

## Effect of *Eurycoma Longifolia* Standardised Water Extract on Anabolic Balance during Endurance Exercise

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### ABSTRACT

*Eurycoma Longifolia* (EL) is a medicinal plant popular for its energy giving properties; it has been called the “Malaysian ginseng” and proposed as a natural testosterone replacement therapy due to its’ ability to normalise healthy testosterone levels in hypogonadic subjects. Clinical studies of EL supplementation have been shown to improve libido, energy, sports performance and weight loss, stimulate release of free testosterone, reduce fatigue and improve quality of life. This study assessed the effect of a standardised water extract from the root of *Eurycoma Longifolia* (EL) in balancing the testosterone and cortisol hormones in endurance sports. The standardized hot-water extract of TA root (Physta®) was able to increase testosterone and decrease cortisol compared with placebo ( $p < 0.05$ ). These results indicate that daily supplementation with EL standardised root water extract potentially improves adrenal fatigue by improving testosterone/cortisol balance creating an anabolic rather than a catabolic state of the body. EL thereby improves health by protecting the body from the detrimental effects of modern-day chronic stress, which may include general day-to-day stress, stress from dieting, sleep deprivation, poor mental health and exercise training. EL may improve overall fitness and health.

**Keywords:** Testosterone; Cortisol; Tongkat ali; *Eurycoma*

### INTRODUCTION

*Eurycoma Longifolia* (EL) is an herbal medicinal plant from the Simaroubaceae family found in South East Asia and has been traditionally used as a health tonic for improving physical and mental energy levels and overall quality of life [1,2]. In Vietnam, it is called Cay Ba Binh or as the “Cure for a Hundred Diseases” due to its’ myriad healing properties [3]. The root of EL were traditionally used as a decoction by the Malay folk in Malaysia, for strength and energy; to treat fever and malaria and as an aphrodisiac [1,4]. Early pre-clinical research of EL demonstrated increase in testosterone levels and improvement in fertility in animal models [5]. In a study that investigated 75 men with idiopathic infertility, supplementation of 200 mg/day EL root water extract (Physta®) improved testosterone levels and semen profiles such as sperm motility, morphology and semen volume [6]. Physta® supplementation was also investigated in a pilot

study in senior amateur cyclists which showed a significant increase in muscle strength and testosterone levels with a dose of 400 mg/day [7].

A supplementation of 100 mg daily of Physta® for 5 weeks can increase fat-free mass, muscle strength and size [8]. A significant improvement in moderately stressed subjects with decreased tension (-11%), anger (-12%), and confusion (-15%) was reported with supplementation of 200 mg Physta® per day [9]. The study also reported significant improvements in stress hormone profiles via reduced cortisol (-16%) and increased testosterone (+37%).

Andropause or late-onset hypogonadism is associated with low (bioavailable) testosterone levels. Between the ages of 30 to 40 years, the levels of bioavailable testosterone remain fairly constant. However, as from about 40 years of age, serum testosterone concentrations in men decline with annual rates

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between 0.4% and 2.6% for total testosterone and 0.87% and 1.7% for free testosterone [10]. Eventually, this decline results in serum testosterone levels being 40-50% lower by the age of 60. At the same time, Sex Binding Hormone Globulin, or SHBG, is increased [11]. SHBG binds much of the testosterone that is still circulating and makes it unavailable to exert its' effects in the body's tissues. The remainder is made available for the body's optimal functioning and is known as "Bioavailable" testosterone.

Endurance sports such as marathon, long distance cycling, over training of athletes in preparation for a competition and extreme sports for long durations of time are frequently associated with a reduced level of testosterone and an increased level of cortisol [12]. This result in a state of catabolic compared to anabolic states in muscles and has an implication to physical strength and performance. Creatine kinase levels are found to increase which represents muscle damage and is reportedly higher in an ageing population. Supplementation with Physta® decreased SHBG and creatinine kinase production amongst senior cyclists [7]. Low levels of testosterone can lead to low sex drive, emotional, psychological and behavioural changes, decreased muscle mass, loss of muscle strength, increased upper and central body fat, osteoporosis and increased cardiovascular risk [13].

Clinical studies to date have limited reports on the effect of EL water extracts on testosterone levels at low dosages. Upto 400 mg/day of EL demonstrated an improvement in elderly recreational athletes and senior hypogonadic subjects in terms of androgenic hormones and strength. However, the effect of EL supplementation in younger adults at a lower dosage of 100 mg/day has not been tested for its' effect on the cortisol-testosterone balance in a sports endurance study. In this study, we investigate the effect of a standardized root water extract of EL (Physta®) on endurance sports.

## METHODOLOGY

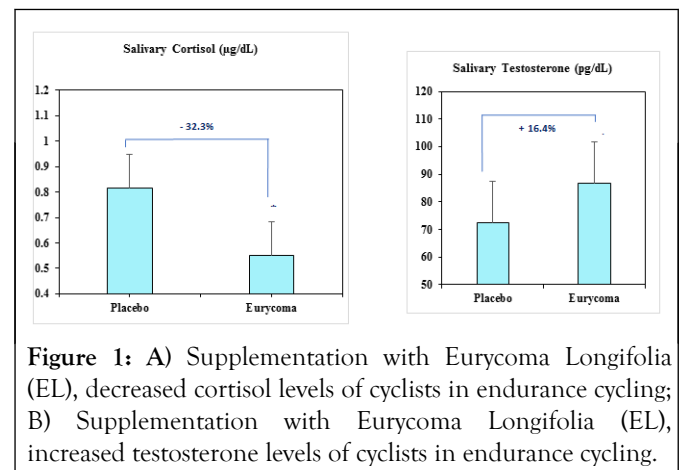
The water extract of EL trademarked Physta® and LJ100 in the US was produced in Biotropics Malaysia Berhad and standardized to 0.8%-1.5% Eurycomanone, not less than 22% total protein, 30.0% total polysaccharide and 40.0% glycosaponin. Thirty healthy male subjects of ages between 26 to 52 were recruited for a 24-hour mountain biking event. Subjects were randomised to two groups and either consumed 100 mg of Physta® or a look-alike Placebo (P) approximately 30 minutes prior to the endurance exercise.

The subjects were asked to provide a saliva sample after each lap for measurement of cortisol and testosterone by an enzyme immunoassay (Salimetrics, State College, PA). Subjects completed 4 laps (14.91 miles/lap) and provided 8 saliva samples over a 24h period. The salivary samples of each of the cyclist were tabulated for the mean values in cortisol and testosterone at the end of the biking laps.

## RESULTS

All 30 completed the mountain biking event without any dropouts. The levels of testosterone and cortisol at the end of

the laps were measured and compared to placebo as shown in (Figures 1A and Figure 1B).



**Figure 1:** A) Supplementation with Eurycoma Longifolia (EL), decreased cortisol levels of cyclists in endurance cycling; B) Supplementation with Eurycoma Longifolia (EL), increased testosterone levels of cyclists in endurance cycling.

The significance between groups was calculated using simple independent t-test. Cortisol levels were 32.3% lower in EL compared to P ( $0.552+0.665$  versus  $0.816+0.775$  ug/dL,  $P<0.05$ ). Testosterone levels were 16.4% higher in EL compared to P ( $86.72+40.90$  versus  $72.47+33.77$  pg/mL,  $P<0.05$ ). The subjects on EL also anecdotally reported feeling less fatigue.

## DISCUSSION

The cortisol levels were lower in the EL group compared with the placebo group while the testosterone levels were higher. The EL is said to be an adaptogen which is able to regulate the Hypothalamus Pituitary Gonadal (HPG) and Hypothalamus-Pituitary-Adrenal (HPA) axis *via* the modulation of these hormones [14,15]. This enables endurance sports performance not at the expense of catabolism. Should catabolism persist, lower sports performance would entail. This has not been observed in a clinical study whereby increase in muscle size and fat loss with strength training was observed with 100 mg supplementation of Physta® [8]. The adaptogenic property of EL is described that while improving physical strength and performance, it did not result in a doping effect [16]. Reduction in cortisol and improvement in testosterone was reported in hypogonadic senior subjects accompanied with a reduction in fatigue [17]. While these subjects had low levels of testosterone due to ageing, the effect of EL on testosterone and cortisol balance remains constant whether caused by age or induced by exercise stress/fatigue.

Previous clinical studies on EL supplementation have mostly been with supplementation of 200 mg to 400 mg in older subjects which have an age-related decline in testosterone [7,17]. However, decline in testosterone which was stress related albeit mental stress was only reported in one clinical study [9]. Eccentric exercise with leg press on rugby national athletes demonstrated an increasing trend in testosterone by day 7 of Physta® supplementation of 400 mg/day [18]. Significant reduction of muscle soreness and creatinine kinase upto 48 hours post leg press was observed. No significant changes in cortisol were observed probably due to the short spurt of intense exercise in elite well-conditioned athletes. Therefore, this is the

first pilot clinical study whereby physically induced chronic stress in endurance sports that could have normally led to increases in cortisol at the expense of testosterone was attenuated with the supplementation of EL. It is suggested that the production of testosterone is both controlled via the HPG axis and also the HPA axis which provided a direct effect to the modulation of adrenal hormone secretion ie. the cortisol and testosterone [15].

Future studies of younger adults with an active lifestyle are timely. The efficacy of EL in future clinical studies should include additional quantifiable parameters of sports performance indicators such as duration of sports activity, fatigue recovery and Delayed Onset Muscle Soreness (DOMS) in specific endurance sports such as marathon, cycling and swimming.

## CONCLUSION

The ability to maintain a balance between cortisol and testosterone has a far-reaching effect not only on sports but general wellbeing. Cortisol hormone which is often termed the stress hormone if elevated can lead to Type-2 diabetes, inflammation and cardiovascular disease. It is known to increase not only from chronic stress induced by sports but also mental stress.

The EL has been found to increase strength in both young and old from a dose of as low as 50 mg/day with an increase in testosterone at 100 mg/day upwards. An accompanied decrease in enzyme creatinine kinase indicating reduced muscle damage and a reduction of cortisol associated with stress has also been reported. As a preliminary pilot study, these findings report a beneficial effect of EL supplementation in a healthy population. A global movement post-Covid are seeing more and more younger adults taking responsibility for their health by better nutrition and exercise and an active lifestyle.

The increase of weekend warriors (exercise in the weekends) is becoming more often a common past time amongst generation Z who prioritize work-life balance. Hence supplementation with EL which has the potential of reducing cortisol caused also by poorer mental health post-Covid enables them to pursue life with better physical and mental health accompanied with hormonal balance.

These results suggest that *Eurycoma longifolia* standardised water extract may help to maintain normal levels of cortisol (low) and testosterone (high) thus promoting an overall "Anabolic" hormonal state (versus a "Catabolic" state characterized by elevated cortisol and suppressed testosterone) during intense endurance exercise.

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