Review Article

Vanilla Planifolia: A Review of a Plant Commonly Used as Flavouring Agent

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ABSTRACT

The plant *Vanilla planifolia* is a popular orchid species. The main constituent is vanillin which has been used as a flavoring agent in most of the pharmaceutical preparations. In the present study an attempt has been made to illustrate and to provide an insight to the cultivation, phytochemistry, phytochemical analysis, pharmacological actions and commercial uses of this plant.

Keywords: *Vanilla planifolia*, phytoconstituents, analysis, medicinal uses.

INTRODUCTION

Vanilla planifolia, or 'flat-leafed' vanilla, is the scientific name for the plant referred to as the 'vanilla vine', 'vanilla orchid' or simply, and most commonly, as vanilla.

The name "vanilla" is derived from the Spanish word "vanilla", which means "little pod". The vanilla beans are also called as pods or "black flower" as the mature bean, shrivels and turns black after it is picked. It is a commercial as well as medicinal orchid which belongs to the family Orchidaceae, which is the largest family of flowering plants with over 700 genera and 20,000 species. Many orchid species are grown for their flowers, but vanilla is the only orchid that produces a commercial fruit[1].

TAXONOMIC CLASSIFICATION

Kingdom - Plantae

Phylum - Magnoliophyta

Class - Liliopsida

Order - Orchidales

Family - Orchidaceae

Genus - Vanilla

Species - Planifolia

Wild vanilla is a thick, tropical, leafy, evergreen vine climbing orchid native to tropical climates with wide, fleshy 6-9 inch leaves. It adheres to the trees on which it climbs by means of aerial roots which are long, whitish and aerial with a diameter of about 2 mm. Along the vine; there are clusters of trumpet shaped flowers, which vary in color from cream, to yellow, to green. There are three sepals which are 4-7cm long[2].

The fresh pods are fleshy and green while the dried pods are shriveled and black as depicted in figure 1 and 2.

Figure 1: Fresh vanilla pods

Figure 2: Dried vanilla pods

GEOGRAPHICAL DISTRIBUTION, HISTORY, CULTIVATION AND HARVESTING

The history of vanilla begins with the ancient Totonaco Indians of Mexico. Until the mid-19th century, Mexico was the main producer of vanilla. In 1819, French shipped vanilla beans to the Réunion and Mauritius islands. Vanilla plants are grown in five main areas of the world Madagascar, Indonesia, Mexico, Tahiti and India.

In the last few years India has significantly expanded its cultivation to nearly 24,000 hectors with a estimate that the turnover of vanilla pods is about 700 tons. Vanilla plants are cultivated in the southern states of India i.e. Karnataka, Andhra Pradesh, Tamil Nadu, and Kerala [3,4,5].

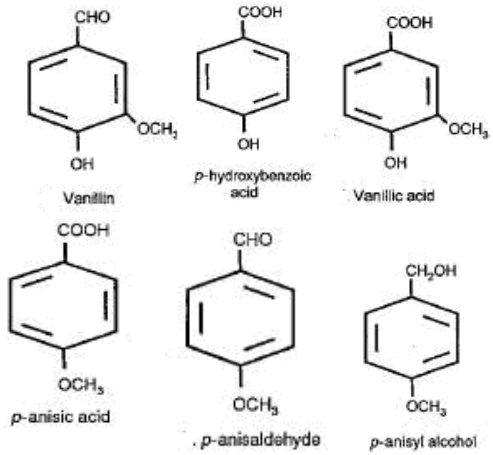
The plant is grown by hand pollination of the vanilla flower. Vanilla is cultivated in tropical regions and is propagated by stem cuttings. The preferred temperature

range is 21-32°C with an average of 27°C. Annual rainfall requirements are 70-90 inches per year. The plant grows best at elevations up to 700m. The plant requires 3 to 4 years to start flowering, and afterward flowers once a year. The pod-like fruit which is referred to as vanilla bean is allowed to develop for 8 to 10 months before harvesting. Vanilla beans are harvested green and are flavorless. These beans are then subjected to curing[6]. Curing process helps to develop the vanilla flavor. The main purpose of the curing processes is to create contact between flavor precursors and the enzymes that help the hydrolysis of precursor compounds to vanillin which is the component that imparts flavor. Curing process involves four major stages which include killing, sweating, drying and conditioning [7].

PHYTO CHEMISTRY

The main constituent of *Vanilla planifolia* is vanillin, a methylprotocatechuic aldehyde (4-hydroxy-3-metoxy benzaldehyde) which constitutes 85 per cent of the entire volatiles in Vanilla beans. The extract of *Vanilla planifolia* with vanillin contains a number of related phenylpropanoid (C6–C3) compounds. During curing these compounds undergo a series of enzymatic reactions which brings about the characteristic aroma and flavor of vanillat[8,9].The other constituents reported are vanillic acid, anisaldehyde,hydroxy benzoic acid, anisic acid, anisyl alcohol,caproic acid, vitispiranes, eugenol, phenols, phenol ether, carbonyl compounds, acids, esters, benzyl ether, lactones, 25% carbohydrates, 15% fat, B-complex, mineral salts like magnesium, calcium, zinc manganese,potassium and iron which constitute six percent. The water content present in vanilla is around 35 %[10-14].

STRUCTURES OF SOME OF THE IMPORTANT CONSTITUENTS OF VANILLA PLANIFOLIA



PHYTOCHEMICAL ANALYSIS

Several methods have been reported for the analysis of phytoconstituents present in the plant. Review of literature has revealed that the chief constituent of the plant i.e. Vanillin has been analyzed using HPLC, RP-HPTLC, RP LC with UV, LC (UHPLC) etc. The other phytoconstituents that have been analyzed and quantified by various techniques are vanillic acid, ethyl vanillin, 4-hydroxybenzyl alcohol, 3,4-dihydroxybenzaldehyde, 4-hydroxybenzoic acid, 4-hydroxybenzaldehyde, vanillyl alcohol, p-coumaric acid, Coumarin, ferulic acid, piperonal, glucovanillin, p-cresol, creosol, bis[4-(β-d-glucopyranosyloxy)-benzyl]-2-isopropyltartrate and bis[4-(β-d-glucopyranosyloxy)-benzyl]-2-(2-butyl)tartrate[15-26].

PHARMACOLOGICAL ACTIVITIES

Vanillin has been evaluated for its anticlastogenic properties [27], it has been reported that it has the ability to reduce chromosomal damage caused by X-ray and UV light[28], it posseses antimutagenic[29], anticarcinogenic effects in a family of DNAPK inhibitors and other types of cancers[30-33]. Vanillin's antimicrobial properties against yeasts and other microorganisms have been evaluated.[34-35] It has been documented that it is a effective inhibitor of red blood cell sickling in patients suffering with sickle cell anemia[36]. Vanillin has also been reported to posses aphrodisiac activity[37,38] and anti oxidant activity[39].

TRADITIONAL USES

Vanilla plant has been used for several diseases traditional some which include in the treatment of dysmenorrhea, fever, hysteria, dyspepsia, prevents dental caries, alleviates tooth ache and ulcers. It has antispasmodic, anti-inflammatory and analgesic activity. Vanilla is also used for respiratory pain and congestion, deep coughs, stomach ailments etc. Vanillin is used extensively as flavoring agent in food, beverage, perfumery and pharmaceutical industries[40-41] .

CONCLUSION

This review provides valuable information about the cultivation, collection, phytochemistry, phytochemical analysis and pharmacological actions of the plant *Vanilla planifolia.* It is quite obvious from the review that vanillin is the chief constituent of the plant and it has been analyzed using various techniques. It is widely used as a flavoring agent. But a systematic and scientific approach is required to explore the maximum potential of this plant. It is expected that this review will inspire and encourage further research on the phytoconstituents and other unexplored medicinal values of the plant.

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