

Effects of *Butea superba* Roxb. on Skeletal Muscle Functions and Parvalbumin Levels of Orchidectomized Rat

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Abstract : Hypogonadism is characterized by a decline in sex hormone levels, especially testosterone. It has been shown to be an important contributor to the decrease in muscle mass, muscle strength and performance, a condition known as sarcopenia. Preparations from *Butea superba* Roxb. (red Kwao Krua) have been reported to have androgenic properties. The active compounds are proposed to be flavonoids and flavonoid glycosides. Treatment with *B. superba* has been shown to improve erectile dysfunction in males. Parvalbumin (PV) is a relaxing factor and identified in fast twitch fibers. Alterations of the PV levels affects skeletal muscle functions. This study aimed to investigate the effects of orchidectomy, testosterone replacement and different doses of *Butea superba* Roxb. on the structure, performance, levels of parvalbumin, parvalbumin and androgen receptor immunoreactivities in the extensor digitorum longus (EDL) and gastrocnemius muscles of orchidectomized rats. Twelve-week old male Wistar rats were randomly divided into 6 groups; sham-operated (SHAM), orchidectomized (BS-0), orchidectomized group that was treated with testosterone replacement of 6 µg/kg (TP) or an orchidectomized group that was treated with various doses of an extract from *Butea superba* Roxb.; 5 mg/kg (BS-5), 50 mg/kg (BS-50) and 500 mg/kg (BS-500) all for 90 days. The testosterone level, epididymis, seminal vesicle, prostate gland, vas deference weight, muscle fiber size, strength and endurance in both the EDL and gastrocnemius muscle were decreased in the BS-0 group but increased in the testosterone replacement group. Treatment with the *B. superba* Roxb. extract replacement group improved muscle fiber size, strength and endurance, but not total testosterone levels, or the epididymis, seminal vesicle, prostate gland, vas deference weight. Furthermore, the parvalbumin level, parvalbumin and androgen receptor immunoreactivities were reduced in the BS-0 group but increased in the testosterone replacement group and the *B. superba* Roxb. extract groups for both the EDL and gastrocnemius muscle. This study indicated that the reduction of testosterone level led to a decrease of the androgen receptor density resulting in a decline in the muscle mass and parvalbumin levels. The decrease of parvalbumin levels affected muscle performance. Testosterone replacement increased the androgen receptor density and led to an increase of muscle mass and parvalbumin levels. The increase in the parvalbumin levels may result in an improvement of muscle performance. This may explain one mechanism of testosterone on muscle mass and strength in the testosterone dependent sarcopenia. The *B. superba* Roxb. extract groups also had improved muscle mass, strength and endurance, parvalbumin level, parvalbumin and androgen immunoreactivities compared to the BS-O group. *Butea superba* Roxb. Extracts contains a flavonoid (3, 7, 3'-Trihydroxy-4'-methoxyflavone), flavonoiglycoside (3, 3'-dihydroxy-4'-methoxyflavone-7-O-β-D-glucopyranoside) and isoflavanolignans (butesuperins A and butesuperins B) all known to inhibit the cAMP phosphodiesterase enzyme. Therefore, cAMP signaling may have adaptive effects on skeletal muscle by increasing muscle mass, strength and endurance.

Keywords : *Butea superba*, parvalbumin, skeletal muscle, orchidectomy

Conference Title : ICMMA 2015 : International Conference on Microscopic and Macroscopic Anatomy

Conference Location : Barcelona, Spain

Conference Dates : August 17-18, 2015