

Evaluation of aphrodisiac effect of vanillin in male wistar rats

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ABSTRACT

Introduction: Vanillin is one of the primary chemical components of the vanilla bean (*Vanilla planifolia*). An aphrodisiac is defined as any food or drug that arouses the sexual instinct, induces venereal desire and increases sexual pleasure and performance. Unpublished data claim that vanillin, taken under proper guidance, can help relieve problems of impotence, erectile dysfunction, frigidity, loss of libido and promotes arousal. Hence this study was conducted to study the potential aphrodisiac effects of vanillin in rats. **Methods:** Twenty four male rats were divided into four groups which received vehicle, vanillin 100 mg/kg/day, 200 mg/kg/day and 400 mg/kg/day orally, respectively. Female rats were brought to oestrous cycle by the sequential administration of estrogen (10 µg/100 g) and progesterone (0.5 mg/100 g) through intraperitoneal injections, 48 hours and 4 hours (respectively) prior to pairing with the male on day 1 to study the acute effects and on day10 to study the sub-chronic effects. Sexual behaviors were observed for three hours. Serum testosterone levels were estimated. The data was analyzed using one way ANOVA followed by posthoc tests. **Results:** There was a statistically significant increase in the mount frequency and intromission frequency compared to control following both acute and chronic treatment with vanillin (200 mg/kg). The mount latency, intromission latency, ejaculation latency and post-ejaculatory interval decreased in the vanillin treated groups especially at 200 mg/kg. There was no significant difference in the serum testosterone levels among the groups. **Conclusion:** Vanillin in the dose of 200 mg/kg demonstrated aphrodisiac properties in male wistar rats.

Keywords: Vanillin, Aphrodisiac, Sexual dysfunction

INTRODUCTION

An aphrodisiac is defined as any food or drug that arouses the sexual instinct, induces venereal desire and increases pleasure and performance. This word is derived from “Aphrodite” the Greek goddess of love and these substances are derived from plants animals or minerals and since time immemorial they have been the passion of man.^[1] There are two main types of aphrodisiacs, psychophysiological stimuli (visual, tactile, olfactory and aural) preparations and internal preparations

(food, alcoholic drinks).^[2] Based on their mechanism of actions, aphrodisiacs can be divided into three categories which include: a. Aphrodisiacs that simply provide a burst of nutritional value, thereby improving the immediate health or well-being of the consumer and consequently improving sexual performance and libido. This simple improvement in general health can lead to a burst of energy and translate into an increased sexual appetite,^[3] b. The second group are those with specific physiological effect. They may affect blood flow; mimic the burning of fire of sex and intercourse and increase the duration of sexual activity,^[4] c. The third group of biologically active aphrodisiacs are those that are psychologically active in nature. They actually cross the blood brain barrier and mimic or stimulate some areas of sexual arousal. Examples include hormones and a wide variety of neurotransmitters.^[5] Sexual health and function are important determinants of quality of life. Inability to perform this function effectively is a major problem facing the reproductive process. This is known as sexual dysfunction.^[6]

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The increasing incidence of male sexual dysfunction is necessitating more and rapid search into plants & plant products with aphrodisiac potentials.

Vanilla (*Vanilla planifolia*), a monocotyledoneous orchid native of Central America, is grown for the attractive aroma produced by its fruit.^[7] Because vanilla is so much in demand, and expensive, synthetic vanilla are often used instead of natural vanilla. In fact, 97% of vanilla used as a flavour and fragrance is synthetic. Synthetic vanilla contains only one organic component – vanillin – the flavour and fragrance that we most associate with vanilla. Natural vanilla extract is a mixture of several hundred different compounds in addition to vanillin. Vanillin is one of the primary chemical components of the extract of the vanilla bean. It is a pleasant aromatic compound that occurs naturally in vanilla beans (*Vanilla planifolia*); it is a fine, white to slightly yellow crystal, usually needle-like, having an odour and taste suggestive of vanilla. Synthetic vanillin is used as a flavouring agent in foods, beverages, and pharmaceuticals.^[8] Studies on vanillin has demonstrated that it has antimutagenic,^[9] antinvasive and antimetastatic.^[10,11] It has been claimed in unpublished data that vanillin, taken under proper guidance, can help relieve the problems of impotence, erectile dysfunction, frigidity, loss of libido and promotes arousal.

OBJECTIVES

To study the aphrodisiac effect of the Vanillin in adult male wistar rats.

MATERIALS AND METHODS

Animals

Male albino wistar rats inbred in the central animal house of KMC were used for the study. Rats were housed in clean polypropylene cages, three rats in each cage, in a controlled environment (24–26°C) with a 12 hour light and dark cycle with standard chow containing fat 4.15%, protein 22.15%, carbohydrates 4% (supplied by Amruth laboratory animal feed manufactured by Pranav Agro industries ltd., Sangli) and water *ad libitum*. The rats were allowed to acclimatize to these conditions for one week. Experiment was performed during the light phase of the cycle (10:00–17:00 hrs). The animals were maintained as per the CPCSEA guidelines and

regulations. The study was approved by Institutional animal ethics committee.

Study Drug

Vanillin [IUPAC name 4-hydroxy-3-methoxybenzaldehyde, chemical formula (CH₃O)(OH)C₆H₃CHO, molecular weight of 152.15] obtained from HiMedia laboratories at Kasturba Medical College, Mangalore.

Study Design

Twenty four male rats were divided into four groups of 6 rats each.

Drug dosage in different groups of rats

Group	Dose
1 (Gum Acacia 2%)	10 mg/kg
2 (Vanillin)	100 mg/kg
3 (Vanillin)	200 mg/kg
4 (Vanillin)	400 mg/kg

Dose Formulation

Required quantity of test item was weighed as per the dose. The weighed test item was suspended in required quantity of gum acacia to get the desired concentration as per the dose. Formulation of the test item was prepared shortly before dosing.

Administration of Study Drug

All male rats were administered increasing doses of the test drug/vehicle orally by gavage using oral feeding tube at the same time of the day for 10 days. The dose volume was approximately 1.5 ml. The dosage volume administered to individual rat was adjusted according to its body weight recorded on the day of dosing.

Methodology

Six rats from each group were monitored for sexual behavior on day 1 (for the acute study) and day 10 (for the sub-chronic study) after daily doses of the drug. Twenty four female rats were brought to oestrus cycle by the sequential administration of estradiol benzoate (10 µg/100 g) and progesterone (0.5 mg/100 g) through intraperitoneal injections, 48 hours and 4 hours (respectively) prior to pairing. The animals were given a 20 minute adaptation period, after which a primed female was placed in the same cage with the male. Sexual behavior studies were monitored in a separate dark room for 3 hours following the administration the drug.

Sexual Behaviours

Sexual behavior in male rats consists of three distinct phases:

1. **Mount:** the animal assumes the copulatory position, but does not insert its copulatory organ (the penis) into the vagina
2. **Intromission:** the copulatory organ enters the vagina during a mount
3. **Ejaculation:** forceful expulsion of semen. This is characterized by longer, deeper pelvic thrusting and slow dismount followed by a period of inactivity.

Parameters Assessed

- Mount latency: the time interval between the introduction of the female to the first mount by the male.
- Mount frequency (MF): the number of mounts without intromission from the time of introduction of the female until ejaculation.
- Intromission latency: the interval from the time of introduction of the female to the first intromission by the male.
- Intromission frequency (IF): the number of intromissions from the time of introduction of the female until ejaculation.
- Ejaculatory latency: the time interval between the first intromission and ejaculation.
- Post ejaculatory interval: the time interval between ejaculation and the next mount
- Testosterone assay: After observing the sexual behavior the rats were anaesthetized with ether & blood sample (1.5 ml) for assay was collected by cardiac puncture. Then animals were sacrificed by giving sodium pentobarbitone at dose of 100 mg/kg intraperitoneally.

RESULTS

As shown in Table 1, in the acute study the intromission latency, ejaculation latency and post-ejaculatory interval significantly decreased following treatment with vanillin 200 mg and 400 mg/kg compared to the control. Ejaculation latency and post-ejaculatory interval were also significantly low compared to group 2 (vanillin 100 mg/kg). Moreover, the mount frequency and intromission frequency significantly increased following treatment with vanillin at the dose of 200 mg/kg.

As shown in Table 2, in the sub-chronic study the mount latency decreased but ejaculation latency and post-ejaculatory interval significantly increased in the group treated with vanillin 100 mg/kg compared to control. At 200 mg/kg vanillin significantly decreased the mount

Table 1. Acute Study.

Group	Mount latency (sec)	Mount frequency	Intromission latency (sec)	Intromission frequency	Ejaculatory latency (sec)	Post ejaculatory interval (sec)
1 Mean	581	14.67	6401	1.67	9000	9000
SD	426	13.868	3841	1.528	3118	3118
2 Mean	930	16.00	3920	2.67	8040	7380
SD	1003	8.544	2547	1.528	4781	5924
3 Mean	401	34.33**	1440*	6.00 [#]	2120**	840**
SD	92	4.041	318	1.000	270	104
4 Mean	581	19.00	1601*	1.67 [€]	2400**	820**
SD	92	3.00	92	0.577	120	92

*p<0.05 vs group 1; [#]p<0.05 vs group 2; [€]p<0.01 vs group 1; [€]p<0.01 vs group 3

Table 2. Sub-chronic Study.

Group	Mount latency (sec)	Mount frequency	Intromission latency (sec)	Intromission frequency	Ejaculatory latency (sec)	Postejaculatory interval (sec)
1 Mean	640	15.67	2340	5.33	1520	1700
SD	151	3.512	360	2.082	510	524
2 Mean	300*	15.33	2081	5.67	7520 [€]	7860 [€]
SD	60	5.312	819	3.055	94	5092
3 Mean	220*	39.67**	1060 [€]	9.33 [€]	1820 [€]	600 [€]
SD	92	4.509	92	.577	211	120
4 Mean	400 [€]	25.67 [€]	1640	5.00 [€]	2120 [€]	700 [€]
SD	35	3.055	250	1.000	125	92

*p<0.01 vs group 1; [€]p<0.05 vs group 1; [#]p<0.001 vs group 2; [€]p<0.05 vs group 2; [€]p<0.05 vs group 3

latency and intromission latency compared to the control. Also, the mount frequency and intromission frequency increased with vanillin treatment at the dose of 200 mg/kg compared to the control. Vanillin 400 mg/kg significantly decreased mount latency and increased mount frequency compared to control.

DISCUSSION

This study was designed to evaluate the aphrodisiac effects of vanillin at three different doses (100, 200 and 400 mg/kg) in normal wistar rats. Results obtained in the present study reveal that acute administration of vanillin at 200 mg/kg improved sexual behavior as observed by a decrease in intromission and ejaculatory latency and post ejaculatory interval and an increase in mount and intromission frequency. At the dose of 400 mg/kg vanillin only decreased intromission and ejaculatory latency and post ejaculatory interval but did not increase the mount and intromission frequencies. And at 100 mg/kg it did not show any change in sexual behavior.

In the sub-chronic study too, administration of vanillin 200 mg/kg improved sexual behavior as observed by a decrease in mount and intromission latency and increase in mount and intromission frequencies. At the dose of 400 mg/kg, vanillin only decreased mount latency and increased mount frequency; while the other parameters did not show any improvement in sexual behavior. At 100 mg/kg, vanillin decreased the mount latency but other parameters did not show any improvement.

Most plant products that improve sexual behavior have shown to increase serum testosterone levels;¹³ however vanillin did not show any significant change in the testosterone levels on sub-chronic administration. Hence the mechanism by which it enhances sexual behavior needs further evaluation.

The results conclude that vanillin has aphrodisiac properties especially at doses of 200 mg/kg in rats and the effects are better on acute administration than sub-chronic administration.

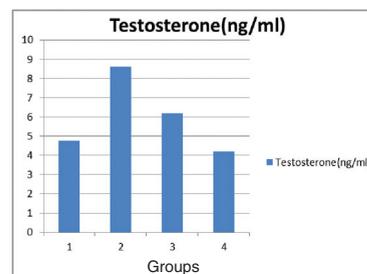


Figure 1. Effect of vanillin on testosterone levels.

There was no significant difference in the testosterone levels in any of the groups.

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