

## The effect of buceeng extracts on androgen production in *Sprague Dawley* male rats

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### Abstrak

**Latar Belakang:** Buceeng adalah kombinasi tanaman purwoceng (*Pimpinella alpina* Molk) dan pasak bumi (*Eurycomalongifolia* Jack) yang digunakan secara turun temurun untuk meningkatkan vitalitas pria. Namun mekanisme kerja buceeng terhadap peningkatan vitalitas masih belum jelas. Penelitian ini bertujuan untuk mengetahui apakah buceeng dapat meningkatkan kadar Testosteron (Te), Luteinizing Hormone (LH), dan Follicle Stimulating Hormone (FSH) pada tikus.

**Metode:** 20 tikus jantan *Sprague Dawley* umur 3 bulan dibagi menjadi 2 grup secara random masing-masing terdiri dari 10 ekor. Setelah satu minggu aklimatisasi, kelompok kontrol diberi aquadest 2 mL. Kelompok perlakuan diberi 2 mL ekstrak buceeng (25 mg) selama 7 hari berturut-turut, kemudian diperiksa kadar Te, LH, dan FSH, masing-masing dengan metode RIA dan IRMA. Data dianalisis menggunakan t-test tidak berpasangan untuk membandingkan kadar Te, LH, dan FSH pada kedua grup.

**Hasil:** Rerata kadar Te pada kelompok perlakuan (3,55 pg/mL) lebih tinggi secara bermakna dibanding kelompok kontrol (1,00 pg/mL)  $p = 0,003$ . Rerata kadar LH tidak berbeda bermakna pada kedua kelompok (0,12 pg/mL vs 0,11 pg/mL,  $p = 0,81$ ), demikian juga FSH (0,15 pg/mL vs 0,14 pg/mL,  $p = 0,088$ ).

**Kesimpulan:** Pemberian ekstrak buceeng meningkatkan kadar testosteron yang mungkin berperan pada peningkatan vitalitas pria. (*Med J Indones 2012;21:28-31*)

### Abstract

**Background:** Buceeng is a combination of plant of purwoceng (*Pimpinella alpina* Molk) and pasak bumi (*Eurycomalongifolia* Jack) that has been traditionally used to enhance adult male vitality. However, the mechanism of action of buceeng has not been understood. This study was aimed to elucidate whether buceeng could increasing Testosterone (Te), Luteinizing Hormone (LH), and Follicle Stimulating Hormone (FSH) level in rats.

**Methods:** 20 male *Sprague Dawley* rats were randomly assigned into two groups. After one week of acclimatization, control group was given aquadest 2 mL, while treated group B received 2 mL (containing 25 mg) buceeng extract for seven successive days. The plasma concentration of Te, LH, and FSH were assessed by RIA and IRMA method respectively. Independent t-test was used to analyze the different concentration of Te, LH, FSH between the two groups.

**Results:** Testosterone level of treated group was significantly higher (3.55 pg/mL) compared to control group (1.00 pg/mL),  $p = 0.003$ . LH concentrations of treated group (0.12 pg/mL) was slightly but not significantly higher compared to control group (0.11 pg/mL),  $p = 0.810$ . Likewise, the FSH level was not significantly different between the two groups (0.15 vs 0.14 pg/mL,  $p = 0.088$ ).

**Conclusion:** Administration of buceeng extract increases testosterone level which might play a role in enhancing male vitality. (*Med J Indones 2012;21:28-31*)

**Keywords:** *Eurycomalongifolia* Jack, FSH, LH, male vitality, *Pimpinella alpina* Molk, testosterone

The use of alternative therapy has been a growing trend worldwide. As an evidence, 91% respondents motivated the Congress and US Food and Drug Administration to undertake studies on alternative therapy.<sup>1</sup> In Indonesia, pasak bumi (*Eurycomalongifolia* Jack) and purwoceng (*Pimpinella alpina* Molk) alone or in combination, so called buceeng, has long been used as an alternative treatment to improve sexual vitality in adult men.<sup>2</sup> Most men, with or without sexual problem, have a passion to increase their sexual vitality, thus quite lot number of them use aphrodisiac herbal medicine such as buceeng. Testosterone (Te) is a hormone in the androgen group that plays a role in male vitality,<sup>3</sup> while luteinizing hormone (LH) and follicle stimulating hormone (FSH) serve as the regulator for steroidogenesis and spermatogenesis

respectively.<sup>4</sup> It is not known whether the mechanism how buceeng enhance male sexual vitality is related with one of those hormones.

The modern therapy, especially hormonal therapy are usually costly and thought to be inherent with bothersome side effects, while on the other hand, the men have a great passion to enhance their sexual vitality which motivate them to use alternative therapy. Apart from the needs of consumers, the Ministry of health, in an attempt to promote the use of indigenous natural products and to protect the customers, has recommended that drugs available in the market should be scrutinized for their efficacy and safety, as well as their mechanism of action.<sup>5</sup> Thus, it is important to provide the evidence

whether *buceng* really have the effects. We speculate that this effect of *buceng* at least partially mediated by the increase of androgen synthesis. In this part of research, we tried to evaluate the effect of *buceng* on testosterone, LH, and FSH level. If it is proven, we hope that it will offer a potential market share, since a lot of men suffered from a decline in sexual function which is believed to impair the quality of live and consequently life expectancy.<sup>6</sup>

A phytochemical study showed that *buceng* contains substances including saponin, sterol, alkaloid, and oligosaccharids.<sup>7</sup> Sitosterol and stigmasterol is known as the precursor of testosterone which will be converted into testosterone by an enzyme 3  $\beta$  hydroxysteroid dehydrogenase,  $\Delta^5,4$  isomerase, 17  $\alpha$  hydroxylase, C17, 20 lyase, and 17  $\beta$  hydroxysteroid dehydrogenase.<sup>4,8,9</sup> LH and FSH are hormones produced by anterior hypophysis which in turn stimulate Leydig and Sertoli cells in the testes to synthesize Te and to produce spermatozoa respectively.<sup>9</sup> The pharmacologic effects of *buceng* extract is assumed to enhance male sexual behavior, increases the tonus of various striated muscles, motoric activity, sensibility, and stimulation of central nervous system (CNS).<sup>10</sup> On the other hand, the male vitality appears to require high levels of testosterone since it improves aggressiveness, response to sexual stimulation, erection, and male-type of libido.<sup>11,12</sup>

The mechanism of *buceng* to improve vitality has not been fully elucidated. Some previous studies about *pasak bumi* and *purwoceng* have proven that both plants have good aphrodisiac and vitality effects on male as indicated by the increase in Te and LH level, while the FSH level only slightly increase.<sup>13,14</sup> There was no evidence whether the combination of *pasak bumi* and *purwoceng* (*buceng*) is potential to increase totals Te, LH, and FSH level. Thus, the aim of this study was to evaluate the effect of *buceng* in enhancing Te, LH, and FSH level, the consequent of which is expected to enhance male vitality.

## METHODS

This study was conducted at the Animal Experimental Development Unit (UPHP) Gajahmada University, whilst for Te, LH, and FSH assay was done at Laboratory of Iodine Deficiency Related Disorder, Diponegoro University, Semarang. Twenty male *Sprague Dawley* rats weighing about 300 g were used in this study. The animals were divided randomly into 2 groups of ten rats according to the Federer formula. The control group was treated with aquadest (2 mL), while treated group was given 2 mL suspension of *buceng* extract (25 mg/mL). The *buceng* were extracted using the soxhlet method with methanol 99% as a solvent.

A dose of 25 mg/mL was used in accordance with the *Caropeboka* study in monkey. The rats were kept in individual cage for acclimatization, fed with normal rat chow and were allowed free access to tap water. One week after acclimatization, the treatment was given for seven days by oral gavages.

At the end of the treatment, 2 mL blood sample was aspirated via orbital sinus. Plasma concentration of Te was measured by using Radio Immuno Assay (RIA) and that of LH and FSH was measured by Immuno Radiometric Assay (IRMA). The independent t-test was used to analyze the difference in concentration of Te, LH, and FSH between control and treated groups. The p value of < 0.05 was taken as the limit of statistical significance.

## RESULTS

After 7 days of treatment, body weight (BW) and the mean concentration of Te, LH, and FSH are shown in Table 1.

Table 1. Body weight and serum concentration of Te, LH, and FSH (pg/mL) in control group and in the group treated with *buceng* extract. Data are presented as mean  $\pm$  SD

Variables	Control (n=10)	Treated (n=10)	P
BW (g)	273.39 $\pm$ 25.24	278.06 $\pm$ 16.72	
Te (pg/mL)	1.00 $\pm$ 0.314	3.55 $\pm$ 2.31	0.003
LH (pg/mL)	0.112 $\pm$ 0.03	0.115 $\pm$ 0.02	0.81
FSH (pg/mL)	0.113 $\pm$ 0.02	0.149 $\pm$ 0.06	0.08

The mean Te level of group treated with 25 mg *buceng* extracts is significantly higher compared to control group. The LH and FSH levels are slightly higher in treated group, but it did not reach statistical significance.

## DISCUSSION

In the present study, administration of 25 mg *buceng* extract per day for 7 consecutive days was associated with a significant increase of the Te level (p = 0.03) compared to control. However, the LH and FSH levels were not significantly increased.

Physiologically, LH and FSH are hormones secreted from anterior hypophysis stimulated by gonadotropin releasing hormone (GnRH) derived from hypothalamus. LH and FSH circulate in the blood and binds to specific

receptors on the Leydig and Sertoli cells respectively in adult testis to synthesize Te hormone and trigger (supports) spermatogenesis.<sup>10,11</sup> In addition, a part of Te is also synthesized from sterol in peripheral tissues. The increase in Te in the blood circulation lead to negative feedback against LH and GnRH which in turn decreases LH.<sup>8,9</sup> The increase in spermatogenesis provides negative feedback to the FSH secretion mediated by inhibins.<sup>9,15</sup> Thus, it is reasonable to believe that the significant increase in Te level under *buceng* treatment are due to the stimulation of LH from hypophysis and or via peripheral conversion of sterol into Te. However the present study suggests that the influence of peripheral tissue is more significant, because the increase of LH level was not statistically significant.

According to phytochemical analysis, *buceng* are rich in stigma and phytosterol,<sup>7</sup> that might be constitute the Te precursor. Furthermore, by the aid of enzyme 3 $\beta$ hydroxy steroid dehydrogenase (3 $\beta$ -HSD) in peripheral tissues, stigma and phytosterol can be converted to Te. The 3 $\beta$ -HSD enzyme is a superfamily of  $\beta$ -HSD isoenzyme and aromatase, expressed abundantly in peripheral tissues.<sup>16</sup> The function of the enzyme of 3 $\beta$ -HSD in human body is to converting dehydroepiandrosterone (DHEA) from cortex adrenal to Te in peripheral target tissues. These data consistent with the Granner and Molina's study proposing that Te can originate from the peripheral conversion of sterol by enzyme 3  $\beta$  hydroxy steroid dehydrogenase,  $\Delta^5,4$  isomerase, 17  $\alpha$  hydroxylase, C17,20 lyase, and 17  $\beta$  hydroxysteroid dehydrogenase.<sup>8,9</sup>

The present study revealed that the administration of 25 mg *pasak bumi* and 25 mg *purwoceng* in combination (*buceng*) once daily for seven consecutive days in male *Sprague Dawley* rats slightly increases FSH level but it was not statistically significant ( $p = 0.08$ ). This finding can be compared to the study of protodioscin effect of Bulgaria containing saponin steroid from the furostanol group.<sup>17,18</sup> The target effect of furostanol is to stimulate the LH secretion without influencing FSH secretion. Such stimulation is possible, although it uses GnRH. This is presumably caused by the fact that LH and FSH secretion is regulated independently by substrates originated from the testes related to spermatogenesis.<sup>19</sup> It is known that spermatogenesis activity in tubulus seminiferus is closely related to FSH from anterior hypofisis.<sup>11</sup> The mounting of spermatogenesis activity in the tubulus seminiferus has a negative feedback effect on the anterior hypofisis through inhibin produced by Sertoli cell in the testis, leading to decreased FSH levels. It is possible that insignificant increase in FSH after the administration of 25 mg *buceng* were due to the increased activity of spermatogenesis in tubulus seminiferus. This finding is similar to Yuniarto's

study showing that *buceng* increased the spermatozoa concentration.<sup>20</sup> Since saponin steroid contained in the *buceng* extract are similar to furostanol, it is reasonable to speculate that they are in the same group. However further studies are needed.

From the above study, it is concluded that administration of *buceng* extract increase testosterone level which might enhance male vitality.

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