

Glycoproteins Isolated from Tongkat Ali Plants Capable to Elevate Testosterone in Both *in vitro* and *in vivo* Experiments

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Extended Abstract

Tongkat Ali found with at least three plants namely *Polyalthia bullata*, *Stema tuberosa* and *Eurycoma longifolia* (the most popular) [1]. All three Tongkat Ali plants have been shown capable to boost testosterone in both *in vitro* and *in vivo* tests conducted [2]. Additionally, glycoprotein isolated from *E. longifolia* was shown to elevate testosterone within *in vitro* evaluations performed [3]. In this study, the lesser investigated *P. bullata* and *S. tuberosa* experimented for their bioactive constituents in boosting testosterone (i.e. one of the mechanism of aphrodisiacs).

Using lectin affinity chromatography, their glycoproteins were specifically isolated and characterized [3]. The glycoproteins were next treated to TM-3 Leydig (mouse testicular) cell cultures (*in vitro*) for 72 hours as well in BALB/c mice (*in vivo*) dosed for 20 days [3].

At the end of the *in vitro* experiments the glycoproteins of *P. bullata* and *S. tuberosa* were found to elevate the testosterone concentrations by approximately 45 % and 48 %, respectively compared to untreated control. While in mice, groups treated with glycoproteins of *P. bullata* and *S. tuberosa* managed increase of approximately 56 % for both compared to the control untreated mice group. Additionally, sexual behaviours of the *S. tuberosa* glycoprotein-treated groups observed the highest frequencies of mounting and intromission compared to the *P. bullata*, with only one mouse of the latter was found to achieve ejaculation. It is worth noting that ejaculation is entirely influenced by the partner's willingness and the aphrodisiac given to the males had no bearing towards the change in sexual behaviour of the females. The groups measured for their weight from initial and after 20 days were found to undergo loss of weight for both glycoproteins (*P. bullata*: -8 % and *S. tuberosa*: -5 %) compared to gain of weight for control (+2.5 %). Nevertheless, according to the histology evaluations performed no untoward damages visible on their kidneys, livers and testes. Hence a chronic study involving longer duration with more safety parameters warranted to establish suitable dosing for each glycoprotein.

The findings established the glycoprotein in *S. tuberosa* with a slight advantage over the glycoprotein of *P. bullata* to be their aphrodisiac bioactive constituents. It is therefore concluded all three types of Tongkat Ali plants are found with bioactive aphrodisiac constituents of glycoprotein. The three glycoproteins are different from one to another and not to be found in any protein database for conclusive identifications. Only very little of their amino acid sequences and sugar moieties are known currently.

Keywords: Aphrodisiac, glycosylated protein, plants, root, sexual health

References

- [1] J. Vejayan, A.N. Mohamed, A.A. Zulkifli, Y.A.C. Yahya, N. Munir, and M.M. Yusoff, 'Marker to authenticate *Eurycoma longifolia* (Tongkat Ali) containing aphrodisiac herbal products', *Curr. Sci.*, vol. 115, no. 5, pp.886-894, Sept. 2018, doi: <https://www.jstor.org/stable/26978316>.

- [2] S.A. Said, F. Ahmad, S. Chakravarthi S., J. Vejayan The Ranking of Tongkat Ali Plants to Boost Testosterone Hormone Evaluated in both In vitro and In vivo Experiments, TJNPR, vol.7, no. 11, pp 5236-5243, Nov. 2023, doi: <http://www.doi.org/10.26538/tjnpr/v7i11.31>.
- [3] J. Vejayan, Y.A. Yahya, S.A. Said, A. Norhidayah, V. Jayarama, N. Zamri, and H. Ibrahim, “Glycoprotein isolated from *Eurycoma longifolia* (Tongkat ali) is capable of boosting testosterone levels in Leydig cells”, TJNPR, vol.5, no.6, pp.1078-1082, Jun. 2021, doi: <https://www.tjnpr.org/index.php/home/article/view/624/998>.

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