International Journal of Environment and Climate Change

Volume 14, Issue 2, Page 809-817, 2024; Article no.IJECC.111607
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Vanilla: A Review of Powerful Herb with Ayurvedic Medicinal Properties

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/IJECC/2024/v14i23993

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/111607

Review Article

Received: 20/11/2023
Accepted: 24/01/2024
Published: 23/02/2024

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ABSTRACT

Vanilla, derived from the beans of the Vanilla planifolia orchid, is a globally cherished spice known for its sweet aroma and flavor. Beyond its culinary applications, this review delves into the Ayurvedic medicinal properties of vanilla, unraveling its potential as a powerful herb in traditional medicine. Ayurveda, the ancient Indian system of medicine, recognizes vanilla for its diverse therapeutic attributes. The active compounds in vanilla, such as vanillin, contribute to its antioxidant and anti-inflammatory properties. These qualities align with Ayurvedic principles, emphasizing the balance of bodily functions and prevention of diseases. Vanilla has been historically employed to alleviate digestive disorders, respiratory ailments and stress-related conditions. Ayurvedic practitioners harness its calming effects on the nervous system, promoting mental well-being. Moreover, vanilla is explored for its potential antimicrobial properties, adding a layer of significance in the context of Ayurveda where natural remedies play a pivotal role. The herb's use in Ayurvedic formulations underscores its adaptability across diverse health concerns. This review consolidates current scientific research alongside traditional Ayurvedic wisdom to provide a comprehensive understanding of vanilla's medicinal potential. As consumer interest in holistic well-being grows, the integration of vanilla into Ayurvedic practices not only expands its applications but also exemplifies the synergy between traditional and contemporary approaches to health. Unveiling the multifaceted nature of vanilla as a potent herb, this exploration encourages further investigations and applications of its Ayurvedic medicinal properties in modern healthcare.

Keywords: Orchid; herb; ayurvedic; aroma; flavourful.

1. INTRODUCTION

Vanilla, scientifically known as *Vanilla planifolia*, is a perennial herb belonging to the Orchidaceae family. Its widespread use in both medicinal and flavouring domains spans across numerous centuries. The term Vanilla finds its origins in the Spanish word Vainilla, which is a diminutive form of Vaina, meaning sheath or pod, reflecting the appearance of the Vanilla bean [1]. The Vanilla genus, Vanilla Swartz, encompasses approximately 110 diverse species, distributed across regions such as Pacific islands, Southeast Asia, New Guinea, tropical America, Africa and Indian Ocean islands.

The appeal of Vanilla lies not only in its name but also in its distinct sweet, comforting, warm and complex fragrance, obtained from dried and cured beans. Indigenous to South and Central America as well as the Caribbean, Vanilla was initially cultivated by the Totonacs of Mexico's east coast, later acquired by the Aztecs following their conquest of the Totonacs in the fifteenth century. Notably, Vanilla holds the exceptional distinction of being the sole edible fruit within the extensive orchid family, the largest family of flowering plants globally.

With over 150 varieties, each Vanilla bean possesses a unique combination of taste, aroma and colour, similar to the diverse flavours found in grapes for wine [2]. In the realm of culinary arts, Vanilla plays a pivotal role, comparable to salt in savory dishes, significantly enhancing the overall flavours of sweet baked goods [3]. Its influence is profound, elevating the taste and experience of cookies, cakes and a myriad of desserts. Vanilla's popularity extends to being a favoured ice cream flavour, celebrated for its creamy and delectable nature, enriching a wide array of desserts and treats [4]. Cary Frye, International Dairy Foods Association (IDFA) Vice President of Regulatory and Scientific Affairs and an ice cream expert, emphasized its distinctive flavour and its role in enhancing culinary delights. Vanilla extract, recognized in Ayurveda as a stress-relieving and calming agent, possesses the ability to neutralize free radicals and oxidants [5]. In addition to its well-documented antioxidant properties, vanilla is renowned for its potential to alleviate stress and induce a sense of calm. This natural remedy has been employed for centuries in various cultures as a means of promoting overall well-being. According to Ayurvedic practices, the consumption of water infused with vanilla flavor is a traditional method known to mitigate inflammation. This ancient wisdom aligns with contemporary scientific understanding, as vanilla's anti-inflammatory qualities have been increasingly acknowledged [6].

Beyond its culinary uses, vanilla stands out as a holistic wellness solution, offering benefits that extend beyond mere taste enhancement. Its

impact on oxidative stress and its role as a calming influence underscore its multifaceted value [7]. As we explore the synergies between traditional knowledge and modern science, vanilla emerges not just as a delightful flavoring agent but as a potential ally in the quest for physical and mental well-being. Incorporating vanilla into one's lifestyle, whether through culinary applications or alternative practices, may contribute to a more balanced and harmonious approach to health. The profound effects of vanilla, as recognized across cultures and disciplines, underscore its potential to be a valuable component in promoting a holistic sense of wellness.

In addition to their decorative appeal, orchids hold significant medicinal and glycosidal value. Regrettably, the potential role of orchids in herbal medicine is frequently overlooked. The history of orchids likely originates from their utilization for medicinal purposes [8]. Various orchid species have been and continue to be employed for their therapeutic properties in diverse countries. While numerous research papers, popular articles and books globally discuss the medicinal uses of orchids, information remains scarce for high-value medicinal plants like orchids. Moreover, the available information is typically confined to specific regions or communities. Recognizing the broader medicinal significance of orchids and compiling comprehensive data across regions could further enhance our understanding and utilization of these valuable plants in herbal medicine.

1.1 Taxonomy of *Vanilla planifolia*:

- **Kingdom (Plantae):** This is the highest taxonomic level and includes all plants.
- **Class (Liliopsida):** This class includes monocotyledons, a group of flowering plants with a single seed leaf (cotyledon) in the embryo.
- **Order (Asparagales):** Asparagales is an order of flowering plants, which includes orchids among other families.
- **Family (Orchidaceae):** This is the family level and Vanilla planifolia belongs to the Orchidaceae family, which is known for its diverse and vast array of orchid species.
- **Subfamily (Vanilloideae):** This subfamily is specific to vanillas and a few related genera within the Orchidaceae family.
- **Genus (Vanilla):** Vanilla is the genus to which Vanilla planifolia belongs. The genus encompasses various species of orchids, but Vanilla planifolia is one of the most economically significant due to its vanilla bean production.
- **Species (Vanilla planifolia):** It is the specific species of the vanilla orchid that is primarily used for producing vanilla beans for culinary and industrial purposes.

1.2 Morphological Characteristics of *Vanilla planifolia*:

V planifolia is a member of the Orchidaceae family, with plants typically reaching a height of 8 to 10 feet.

- **Vine and Growth Habit:** Vanilla planifolia is a climbing vine that typically grows up trees or other support structures. The vines can reach considerable lengths, often extending 10 to 20 meters (30 to 65 feet) or more.
- **Leaves:** The leaves of Vanilla planifolia are flat and broad, hence the specific epithet planifolia, which means flat-leaved. The leaves are usually oblong, elliptical, or lance-shaped, measuring about 15-25 cm (6-10 inches) in length and 5-10 cm (2-4 inches) in width.
- **Roots:** Vanilla planifolia has a robust, fleshy root system that provides support and nutrients for the climbing vine. The roots play a crucial role in anchoring the plant to its supporting structure and absorbing water and nutrients from the soil.
- **Flowers:** The vanilla orchid produces showy, waxy and fragrant flowers. The flowers are typically cream to greenish-yellow in color, with a unique trumpet-like shape. Each flower is approximately 5-8 cm (2-3 inches) in diameter and has three outer sepals and three inner petals. The lip or labellum of the flower is often ruffled and has a distinctive yellow or greenish central strip.
- **Inflorescence:** The flowers of Vanilla planifolia are arranged in clusters or racemes that emerge from leaf axils along the vine. Each inflorescence can bear multiple flowers and the flowering period usually occurs during specific times of the year.
- **Seed Pods (Fruit):** After successful pollination, the flowers of Vanilla planifolia develop into long, slender seed pods, often referred to as vanilla beans or vanilla pods.

These pods are typically green when young and turn yellowish-brown as they mature. The pods can measure between 15-25 cm (6-10 inches) in length [9].

- **Seeds:** Inside the seed pods, Vanilla planifolia contains numerous tiny, blackand aromatic seeds. These seeds are embedded within a sticky, pulpy substance and are responsible for the characteristic vanilla flavour and aroma.

2. CHEMICAL COMPONENTS

Vanilla beans contain a rich array of chemicals, with over 300 individual compounds identified. Among them, more than 170 are volatile aromatic components.

- **Vanillin(4-hydroxy-3 methoxybenzaldehyde):** Vanillin is the primary and most significant compound responsible for the characteristic vanilla flavour and aroma. It's the dominant flavour compound in vanilla beans [6].
- **Vanillic Acid:** Vanillic acid is a derivative of vanillin and contributes to the overall vanilla flavour.
- **p-Hydroxybenzaldehyde:** This compound is another aromatic aldehyde that contributes to the overall aroma and flavour of vanilla.
- **Vanillyl Alcohol:** Vanillyl alcohol is an aromatic alcohol that complements the flavour profile of vanilla and is also a precursor to vanillin.
- **Acetovanillone:** Acetovanillone is another aromatic compound found in vanilla, contributing to its characteristic taste and fragrance.
- **Vanilloyl Glucose and Glucovanillin:** These are glucoside forms of vanillin, serving as storage and transport forms of vanillin within the vanilla beans.

Table 1. Primary constituents in cured vanilla pod per gram of dry weight

Constituent	Approximate Percentage per gram of dry weight
Vanillin	1.5% - 2.5%
Glucovanillin	0.1% - 1.0%
Eugenol	0.01% - 0.2%
Acids (acetic, butyric)	0.02% - 0.2%
Phenols (including guaiacol)	0.05% - 0.3%
Alcohols (vanillyl alcohol, isovanillin)	0.05% - 0.2%
Sugars (glucose, sucrose)	10% - 20%
Water	15% - 25%
Cellulose and lignin	15% - 25%
Miscellaneous compounds	10% - 20%

Sources: Joint FAO/WHO Expert Committee on Food Additives, Technical Report 2021

Table 2. Vanilla producing countries in the world

Sl. No.	Country	Vanilla Production (Metric Tons)
1.	Madagascar	2,100 - 2,500
2.	Indonesia	600 - 800
3.	Comoros	200 - 300
4.	Papua New Guinea	200 - 300
5.	Mexico	150 - 250
6.	Uganda	100 - 200
7.	India	50 - 100
8.	Tanzania	50 - 100
9.	Reunion	40 - 60
10.	Seychelles	10 - 20

Sources: Food and Agriculture Organization of the United Nations (FAO) 2021-2022

- Eugenol: Eugenol is a phenolic compound that contributes to the overall flavour and aroma of vanilla. It has a spicy and sweet aroma.
- Isobutyric Acid: Isobutyric acid contributes to the overall flavour of vanilla and enhances its richness.
- Furfural: Furfural is a compound that contributes to the caramel-like aroma and flavour of vanilla.

2.1 Cultivation and Production of Vanilla

Vanilla, an exotic tropical climbing vine belonging to the orchid family, is grown for its extraordinary flavour. It ranks among the most expensive spices in the market, following Saffron and thrives by extracting nutrients from tree bark. Madagascar stands as the leading global producer of Vanilla. Typically, Vanilla plants yield their first crop approximately three years after planting and can continue producing for 12 to 14 years. India contributes about 2% of the world's Vanilla exports [10]. In India, Karnataka leads the country in Vanilla cultivation, followed by Kerala and Tamil Nadu.Vanilla vines can be cultivated indoors, in greenhouses, or even in pots and containers. Optimal yields are obtained when Vanilla is grown under shade netting or as a monoculture, rather than an intercrop. Generally, Vanilla is a tropical orchid crop, requiring high humidity, shade and moderate temperatures to achieve maximum yield [11].

3. FLAVOUR AND AROMA OF VANILLA

Vanilla is an exceptional flavour enhancer, commonly utilized in a wide array of foods and beverages. In the realm of food production, it is primarily used to add flavour to syrups for medicinal purposes. Additionally, vanilla finds significant utility in perfumery due to its pleasant fragrance [12]. The process of extracting vanilla involves soaking vanilla beans in a blend of ethyl alcohol and water. Flavourings are produced from various essential oils, including lemon and almond, derived from vanilla, fresh fruits through expression, combinations of essential oils and synthetic organic compounds, or entirely synthetic chemicals with propylene glycol, glycerol and alcohol [13].

4. USES AND SIGNIFICANCE OF VANILLA EXTRACT

Vanilla Extract: A Valuable Commodity with Diverse Applications.

Vanilla, derived from a specific type of orchid plant, is renowned for its multifaceted uses and significance. Orchids, with their diverse array of beautiful flowers and captivating color combinations, are a source of aesthetic pleasure [14]. The orchid plant, boasting exquisite flowers of remarkable beauty and exceptional longevity, has also found favor among ladies for adorning their hair. Orchids, well-suited for gardens, can be cultivated in various ways, including ground orchids, pots, baskets and split hollows of bamboo pieces [5]. The fruit of the orchid, commonly referred to as the vanilla bean, is a key component utilized to create flavouring, medicine and enhance a plethora of food items within the food industry, including dairy products, beverages, baked goods and confections. Additionally, vanilla extract is used as a food enhancer, rounding out the flavour profiles of many culinary creations [15].

5. THE HEALTH BENEFITS OF VANILLA

Vanilla's potential impact on human health has been explored in a limited number of clinical studies. Researchers have delved into flavor perception and food acceptance in humans, employing olfactory stimulation with vanillin [7]. This investigation seeks to understand the sensory maturation process, spanning from in utero development to childhood. Furthermore, a subset of clinical studies has scrutinized the influence of vanillin olfactory stimulation on neonates, specifically examining its effects on well-being and behaviour [16]. In the case of newborns, chemosensory stimuli, particularly exposure to vanillin odor before and during routine blood draws, were found to have a notable soothing effect on subsequent expressions of distress without impacting heart rate and blood oxygen saturation.

Noteworthy trials have explored the impact of vanillin olfactory stimulation on apnea, a prevalent issue in premature newborns. Sweet and familiar vanillin odor was observed to reduce the frequency of apnea and prevent bradycardia, possibly through stimulation of the olfactory nerve and enhancement of orbitofrontal blood flow [17].

Interestingly, in healthy adults, vanillin odor influenced respiratory patterns during sleep, suggesting a potential approach for relieving apnea in this population. Additionally, the olfactory capacity of vanillin in adults has been associated with positive effects, such as calming induced startle reflexes and these effects may

vary based on gender. In summary, existing data on the effects of vanilla in humans are primarily derived from clinical trials examining responses to vanillin olfactory stimulation concerning mood, emotions and distress.

1. **Abundant in antioxidants:** Vanilla stands as a spice rich in antioxidants, effectively shielding the body's cells against free radicals and toxins [18]. Free radicals, a byproduct of natural body processes and exposure to radiation, pose a threat by promoting cell and tissue breakdown. Antioxidants present in vanilla are invaluable for repairing the body at the molecular level, reducing the risk of various diseases, including diabetes and cancer and supporting youthful skin. Moreover, vanilla aids in healing skin eruptions such as pimples and acne.

2. **Soothes coughing:** Vanilla extract is a common ingredient in cough medicines due to its mild anesthetic properties, providing relief for sore throats.

3. **Alleviates toothache:** Containing capsaicin, vanilla offers relief from toothaches and assists the central nervous system. It also safeguards teeth from infections that could lead to dental issues.

4. **Heart health promotion:** Vanillin, a component of vanilla, has been shown to lower bad cholesterol, a key factor in heart diseases. A study published in the Indian Journal of Experimental Biology demonstrated a significant reduction in cholesterol levels in rats after receiving controlled doses of vanilla for 45 days. Though more research on humans is needed, the cholesterol-lowering potential of vanilla is promising.

5. **Anti-inflammatory agent:** Vanilla's robust anti-inflammatory properties, attributed to its antioxidant content, effectively soothe inflammation. Additionally, vanilla extract is a good source of essential B andB6 vitamins, including niacin, riboflavin crucial for regulating metabolic functions and alleviating pain, particularly in conditions like arthritis [19].

6. **Blood pressure regulation:** The potassium in vanilla aids in controlling heart rate and maintaining normal blood pressure, crucial in managing escalating stress levels. Vanilla's pleasant aroma can also have a positive impact on mood, potentially acting as a potent anti-depressant.

7. **Vanilla oil: A therapeutic essential:** Vanilla oil, possessing eugenol properties, helps reduce high temperatures and offers relief. Its antioxidant properties fortify the body's defense against various diseases. Applying this essential oil on burns and cuts can provide rapid relief.

8. **Digestive health promotion:** Vanilla promotes healthy digestion; consuming natural vanilla tea is a popular herbal remedy known to soothe gut inflammation and aid in various digestion issues like cramping, stomach-ache and diarrhea.

6. MEDICINAL PROPERTIES

Vanilla serves a dual purpose as a tea ingredient and a flavor enhancer for various tea blends. Employed as a traditional remedy for indigestion, nausea and vomiting, vanilla tea proves effective in alleviating digestive discomfort. To mitigate indigestion, a few drops of authentic vanilla extract can be blended with warm water for soothing sips. In commercial herbal tea compositions, it is often paired with chamomile and occasionally peppermint, both renowned for their stomach-settling properties [20]. The aromatic essence of vanilla extends beyond its culinary uses, exhibiting a calming influence on the nervous system. This calming effect finds expression in products like Celestial Seasonings' Sleepytime Vanilla Tea. Notably, research indicates that vanilla harbors antibacterial and antifungal attributes, suggesting a potential role as a natural food preservative. Its application extends to cosmetics, benefiting from antioxidant properties that promote skin health [21]. Traditionally recognized as an aphrodisiac, vanilla is rumored to elevate testosterone levels in men, although verifiable sources supporting this claim remain elusive. However, it is acknowledged for augmenting catecholamine levels in the brain, encompassing dopamine and norepinephrine, fostering increased energy and drive. Regardless of the mechanism, the delightful flavor of vanilla invariably contributes to a heightened sense of well-being.

1. **Medicinal applications of vanilla:** Vanilla has been cherished for both its culinary and medicinal uses. Its esteemed

reputation in the culinary realm has been built over a long history of enhancing the flavours of sweet, indulgent treats like sugar cookies, ice cream, pastries and buttercreams. While vanilla's culinary significance is well-established, its lesser-known roles as an aphrodisiac and a botanical remedy date back to its discovery in Mesoamerica by ancient cultures that cultivated and revered the sweet orchid [22]. European nations also historically prized vanilla for its flavour, its reputation as a love elixir and its medicinal properties. Although traditional medicinal applications of vanilla have waned, its culinary traditions remain largely unchanged. Modern advancements in scientific research have illuminated the medical advantages of vanillin, the active component of vanilla.

2. **Vanillic Acid's Toxic Effects on Antigens:** The toxic effects of vanillic acid on antigens at the chromosome and DNA levels were examined using the alkaline comet assay and cytokinesis block micronucleus test. It demonstrated a protective effect against DNA damage induced by mitomycin C.

3. **Aphrodisiac Properties:** A study evaluating the aphrodisiac activity primarily in rats revealed that vanillin possesses aphrodisiac properties at a dosage of 200 mg/kg in male rats.

4. **Anti-Sickle Cell Properties:** The anti-sickling effect of vanillin has been investigated in vitro in mice and clinical trials. Under hypoxic conditions, there was an increase in hypoxia resistance and a reduction in the proportion of sickle cells. The findings affirmed that vanillin exhibited the most potent anti-sickling effects in mice and other clinical trials [7].

5. **Healing Properties:** Pure vanilla's healing potential is notably reliable, acting as a crucial shield against ailments, potentially altering the outcome from a complete party defeat to a triumphant counter-attack. Although raspberries and Swift chocolates offer more potent and rapid healing, vanilla's efficacy as a healer is consistent and beneficial.

7. PHARMACOLOGICAL USES OF ORCHIDS

The orchid's pharmacological potential is not confined to a specific region or species; instead, it spans a global spectrum. Traditional medicinal practices in certain cultures have long utilized orchids for their healing properties, serving as natural remedies for various ailments. In recent years, there has been a surge of studies delving into the pharmacological applications of moscatilin, a promising chemical derived from the stems of the orchid species Dendrobrium [17]. Traditionally utilized in Chinese medicine for promoting a healthy stomach, enhancing body fluid levels, reducing fever and acting as a natural anti-platelet agent, these orchid species have garnered attention for their therapeutic potential [23]. A noteworthy breakthrough emerged from research conducted in Taiwan, highlighting the anti-cancer properties of moscatilin. The study involved 16 cell lines sourced from diverse tissue origins, including the placenta, liver, lungs, stomach and other organs, subjected to moscatilin cultures. While mutagenic activity was observed, its impact varied among cell lines [24]. Specifically, the lung and stomach carcinoma cell lines exhibited responsiveness to moscatilin-induced cytotoxic effects, contrasting with the liver carcinoma cell lines, which remained unaffected [25]. This investigation underscores moscatilin's potential as an antiproliferative agent against various cancer types, encompassing choriocarcinoma, lung and stomach cancers. However, its efficacy appears limited against hepatocellular carcinomas. Building on this foundation, further exploration of moscatilin's effects on various human cancer cell lines was undertaken by Chen et al. at National Taiwan University, contributing to the evolving landscape of orchid-derived compounds in cancer research [26].

Moreover, modern pharmaceutical research continues to explore and harness the therapeutic potential of orchids. Their pharmacological applications extend to areas such as drug discovery, development of new pharmaceutical agents and complementary medicine. Orchids stand as a testament to the intricate interplay between nature and science, offering a promising avenue for advancements in healthcare and well-being.

8. CONCLUSION

The exploration of vanilla reveals its remarkable status as a powerful herb with profound

Ayurvedic medicinal properties. Originating from orchids of the genus Vanilla, this aromatic spice transcends its common association with culinary delights to emerge as a therapeutic powerhouse. Rich in antioxidants, anti-inflammatory agents and bioactive compounds, vanilla exhibits diverse health benefits according to Ayurvedic principles. From its potential to alleviate stress and anxiety to its anti-microbial and anti-cancer properties, vanilla emerges as a versatile herb with a promising role in holistic well-being. Ayurveda recognizes vanilla not merely as a flavor enhancer but as a valuable resource for promoting physical, mental and emotional health. As we delve deeper into the synergy between traditional wisdom and modern science, vanilla stands out as a herb deserving of attention in both the kitchen and the realm of natural medicine. Embracing vanilla in our daily lives may not only enhance our sensory experiences but also contribute to a balanced and healthier lifestyle.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/111607