

Effects of *Capsicum frutescens* L. (Siling Labuyo) on the Sexual Behavior of Male *Rattus norvegicus* (Albino Rats)

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Abstract: Among the traditionally used sex enhancement natural remedies in the Philippines, *C. frutescens* is popular for its quick onset of action involving its chemical content, capsaicin. However, its use has not been scientifically validated. Aphrodisiac activity of the test substance was evaluated in terms of exhibited sexual behavior. In order to assess the effect of *C. frutescens*, Mount latency (ML), intromission latency (IL), ejaculation latency (EL), mount frequency (MF), intromission frequency (IF), ejaculation frequency (EF), and post-ejaculatory interval (PEI) were carried out as the parameters. Sixteen male albino rats were divided into the following groups: T_0 being the control group and T_1 , T_2 , T_3 with different concentration of the test substance at 5%, 10% and 15%, respectively. The route of administration for all the groups was oral gavage, which was done once a day for 12 days. The mating behaviour was analyzed with the help of the female rats and was observed for 30 minutes, every four days. The administration of the extract resulted in significant increase in mount frequency, intromission frequency, ejaculation frequency and ejaculation latency. However, the mount latency, intromission latency and post ejaculation interval were significantly decreased throughout the experimental period. The administration of the varying extract concentrations (5%, 10% and 15%) produced great effects in all the parameters which indicated that the extracts of *Capsicum frutescens* enhanced the sexual behaviour of male albino rats.

Keywords: erectile dysfunction, sexual impotence, aphrodisiac, capsaicin, ejaculation, mount latency, mount frequency

1. Introduction

Sexual health is an important component of a person's quality of life. It can be influenced by many factors, including a person's physical, social and mental well-being. Problems such as sexually transmitted infections, unplanned pregnancy and prostate cancer can severely compromise a person's sexual health [1]. Male sexual dysfunction (MSD) is known to affect the sexual life of millions of men worldwide. It may reflect with the following factors: libido, ejaculation, erectile function or a combination of the aforementioned factors. Erectile dysfunction (ED), commonly known as impotence, is one of the male reproductive system abnormalities leading to infertility [2].

Some medicinal plants have been proven to possess traditional as well as scientifically proven aphrodisiac that can enhance passion, increase libido, and enhance sexual performance [3] [4]. With respect to the plants which may have aphrodisiac potential, *Capsicum frutescens* (siling labuyo) is a plant inclined for the study.

Capsicum frutescens belongs to the Solanaceae family, a pantropic plant and is found throughout the Philippines. Cayenne pepper is believed to be wholesome for persons of phlegmatic temperament, being considered stimulating. *C. frutescens* also contains properties for anticancer, anti-inflammatory, antioxidant, immunologic, anti-diabetic, hypoglycemic, acts as a stimulant, tonic, carminative, antiseptic, analgesic and many more [5].

The active component of chili peppers, Capsaicins, can potentially boost sexual desire, hence an aphrodisiac [6]. Capsaicin, a constituent of *Capsicum frutescens*, is found to be a stimulant responsible for transmitting touch, sound, light, taste, and other sensory stimuli to the brain. These

cells, known as sensory neurons, receive information about their external environment via protein molecules called receptors [7]. Capsaicin triggers the same receptor that motions neurons to transmit information about heat and pain to your brain which may be a prerequisite for sexual behaviour [8].

This study evaluated the effectiveness of *Capsicum frutescens* (siling labuyo) as an aphrodisiac that will determine its effects to the sexual behavior of *Rattus norvegicus* (albino rats) based on different parameters.

2. Materials and Methods

Research design

Randomized Complete Block Design (RCBD) was utilized in which the test organisms were characterized as the control group (T_0) that underwent randomization procedures. The specimens were grouped into four representing four extract concentration treatments.

Plant material and preparation of extracts

The researchers purchased ripe and mature fruit of *Capsicum frutescens* from the wet and dry market of Dasmariñas, Cavite. *Capsicum frutescens* was ground with the use of an osterizer. The ground chili peppers were filtered. The extract concentrations were dissolved in distilled water just before the administration. A 5% concentration was made from 5mL of pure chili extract added to 95mL distilled water, 10% concentration was made from 10mL of chili extract added to 90mL distilled water and 15% concentration was made from 15mL of chili extract added to 85mL distilled water.

Acclimatization of albino rats

Sixteen male and sixteen female *Rattus norvegicus* of 12-week old was purchased from an Animal Clinic in Central

Market Ave., Dasmariñas City, Cavite, as recommended by the Food and Drug Administration (FDA). Seven days was allotted for the test organisms to acclimatize. The animals were housed under standard laboratory conditions. They were fed with standard rodent pellet diet and tap water ad libitum. The study was approved by the ethics review committee for animal care and use. The experimentation proper took place at an Animal Clinic in Central Market Ave., Dasmariñas City, Cavite, for a total of 19 days.

Preparation and Administration of plant extract

Capsicum frutescens extract was administered orally using gavage method wherein liquid compounds may be introduced into the mouth of the rats using a syringe. The animal was gently restrained by means of grasping its loose skin of the neck and back to immobilize its head but not such that it vocalizes or shows other signs of distress. The researchers were under the supervision of a licensed veterinarian while performing the oral gavage method.

Experimental animals and treatments (Mating procedure)

The test was carried out by the methods of Dewsbury and Davis Jr [9] and Szechtman et al [10] Healthy and male albino rats were selected for the study. They were divided into 4 groups of 4 animals each and kept singly in separate cages during the experiment. Group 1 represented the control group, with no extract concentration. Groups 2, 3 and 4 received suspension of the extract of *C.frutescens* orally at the doses of 5%, 10% and 15%, daily for 12 days.

Test for mating behavior was carried out every four days starting from the day of the administration of the extract through oral gavage. To begin the experiment, an estrous female was introduced into the cage containing a treated male. Mating activities of the rats were observed upon the introduction of the estrous female into the cage, for a total of 30 minutes. Later, the frequencies and phases were determined from video transcriptions: number of mounts before ejaculation or Mounting Frequency (MF), number of intromission before ejaculation or Intromission Frequency (IF), time from the introduction of female into the cage of the male upto the first mount or Mounting Latency (ML), time from the introduction of the female up to the first intromission by the male or Intromission Latency (IL), time from the first intromission of a series upto the ejaculation or Ejaculatory Latency (EL), and time from the first ejaculation upto the next intromission by the male or Post Ejaculatory Interval (PEI).

Statistical Analysis

The obtained data were expressed as mean ± standard error of mean (SEM) of six animals in each group. The data from all the groups were analyzed using one way analysis of variance (ANOVA) followed by Tukey’s range test.

3. Results and Discussion

Table 1: Effects of *C. frutescens* on the sexual behavior of male *R. norvegicus* based on mount latency and frequency

	Mean ±SEM	
	ML	MF
T0	427 ^X (±186.15)	7.25 ^X (± 1.2)
T1	219.42 ^X (± 144.13)	16.92 ^Y (± 2.07)
T2	230.33 ^X (± 143.12)	18.83 ^Y (± 2.26)
T3	219.17 ^X (± 144.02)	20.33 ^Y (± 2.93)

Legend: X for no significant difference; Y for a significant difference of (P<0.05)

The data obtained with the mating behaviour test indicated that the chili pepper-extract in all groups exhibited no significant difference in mounting latency. Whereas, the doses at T1, T2 and T3 significantly increased the mounting frequency (P<0.05).

Table 2: Effects of *C. frutescens* on the sexual behavior of male *R. norvegicus* based on intromission latency and frequency

	Mean ±SEM	
	IL	IF
T0	407.67 ^X (± 149.07)	0.83 ^X (± 0.39)
T1	278.33 ^X (± 47.87)	4 ^Y (± 0.54)
T2	300.92 ^X (± 29.70)	4.42 ^Y (± 0.78)
T3	551.33 ^X (± 128.06)	4.75 ^Y (± 0.95)

Legend: X for no significant difference; Y for a significant difference of (P<0.05)

Table 2, revealed that in terms of intromission latency, all treatments presented no significant difference. Based on intromission frequency, there is a significant difference, as T1, T2, and T3 were compared with T0. No significant difference was observed, as treatments were contrasted with each other.

Table 3: Effects of *C. frutescens* on the sexual behavior of male *R. norvegicus* based on ejaculation latency and frequency

	Mean ±SEM	
	EL	EF
T0	484.25 ^X (± 179.17)	0.08 ^X (± 0.08)
T1	879.58 ^X (± 85.57)	0.75 ^X (± 0.13)
T2	1007.5 ^Y (± 96.95)	1.67 ^Y (± 0.28)
T3	861.58 ^X (± 125.74)	1.33 ^Y (± 0.26)

Legend: X for no significant difference; Y for a significant difference of (P<0.05)

Table 4.3 shows that in terms of ejaculation latency, 10% extract concentration (T2) showed significant difference, unlike the other treatments which did not show any.

Ejaculation frequency of T1 revealed no significant difference whilst T2 and T3 exhibited significant differences, when compared with T0. On the other hand, there is a significant difference when 10% extract concentration was compared with 5% extract concentration. In contrast with 10% concentration of the extract, 5% extract concentration exhibited a significant difference whereas 15% extract concentration did not.

Table 4: Effects of *C. frutescens* on the sexual behavior of male *R. norvegicus* based on post-ejaculatory interval

Mean ±SEM	
	PEI
T0	3.25 ^{XBD} (± 3.25)
T1	422.67 ^Y (± 69.20)
T2	268.75 ^Y (± 39.84)
T3	167.92 ^X (± 37.51)

Legend: X for no significant difference; Y for a significant difference of ($P < 0.05$)

Table 4 shows that based on post ejaculatory interval, only T2 presented a significant difference, as compared with T0. 15% of the extract exhibited a significant difference in contrast with 5% of the extract.

4. Discussion

The study showed that the extract of *C. frutescens* possesses significant sexual function enhancing activity as observed in sexual behaviour tests. Mating behaviour test revealed that the test drug significantly increased the Mounting Frequency (MF) and Intromission Frequency (IF) as compared to control. The (MF) and (IF) are considered as the indices of both libido and potency. So, this is an indication that the test drug possesses a sexual function improving effect. The groups with extract concentrations significantly increased the EL as compared to control animals. The extract concentrations was found to produce a reduction in the Mounting Latency (ML) and Intromission Latency (IL) as compared to control. This is also an evidence of the sexual function improving effect of the chili pepper.

Capsicum frutescens comprises an active component, capsaicin. Specifically, Capsaicin is found to be a stimulant responsible for transmitting touch, sound, light, taste, and other sensory stimuli to the brain. These cells, known as sensory neurons, receive information about their external environment via protein molecules called receptors [7].

Capsaicin triggers the same receptor that motions neurons to transmit information about heat and pain to your brain. When capsaicin activates this receptor, neurons send a message to your brain that your mouth is truly on fire, tricking your brain into thinking that your body temperature has skyrocketed and inducing unpleasant reactions such as sweating, flushing, running nose, and crying [8].

Although capsaicin produces a burning, painful sensation when you bite into a chili, it also triggers the release of

pleasure chemicals that make a person feel exhilarated and euphoric. Once capsaicin activates the heat receptor, a chemical known as substance P transmits a pain message from the neurons to the brain [11]. When the brain registers pain, it responds with a dose of self-medication: the production and release of endorphins. Chemically, endorphins are neurotransmitters. This means that they are chemical messengers employed by our nervous system. Neurotransmitters are important because they bridge the gaps, or synapses, between neurons. The modification of neural transmissions by these biochemicals now appears to be responsible for the insensitivity to pain that is experienced by individuals under conditions of great stress or shock.

The increased sexual function could be due to the nervous stimulant action of the test drug. Further, phyto chemical study of the extract indicated that it contains sterols and phenol. Thus, the resultant aphrodisiac effectivity of the test drug might also be attributed to sterols or phenolic compounds.

Generally elevated testosterone level also enhanced the sexual behaviour in humans. Moreover, drugs induced changes in neurotransmitter levels or their action at cellular level could also change sexual behaviour [12]. In this connection it should be noted that in ethno medical texts, spices especially Nutmeg and Clove are mentioned as nervous stimulants so the action of these drugs as sexual invigorators may be due to their nervine stimulating property. Further, nutmeg has also been reported to increase blood circulation in the body. The enhanced effect of Nutmeg than that of Clove, as observed in sexual behaviour of animals, may be owing to this property in conjunction with the nervous stimulating activity of the drug. Both the test drugs exhibited more increment of mating performance in mice in comparison with the increased sexual motivation.

Mount frequency (MF) and intromission frequency (IF) are useful guides of vigour, libido and potency. While the number of mount (MF) reflects sexual motivation, increase in the number of intromission (IF) displays the effectiveness of erection, penile orientation and the ease by which ejaculatory reflexes are activated [13].

Male rats induced by the extract, in this study, show significant increase in IF which suggests that the penile erection was stimulated. Therefore, extract of *C. frutescens* may increase potency by permitting or supporting erection. Plant activities on penile erection have been attributed to the various phytochemicals, like the alkaloids, lipid compounds and saponins, in plants which have ergogenic properties in vasodilation of the blood vessels and consequent erection [5]. Difference in the values of MF and IF in this study suggests that not every mount, the male rats proceeded with intromission.

The increase in ejaculation frequency by the extract of *C. frutescens* at 10% and 15% extract concentration is an indication of enhanced aphrodisiac effect of the plant. The dose dependent increase in the frequencies of mount and intromission in the rats administered with the extract were

indications that the extract has the potential to control erectile dysfunction and arousal disorders in males.

Mount latency (ML) and intromission latency (IL) are indicators of sexual motivation. Both parameters are inversely proportional to sexual motivation. Therefore, the decrease in the mount and intromission latencies observed at T1, T2 and T3 in this study implied stimulation of sexual motivation and arousal. It may also be an indication of enhanced sexual appetitive behavior in the male rats which further supports the sexual improvement effect of the extract. The higher mount latency observed in the rats administered with the lower dose of the extract is an indication in the hesitation time of the male rats towards the receptive females [13].

Prolongation of the ejaculatory latency by itself suggests an aphrodisiac action. All the treated rats mounted and intromitted without any inhibition of mount-and-intromission frequencies or copulatory efficiency or intercopulatory interval. This suggests that libido, sexual vigour and sexual performance were unaffected during the aphrodisiac action. However, the significant increase in ejaculation latency (EL) suggests that the extracts prolonged the duration of sexual intercourse, which is an indicator of increase in sexual motivation [13].

The prolonged ejaculation latency of the extract of *C. frutescens* at 10% and 15% extract concentration is an indication that copulatory performance in the animals was enhanced. Similar findings have been reported on the extracts of *Mimosa pudica* [14]. Post ejaculatory interval (PEI) is considered an index of potency, libido and the rate of recovery from exhaustion after first series of mating. It is an important parameter for evaluating the effect of administered extracts on erectile function.

The significant increase in ejaculation latency (EL) suggested that the extracts and standard drug prolonged the duration of sexual intercourse, which is an indicator of increase in sexual motivation. The decreased PEI observed in the *C. frutescens* extract treated groups indicates potency and libido enhancement or less exhaustion in the first series of mating. A reduction in PEI is a reflection of the improvement of erectile function and the ability to perform better copulation.

Given a higher sexual drive usually and should be marked by a shorter latency and a higher frequency, hence the value between two variables of sexual drive in question supposing that the extract of *C. frutescens* has potential effects on the sexual arousal in male mice. There are several possibilities that could explain the effects of chili on sexual drive in animals.

Chili supplementation might increase the plasma testosterone level. Testosterone, as had been known, is a hormone that responsible for male sexual libido [15] capsaicin is one of the constituents of *C. frutescens* which have testosterone 5 α -reductase inhibitory effects due to its capability to catalyze the conversion of testosterone [5]. The inhibitory effect of this enzyme causes testosterone levels remain high and thus libido has remained high. The second

possibility that make high sexual drive in male mice which fed on the extract may be related to the high content of fatty acids in black pepper. As shown by Kouassi (2012) [5], Chili pepper fruit is rich in auric acid, myristic acid and palmitic acid. As summarized by Gromadzka-Ostrowska (2006) [16] in a review article, fatty acids may significantly affect the secretion and metabolism of androgens. The next possibility, as can be read in many other literatures, chili pepper is known to contain a variety of nutrients, including zinc.

Zinc, as reported by some researchers, is responsible for numerous physiological processes in organisms. Zinc supplementation can improve the antioxidative status and hormone levels in goat [17]. In male rats, zinc supplementation had proved to increase serum levels of sex hormones including testosterone [18]. Deficiency of this mineral can lead to reduce sexual drive in men and that zinc is a key role in male sexual function. [19].

5. Conclusion

The present results indicated that the extract of the fruit of *Capsicum frutescens* Linn. (Siling labuyo) could be used as a stimulator of sexual behaviour in male *Rattus norvegicus* (Albino rats). This study thus supports the acclaimed aphrodisiac use. The data obtained revealed that the action of the test drug was due to the influence on both sexual arousal and performance.

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