



Contents lists available at ScienceDirect

Journal of Applied Research on Medicinal and Aromatic Plants

journal homepage: www.elsevier.com/locate/jarmap



Review article

Vanilla (*Vanilla planifolia* Andr.), its residues and other industrial by-products for recovering high value flavor molecules: A review

Itzamná Baqueiro-Peña, José Ángel Guerrero-Beltrán*

Depto. de Ing. Química, Alimentos y Ambiental, Universidad de las Américas Puebla, Cholula, Puebla 72810, Mexico

ARTICLE INFO

Article history:

Received 12 November 2015
Received in revised form 12 October 2016
Accepted 21 October 2016
Available online xxx

Keywords:

Vanilla processing
Vanilla pods
Vanilla bagasse
Biotransformation of vanilla
Industrial by-products

ABSTRACT

Vanilla (*Vanilla planifolia* Andr.) is the only orchidacea grown for food purposes. This plant was a gift from Mexico to the world and for years has been used for various purposes. The pod of this crop in its green state does not have the aroma that characterizes it, is after the curing process that this appears, which can vary depending on the country and growing region. Once vanilla pods are cured, the aromatic properties become significantly noticeable: flavor and aroma. Vanillin has become essential over time for use in medicine and in the pharmaceutical, food and cosmetic industries, among others. Due to the high cost of natural vanilla, various strategies have been implemented for obtaining vanillin, the main molecule found in vanilla extracts or concentrates obtained through various chemical and biotechnological processes using microbial cultures. Various industries and agro-industries generate wastes; the vanilla industry is not an exception. Vanilla waste (residues or by-products) have not been studied and characterized in its composition; therefore, it represents an interesting option for study and possible production of molecules with high added value.

© 2016 Elsevier GmbH. All rights reserved.

Contents

1. Introduction.....	00
2. Vanilla.....	00
2.1. Taxonomy and botanical.....	00
2.2. Geographic distribution.....	00
2.3. Processing of vanilla pods.....	00
2.4. Vanilla composition.....	00
2.5. Vanilla extracts composition.....	00
3. Uses of vanilla.....	00
3.1. Foods and drinks.....	00
3.2. In medicine.....	00
3.3. In pharmacy.....	00
3.4. As antimicrobial.....	00
3.5. As antioxidant.....	00
3.6. In the perfume industry.....	00
4. Vanilla exhausted pods.....	00
4.1. Exhausted pods.....	00
4.2. Vanilla production.....	00
5. Vanilla flavor production.....	00
6. Solid fermentation.....	00
7. Cellulose degradation.....	00

* Corresponding author.

E-mail addresses: angel.guerrero@udlap.mx (I. Baqueiro-Peña),
joseangel150@hotmail.com (J.Á. Guerrero-Beltrán).

<http://dx.doi.org/10.1016/j.jarmap.2016.10.003>

2214-7861/© 2016 Elsevier GmbH. All rights reserved.

Please cite this article in press as: Baqueiro-Peña, I., Guerrero-Beltrán, J.Á., Vanilla (*Vanilla planifolia* Andr.), its residues and other industrial by-products for recovering high value flavor molecules: A review. J. Appl. Res. Med. Aromat. Plants (2016), <http://dx.doi.org/10.1016/j.jarmap.2016.10.003>

8.	Molecules obtained from agro-industrial residues	00
8.1.	Agro-industrial residues	00
8.2.	Phytochemicals	00
8.3.	Organic acids	00
8.4.	Aromas	00
8.5.	Example of flavorings	00
8.5.1.	Coconut flavor (6-pentyl- α -pyrone)	00
8.5.2.	Pyrazines	00
8.5.3.	Aromas of roses	00
8.5.4.	Herbal aromas	00
8.5.5.	Milk products aromas	00
8.5.6.	Fruit aromas	00
9.	Final remarks	00
	Acknowledgements	00
	References	00

1. Introduction

Vanilla (*Vanilla planifolia* Andr.) is a native orchid of Mexico. It is the only orchid grown for food purposes due to the generation of a fragrant fruit: the vanilla pod. This pod is subjected to a special process in which a series of biochemical and enzymatic changes are made to generate about 200 compounds which give the characteristic flavor and aroma of vanilla. Once the pods are cured, these are subjected to an extraction process to obtain a concentrate or vanilla extract. When the process is finished, a by-product is obtained considered a waste: bagasse.

In the process for obtaining vanilla extracts, as in many products in Mexico, and in the world, a comprehensive plan is required using biotechnological strategies for obtaining secondary products of high added value. Among various biotechnological procedures that have been developed in recent years are microbial biotransformation which allows the use of agricultural by-products for abstaining compounds, with natural product designation, allowed for human consumption.

This review aims to show some generalities of vanilla and the physicochemical composition of green and processed pods (bagasse), as well as the composition of vanilla extracts. The use in medicine, in cooking, in other industries and the alternative use of processed pods for obtaining molecules with high added value.

2. Vanilla

Vanilla is one of the most popular spices in the world and is found in the third place after saffron and cardamom (Azeez, 2008) as flavorings. It is a tropical orchid native of Southeast Mesoamerica that has been used since pre-Hispanic Mexico by various indigenous groups such as the Mayans, Aztecs, and Totonacs; they used vanilla as medicine, as a tribute to the gods, and as fragrance and flavoring (Bythrow, 2005).

2.1. Taxonomy and botanical

The Orchidaceae family to what belongs the Vanilla genus contains over 800 genera distributed in more than 25,000 species. The characteristics of the flowers, the configuration of the anthers and stamens structure have traditionally been used for the classification of families. However, molecular phylogenetic studies have been modified to classify plants. Recently, vanilla has been placed in the genus: Vanilla, family: orchid, subfamily: Vanilloideae, group: Vanilleae, and subgroup: Vanillinae (Bory et al., 2008). Vanilla is a perennial, angiosperm, monocot, and climbing plant. It has a simple or branched, cylindrical, flexible green stem. The leaves, arranged alternately along the stem, are flexible, sessile, elliptical, and lanceolate. The plant has a bunch of 15–20 inflorescences

that sprouts in the armpit; they are green-yellow and have three sepals, two normal and one modified called lip (labelo) (Olivares-Soto, 2010). The fruits (pods) are linear and flat, measuring from 12 to 35 cm long and 5 to 9 mm in diameter and have a cone-shaped termination. The fruits have a moderately dark or brown color, they are wrinkled along the fruit and sometimes are covered with small crystals of vanillin. Inside the fruits are about 100,000 seeds of 0.25 to 0.32 mm in diameter (Bagchi and Srivastava, 2003).

2.2. Geographic distribution

In Mexico, the vanilla production area extends from the coast of the Sierra Madre Oriental to the Gulf of Mexico. It grows to a height of 700 m above sea level, where the climate is hot (24 °C average) with relative humidity of 80% (or higher) and tropical environment with an average annual rainfall of 1200–1300 mm. In spring this region is dry, while summer is humid with moderate winds of low intensity; this climate stimulates blooming of vanilla (Hernández-Hernández, 2011). Vanilla requires soils where texture and pH can be more important than fertility. The soil should have a uniform distribution of rainfall and good drainage. Vanilla is a plant that grows on the surface; therefore, a humus-rich soil is ideal for growing (Kandiannan and Dinesh, 2008). It is in the City of Papantla in the state of Veracruz, Mexico, where 70% of the country's vanilla is produced; this place is considered the center of growing, processing and marketing of vanilla. The states of Puebla and Oaxaca produce the remaining 30%. Small amounts of vanilla come from the states of San Luis Potosi, Hidalgo, Chiapas and Quintana Roo, Mexico (Hernández-Hernández, 2011). As already stated, vanilla is regarded as a gift from Mexico to the world (Azeez, 2008). Mexico has the original plants that were introduced in tropical countries of Asia and Africa. Vanilla began to be exported from the Totonac region of Papantla, Veracruz, Mexico to various countries throughout the world; this trade lasted over 100 years, due to the exceptional quality of production. The original production area of vanilla was awarded in Chicago in 1882 and Paris in 1889, distinctions that made to Papantla as "The City that perfumed the world" (Hernández-Hernández, 2011).

Vanilla distribution began around 1773, which was introduced to England in the island of Java (Indonesia); however, its cultivation began only in 1819 and was until 1846 that began to grow significantly. The plant was brought to Reunion Island in 1827, to Madagascar in 1840, and introduced in Seychelles, northeast Madagascar, in 1866. Vanilla was then brought from Manila to Haiti in 1893 and to Uganda in 1912. For years, the production of vanilla was attempted in islands with similar climates as in Mexico; however, the production was unsuccessful, except in the above mentioned places (Anandan, 2004).

Download English Version:

<https://daneshyari.com/en/article/5635171>

Download Persian Version:

<https://daneshyari.com/article/5635171>

[Daneshyari.com](https://daneshyari.com)