

Passiflora spp: Uses and Patents

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Received: July, 04 2018; **Published:** August 11, 2018

Volume 3 Issue 2 August 2018

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The *Passiflora* genus belongs to *Passifloraceae* family. The genus is highly diverse, with approximately 534 species (ESASHIKA, 2018). Most of them (96%) are distributed in the Tropical Americas, mainly in Brazil (145 species), although there are records of species in India, China, Southeastern Asia, Australia, the Pacific Islands, and neighboring regions (examples *Passiflora aurantia* G.Forst., *Passiflora cinnabarina* Lindl, *Passiflora herbertiana* Ker Gawl. , *Passiflora cupiformis* Mast., *Passiflora henryi* Hemsl, *Passiflora jugorum* W.W.Sm., *Passiflora moluccana* Reinw., and *Passiflora siamica* Craib) (THE PLANT LIST, 2013).

The ethnopharmacology from different countries uses *Passiflora* species for phytotherapeutic purpose, mainly for treatment of nervous and endocrinal systems problems. Furthermore, many species present potential for food and cosmetic uses (COSTA, 2017; DHAWAN., *et al.* 2004). The analysis of international patents banks could be a good way to identify the industries interest and guide new research lines.

The search for the expression “passion fruit or *passiflora*” in the patents database WIPO (2017) and EPO (2017) return 454 and 968 documents respectively, of which only 500 were released for consultation at the EPO database. After the discard of the duplicate entries, it was possible to identify 813 different technologies. From these, approximately 9% were developed to the cosmetic industry; 25% to the pharmaceutical and phytotherapeutic area; 48% to the food and beverage area and 5% to the industry in general. In respect to the agronomic area, it was verified that 14% of the technologies had the purpose of gaining productivity (agronomic production methods, molecular marker, genes construction, and tissue cultures methods), and better condition to conservation of fruits of the *Passiflora* spp (postharvest).

Only 30% of the documents identified the specie of *Passiflora* used. Of the species identified 32% used *Passiflora edulis* Sims (pulp, seeds, peel, whole fruits or leaf) as an ingredient to food formulations, raw mater to obtain phenolic acids, piceatannol, fatty acids to food or cosmetics/ phytotherapeutic formulation, and fermentative substrates.

The *Passiflora caerulea* L. (20%) and *Passiflora incarnata* L. (11%) were used mainly as a raw mater to obtain extract enriched in flavonoids compounds to prepare formulas to help the good function of the nervous system. Extracts of *P. caerulea* were developed and used as a flavoring to improve sensory properties of functional foods formulations.

The *Passiflora wilsonii* Hemsl. was the most often in registered formulation used by traditional Chinese medicine. The formulations were intended for the proper functioning of the nervous, digestive and endocrine system.

Technologies for medicinal, functional and cosmetic purposes have also been registered, having extracts of de *Passiflora alata* Curtis (1,5%); *Passiflora alliacea* Barb. (0,5%); *Passiflora antioquiensis* H.Karst (0,5%); *Passiflora cochinchinensis* Spreng (2%); *Passiflora cupiformis* Mast (1%); *Passiflora foetida* L. (3,4%); *Passiflora henryi* Hems (4%); *Passiflora jugorum* W.W.Sm (0,5%); *Passiflora mollissima* H. B. K. (0,5%); *Passiflora moluccana* Reinw (2,4%); *Passiflora papilio* H.L.Li (2,4%); *Passiflora perpera* Mast. (0,5%); and *Passiflora quadrangulares* L. (0,5%).

Of the technologies that involved biotechnological applications, the fermentative processes stand out, which comprised 8.1% of the technologies deposited. In the category, it was verified the predominance of formulations and processes to obtain fermented beverages (48%), followed by food with functional appeal (20%), ingredient for use in food and herbal agroindustry (18%) and agriculture (8%). Fermented drinks with passifloras (with or without herbs, spices, fruits and cereals, dairy products or probiotics) comprised 38% of the technologies in the sector, the others being for teas (26%) and 41% of unfermented beverages. Of these 53% of the technologies were presented with a claim of health benefit.

All the information presented allowed to conclude that there is a great concentration of technological development focused on health; foods and beverages with sensory quality and preferably with health claims; and a vast opportunity to prospect new natural assets, aromas and dyes, considering that there are still few species studied in the face of the diversity of the *Passiflora* genus.

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