

**UNIVERSITI TEKNOLOGI MARA**

**STUDY TO IDENTIFY THE NOVEL  
NEUROMODULATORY SITE OF  
*EURYCOMA LONGIFOLIA JACK*  
(TONGKAT ALI) IN RAT CENTRAL  
NERVOUS SYSTEM (CNS)**

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## ABSTRACT

*Eurycoma longifolia* Jack is the herbal medicinal plant of South-East Asian origin, locally known as Tongkat Ali. Traditionally, it is used for its antimalarial, aphrodisiac, anti-diabetic, antimicrobial, anti-pyretic, anti-stress and anti-aging activities which have been proved scientifically. In Malaysia and South East Asia, demand for the therapeutic products application containing Tongkat Ali to treat male sexual dysfunction is increasing year by year. However, the neuro-anatomical functional site is still not known. The objective of this study is to localize the functional neuro-anatomical site (s) of *Eurycoma longifolia* Jack extract in rat central nervous system (CNS) using immunohistochemistry technique. Control group of male Sprague-dawley rats (six, weight 180-200 g) was received intraperitoneal injection (i.p.) of normal saline and experimental rats received i.p injection of Tongkat Ali (8mg/kg) of body weight. The expression of c-Fos protein immunoreactivity was detected in freeze frozen serial sections (40  $\mu$ m) in dorsal and ventral horn of cervical spinal cord. C-Fos immunostaining was identified as black spot. Statistical analysis was performed using student t-test.  $P < 0.001$  was set as significant. Present study demonstrated that compare to control significant increased in number of c-Fos expression was detected in the sensory and motor nucleus of the spinal cord. To our knowledge, this is the first report in localization the functional sites of Tongkat Ali in rat motor and sensory nucleus. Result indicates that Tongkat Ali may have neuromodulatory function in motor and sensory nucleus. Further study is essential to investigate the therapeutic effect of Tongkat Ali in motor (e.g., temporomandibular) and sensory system (e.g., pain) disorders.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 BACKGROUND OF STUDY

*Eurycoma longifolia* Jack (Tongkat Ali) is categorized in genus *Eurycoma* and in family *Simarubaceae*. Besides Malaysia, Tongkat Ali is found abundantly in South-east Asian countries such as Indonesia, Vietnam, certain places in Thailand, Myanmar and Cambodia. In Malaysia, it is popularly known as Tongkat Ali or Malaysian Ginseng. Ali means 'walking stick' because of the long twisted root characteristics whereas common English name for Tongkat Ali is Long Jack (Bhat & Karim, 2010). Tongkat Ali tree is medium size slender tree that can reach height of 10 meters (Zhari *et al.*, 1999).

Alkaloids and quassinoids are the major group of bioactive compounds extracted from Tongkat Ali. Kuo *et al.* (2003) mentioned that 65 compounds were isolated from Tongkat Ali such as eurycomaoside, eurycomalactone, eurycolactone, eurycomanone and pasakbumin-B.

Traditionally, Tongkat Ali is taken as drinking tea by boiling pieces of Tongkat Ali root in hot water to increase energy in men and for aphrodisiac effect. Besides, it is also used to treat fever, indigestion, wounds, high blood pressure, dysentery and relieve gastric ulcer (Wizneh & Asmawi, 2014). Nowadays, considerable amount of scientific research have demonstrated that Tongkat Ali has effects in multiple conditions including anti-malaria, increase testosterone level, increase muscular strength, anti stress, anti inflammatory, anti nociceptive, anti cancer and many more (Gimlette & Thomson, 1977; Perry & Metzger, 1980; Ismail *et al.*, 1999; Jagananth & Ng, 2000).

As a matter of facts that Tongkat Ali has many traditional and scientific benefits, there is an increase interest in local community includes international. According to statistic, price of dried Tongkat Ali roots can exceed between 20-25 US dollars/kg while water extracts of Tongkat Ali is 26 US dollars per bottle of 60 capsules (Kaur *et al.*, 2003). In Malaysia, over 202 Tongkat Ali products have registered with the National Pharmaceutical Control Bureau of Malaysia (NPCB, 2013).