, swertiajaponin, 4'-O-rhamnosylswertiajaponin, 2''-O-rhamnosylisoorientin and 2''-O-rhamnosylisovitexin (McCormick and Mabry, 1983), cyanogenic glycosides passibiflorin and epipassibiflorin [15]
<i>Passiflora bryonioides</i> HBK	Flavone derivatives saponaretin, vitexin, apigenin-7-monoglucoside and two kaempferol-3-biosides [12-14]
<i>Passiflora caerulea</i> Linn	A flavone chrysin, cyanogenic glycoside sulphate tetraphyllin B-4-sulphate and epitetraphyllin B-4-sulphate [8-9]
<i>Passiflora calcarata</i> Mast	Passiflorine [18]
<i>Passiflora capsularis</i> Lam.	Passicapsin; cyanogenic bisglycoside 4-bi-vinosyltetraphyllin [16-17]
<i>Passiflora coactilis</i> Linn.	C-glycosyl flavones 4'-O-glucosyl-2''-O-rhamnosyl orientin, 4'-O-glucosyl-2''-Orhamnosyl-vitexin, vitexin, 4'-O-glucosylvitexin, isovitexin, isoorientin, 4'-Oglucosyl orientin, 2''-O-rhamnosyl orientin, scoparin, 2''-O-rhamnosyl scoparin and 8-C-glucosyl-diosmetin [18]
<i>Passiflora coccinea</i> Aubl.	Cyanogenic glycoside passicoccin (40) [19]
<i>Passiflora cochinchinensis</i> Sp	Flavonoids naringin and apigenin-7-O-glucoside; Amino acids; Carbohydrates [18-19]
<i>Passiflora colinvauxii</i> Linn.	Cyanogenic glycoside passibiflorin [20]
<i>Passiflora coriacea</i> Fuss.	Cyanogenic glycoside barterin [21]
<i>Passiflora cyanea</i> Mast	C-glycosyl flavonoid 2''-xylosylvitexin and coumarin esculetin [21]
<i>Passiflora foetida</i> Linn.	Flavonoids pachypodol, 7,4'-dimethoxyapigenin, ermanin (42), 4',7-O-dimethylnaringenin, 3,5-dihydroxy-4,7-dimethoxy flavanone, C-glycosyl flavonoids chrysoeriol, apigenin, isovitexin, vitexin, 2''-xylosylvitexin, luteolin-7-dglucoside, kaempferol; cyanohydrin glycosides tetraphyllin A (43), tetraphyllin B, tetraphyllin B sulphate, deidaclin (44), volkenin (45); Fatty acids linoleic acid and linolenic acid; alpha-pyrone named passifloricins, polyketides alpha-pyrone [16-17]
<i>Passiflora hybrida</i> Nees	A sulphate ester of tetraphyllin B [18-20]

Passiflora indecora H.B.K.	Cyanogenic glycoside passibiflorin [16,20]
Passiflora laurifolia Linn	Pantothenic acid, ascorbic acid [11]
Passiflora racemosa Brot.	Sulphate ester of tetraphyllin B [14]
Passiflora sanguinolenta M.	Flavonoids isovitexin, luteolin-7-O-glucoside and 7-O-galactoside, xylosyl vitexin, apigenin, apigenin-7-O-glucoside and luteolin [12-14]
Passiflora serratifolia Linn	C-glycosyl flavonoids vitexin, isovitexin, orientin, 2''-xylosyl vitexin and 2''xylosyl isovitexin [16-18]
Passiflora serratodigitata L.	Serratin I (48) and its 7-β-glucoside; C-glycosylflavone 2''-xylosylvitexin, 2''xylosylisovitexin, vitexin, isoorientin, vicenin and orientin [20-21]
Passiflora sexflora Fuss.	Flavonoids 6-di-C-glycosylflavones, 6-mono-C-glycosylflavones, luteolin-7-Oglucoside, luteolin [22-23]
Passiflora suberosa Linn.	Cyanogenic glycosides passisuberosin, epipassisuberosin; Anthocyanins cyanidin-3-(6''-malonylglucoside), 3-glucoside of cyanidin, delphinidin, petunidin, pelargonidin and anthocyanin acetylated with malonic acid [20-21]
Passiflora subpeltata Orteg.	Cyanogenic glycoside barterin [21-22]
Passiflora talamansis	Cyanogenic glycosides passibiflorin and epipassibiflorin [21-23]
Passiflora tetrandra Banks & Soland.	4-Hydroxy-2-cyclopentenone [22-25]
Passiflora trifasciata Lem.	Cyanogenic glycoside Passitrifasciatin [22]
Passiflora trinervia Poir.	Flavonoids vitexin, isovitexin, luteolin-7-O-galactoside, esculetin, isoorientin [16]
Passiflora vespertilio KerGawl.	Cyanohydrin glycoside passibiflorin [17]
Passiflora violacea Vell.	Cyanohydrin glycoside linamarin [24]
Passiflora warmingii Mast.	Linamarin, linustatin [24, 26]

]

Future aspect of *Passiflora*

The future aspect also defines the further study on *Passiflora* as the plant contains large number of Phytoconstituent, but the plant is not subjected for evaluation of much study. The study in future can be extended to leaves, flowers, seed and roots of the plant to be standardised and evaluated for the pharmacological responses. Plants from the genus *Passiflora* have been used in traditional medicine by different cultures. Flavonoids, glycosides, alkaloids, phenolic compounds and volatile constituents have been reported as the major phyto-constituents of the *Passiflora* species. Other than medicinal properties, *Passiflora* is also used in beverages, food products, perfumes and as an ornamental plant. Growing *Passiflora* species can be helpful to medical industry and food industry.

ACKNOWLEDGEMENT: The author acknowledges Kingston Imperial Institute of Science and Technology, Dehradun for providing necessary resources.

CONFLICT OF INTEREST: No conflict of interest is declared.

References:

- [1]. Anthony Julian Huxley, Mark Griffiths (1992). Dictionary of Gardening. 1992; ISBN 978-0-333-47494-5.
- [2]. Anesini C, Perez C. Screening of plants used in argentine folk medicine for antimicrobial activity, Journal of Ethnopharmacology. 1993;39: 119–128.
- [3]. Beninca J.P, Montaner A.B, Zucolotto S.M, Schenkel E.P, Frode T.S. Evaluation of the anti-inflammatory efficacy of *Passiflora edulis*, Food Chemistry. 2007, 1097–1105.
- [4]. Bennati E. Quantitative determination of harman and harmine in *P. incarnata* extract, Bollettino Chimico Farmaceutico. 1971, 664–669.
- [5]. Benson V.L, Khachigian L.M, Lowe H.C. DNA enzymes and cardiovascular disease, British J Pharmacol. 2008, 741–48.
- [6]. Bergner P. Passion flower. Medical Herbalism. 1995 (7), 13–14.
- [7]. Dhawan K, Kumar S, Sharma A. Aphrodisiac activity of methanol extract of leaves of *Passiflora incarnata* Linn in mice. Phytother Res. 2003 17(4), 401-3.
- [8]. Feuillet C, MacDougal J. "A new infrageneric classification of *Passiflora* L. (Passifloraceae)". Sciencedirect. 2004; 13 (2): 34–35.
- [9]. Haroon Khan, Seyed Mohammad Nabavi. Nonvitamin and Nonmineral Nutritional Supplements, 2019.
- [10]. Juliet Blankespoor. Passionflower: Ecology, Cultivation, Botany, and Medicinal and Edible Uses. Aug. 2012.
- [11]. Katzung BG. Basic and clinical pharmacology, East Norwalk, Connecticut: Prentice-Hall International Inc. 1992.
- [12]. Krosnick S.E, MacDougal J.M, Jorgensen P.M, McDade L.A. "New insights into the evolution of *Passiflora* subgenus Decaloba (Passifloraceae): phylogenetic relationships and morphological synapomorphies". Systematic Botany. 2013; 38 (3): 692–713.
- [13]. Khan T.D, Chung I.M, Tawata S, Xuan T.D. Weed suppression by *Passiflora edulis* and its potential allelochemicals. Weed Research. 2006; 46(4): 296–303.
- [14]. Kidoley L, Nygaard A.M, Andersen O.M, Pedersen A.T, Aksnes D.W, Kiremiri B.T. Anthocyanins in fruits of *Passiflora edulis* and *P. suberosa*. Journal of Food Composition and Analysis. 1997; 10:49–54.
- [15]. Kinghorn G.R. Passion, stigma and STI. Sex Transm Inf. 2001; 77:370–75.
- [16]. Killip E.P. The American Species of Passifloraceae. Chicago, US: Field Museum of Natural History. 1938.
- [17]. Oga S, Freitas P.C.D, Gomes da Silva A.C, Hanada S. Pharmacological trials of crude extracts of *Passiflora alata*. Planta Medica. 1984; 51:303–306.
- [18]. Patel S.S, Soni H, Mishra K, Singhai A.K. Recent updates on the genus *Passiflora*: A review Int. J. Res. Phytochem. Pharmacol. 2011; 1(1): 1-16
- [19]. *Passiflora vitifolia*". Natural Resources Conservation Service PLANTS Database. USDA. September 2015.

- [20]. *Passiflora* Germplasm Resources Information Network (GRIN). Agricultural Research Service (ARS), United States Department of Agriculture (USDA). December 2017.
- [21]. Ulmer, Torsten and John Mochrie MacDougal. "Passiflora: passionflowers of the world". Timber Press. 2004

Dr. Tulsi Bisht, et. al. "A Review on Genus Passiflora: An Endangered Species." *IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)*, 15(4), (2020): pp. 17-21.