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The Effect of *Tribulus terrestris* on Male and Female Reproductive Health and Combination of *Tribulus terrestris* with Other Herbs

	
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ABSTRACT

Tribulus terrestris (family Zygophyllaceae), commonly known as Gokshur or Gokharu or puncture vine, has been used for a long time in both the Indian and Chinese systems of medicine for treatment of various kinds of diseases. *Tribulus terrestris* show a positive effect on both male and female reproductive health. *T. terrestris* fruits as an herbal supplement effective in a sexual performance in women. It possesses aphrodisiac properties purportedly attributed to its ability to influence levels or mimic function of sex hormones.



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INTRODUCTION:

The plant *Tribulus terrestris* L. is annual. The Greek term "tribolos," which means "spike fruit," is where the name *Tribulus* originates.(3) Subtropical regions worldwide are home to the growth of *Tribulus terrestris* L. There are roughly 20 species in it, three of which are commonly found in India: *Tribulus cistoides*, *Tribulus terrestris*, and *Tribulus alatus*. Known by most as Gokhru, it is a member of the Zygophyllaceae family and is found all over India. In traditional Chinese medicine, the fruits of *T. terrestris* L. have been used to treat a variety of conditions, including edema, emission, morbid leucorrhea, sexual dysfunction, and eye problems. Fruits and roots can help with piles, menorrhagia, impotence, renal and vesical calculi, rheumatism, and premature ejaculation.

Luteinizing hormone (LH), which instructs the body to produce more testosterone on its own, is naturally stimulated by *T. terrestris*. *Bulgarian T. terrestris* is a good herb for premenstrual syndrome and menopausal syndrome because of its hormone-balancing properties.

Luteinizing hormone (LH), which instructs the body to produce more testosterone on its own, is naturally stimulated by *T. terrestris*. (1)

Classification according to taxonomy:

- Kingdom: Plantae
- Division: Phanerogams
- Subdivision: Angiospermae
- Class: Dicotyledonae
- Subclass: Polypetalae
- Order: Giraniales
- Family: Zygophyllaceae
- Genus: *Tribulus*
- Species: *terrestris* Linn. (2)

Geographical Source: It is an annual creeping herb that grows in desert, Mediterranean, and subtropical climates, including those in China, India, Mexico, Spain, and Bulgaria. It is a common weed found mostly in hot, dry, and sandy areas of India in pasture lands, roadside ditches, and other waste places.³

1.2 Morphology:

In hotter and colder climates, this herbaceous perennial plant with tap roots grows as an annual summer plant.

Height: height of *Tribulus terrestris* is upto 10 -60 cm.(4)



Fig .1 *Tribulus terrestris*

Stem: The stems, which frequently branch, extend outward from the crown to a diameter of between 10 cm and more than 1 m. Although they may grow more upward in shade or among taller plants, they are typically prostrate and form flat patches. oval, pinnately compound leaves that grow in 3–6 opposite pairs and can reach a maximum length of 8 cm, with leaflets that are less than 1/4 inch in length.

Flowers: The flowers have five lemon-yellow petals and measure 4 to 10 mm in width. Every flower blooms for one week, and then comes a fruit that splits easily into four or five single-seeded nutlets. Typically, solitary, silky, white or yellow flowers emerge from the leaf axils. Style short and stocky, ovary briskly. (4)

Fruits: Fruits are globose, tuberculate, spinous, or nearly glabrous, with two pairs of sharp, hard spines on each, one longer than the other. They are also frequently muriculate and wood cocci. Fruit frequently sticks to both human and animal bodies and clothing.



Fig.2 leaves of *tribulus terrestris*



Fig .3 flower of *tribulus terrestris*

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Fig .4 fruit of *tribulus terrestris*

Seeds: The hard nutlets have two to three sharp spines that measure 10 mm in length and 4 to 6 mm in width from point to point. This herb spreads and trails and is heavily coated in tiny hair. Woodi cocci are abundant in seeds. (4)



Fig .5 seed of *tribulus terrestris*

Tribulus terrestris contains a variety of chemical constituents, and its pharmacological effects are believed to be attributed to the presence of these compounds. Here are some of the key chemical constituents found in *Tribulus terrestris*:

Saponins: *Tribulus terrestris* is rich in steroidal saponins, particularly furostanol and spirostanol glycosides. These saponins are often considered the main bioactive compounds responsible for the plant's potential health effects.

Protodioscin: Protodioscin is a specific saponin found in *Tribulus terrestris* and is often highlighted for its potential influence on testosterone levels. It's converted in the body to dehydroepiandrosterone (DHEA), a precursor to various hormones.

Flavonoids: *Tribulus terrestris* contains flavonoids, which are known for their antioxidant properties. These compounds may contribute to the overall health benefits of the plant.

Alkaloids: Some alkaloids have been identified in *Tribulus terrestris*, although they are not as prominent as saponins. Alkaloids are a diverse group of naturally occurring compounds that can have various physiological effects.

Terpenoids: *Tribulus terrestris* contains terpenoids, which are compounds derived from isoprene units. Terpenoids have diverse biological activities and are found in many plant species.

Glycosides: Glycosides, which are compounds composed of a sugar molecule bonded to a non-sugar moiety, are also present in *Tribulus terrestris*.

Bioactive compounds: *Tribulus terrestris* contains bioactive compounds, such as saponins, flavonoids, and alkaloids, which are believed to contribute to its potential health effects. Understanding the specific mechanisms of these compounds can provide a deeper insight into how *Tribulus terrestris* may interact with the male reproductive system.

Combination with Other Herbs or Supplements:

In traditional medicine systems, herbs are often combined to enhance therapeutic effects. Some studies have explored the combined use of *Tribulus terrestris* with other herbs or supplements for male reproductive health. Investigating potential synergies or interactions may provide a more comprehensive understanding.

The combination of *Tribulus terrestris* with other herbs or supplements in traditional medicine

1. Ayurvedic Formulations:

In Ayurveda, traditional formulations known as "*Rasayanas*" often combine multiple herbs to enhance overall well-being, including reproductive health. *Tribulus terrestris* may be part of such formulations alongside herbs like Ashwagandha (*Withania somnifera*) and Shilajit, aiming to synergistically support male reproductive function.

2. Adaptogenic Combinations:

Tribulus terrestris is considered an adaptogen, and combining it with other adaptogenic herbs may have a balancing effect on the endocrine system. For example, Ashwagandha is another adaptogen known for its potential role in supporting hormonal balance and overall vitality.

3. Maca Root Combination:

Some studies have investigated the combination of *Tribulus terrestris* with Maca root (*Lepidium meyenii*), another traditional herb believed to have aphrodisiac properties. The combination has been explored for its potential to enhance sexual function and improve sperm parameters.

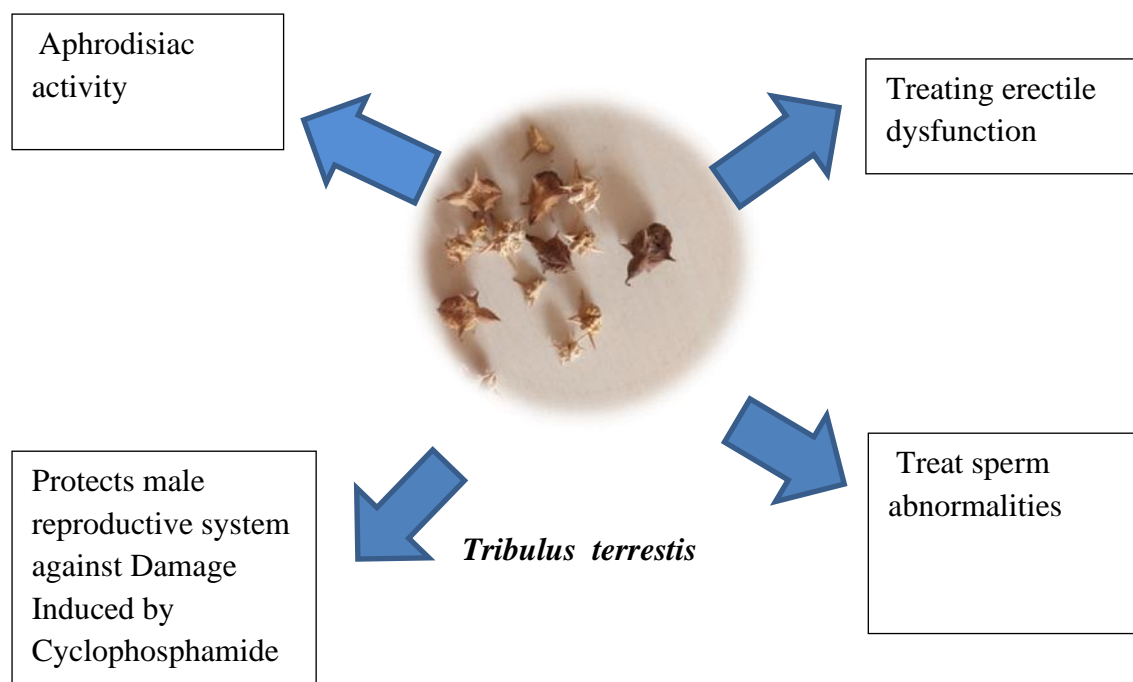
4 Zinc and Selenium Supplementation:

Zinc and selenium are minerals essential for reproductive health. Combining *Tribulus terrestris* with these minerals has been explored due to their potential synergies in supporting sperm production and function. Zinc, in particular, plays a crucial role in testosterone synthesis.

5 Nutritional Support:

Tribulus terrestris may be combined with herbs or supplements that provide nutritional support for overall health. This may include vitamins such as vitamins E and C, which have antioxidant properties and are implicated in sperm health.

Effect of *Tribulus terrestris* on male reproductive health.



Study of *Tribulus terrestris* on male reproductive health:

1. Aphrodisiac activity: The test drug's aphrodisiac effect was assessed in terms of demonstrated sexual behavior. Sperm count and testosterone level estimation were performed to evaluate the impact of long-term *T. terrestris* exposure on the hypothalamus-pituitary-gonadal axis. Oral toxicity studies lasting 28 days were conducted to assess the long-term

impact of LAET administration on various body systems. The findings indicate that *T. terrestris* functions as a sexual enhancer in the treatment of male sexual dysfunction.(7)

2. Treating erectile dysfunction: The inability to get or maintain an erection during sexual activity is known as erectile dysfunction (ED). Men who are affected support intimacy issues as well as feelings of shame and guilt. Even though there are medical treatments for ED, patients are reluctant to talk to doctors about it and frequently try treating their ED with dietary supplements. (8) *Tribulus terrestris* (TT) hormonal effects were assessed in rats, rabbits, and primates to determine whether or not it could help treat erectile dysfunction (ED). For an acute study, primates received TT extract intravenously as a bolus dose of 7.5, 15 and 30 mg/kg. For a chronic study, 2.5, 5 and 10 mg/kg of TT extract were given to rabbits and normal rats for eight week. Furthermore, testosterone cypionate (10 mg/kg, subcutaneous; biweekly for 8 weeks. Using radioimmunoassay, the levels of testosterone (T), dihydrotestosterone (DHT), & dehydroepiandrosterone sulphate (DHEAS) were determined in blood samples.

At 7.5 mg/kg, there were statistically significant increases in T (52%), DHT (31%), and DHEAS (29%), among other parameters in primates. T and DHT levels were higher in rabbits than in the control group; however, only the DHT increases (by 30% and 32% at 5 and 10 mg/kg) were statistically significant. T and TT extracts respectively were shown to increase T levels in castrated rats by 51% and 25%, which were statistically significant. TT raises several sex hormones, maybe because the extract contains protodioscin. In mild to moderate cases of ED, TT might be helpful. (9)

1. Protects male reproductive system against Damage Induced by Cyclophosphamide :

Steroid-derived saponins, which have been associated with *Tribulus terrestris* (TT), have the potential to stimulate the production of testosterone. Cyclophosphamide (CP), the most commonly used immunosuppressive and anticancer drug, has several negative side effects, especially on the reproductive system. The decision to use this medication is influenced both physically and psychologically by reduced fertility or infertility in patients who require CP therapy, especially in young men.

An investigation into *Tribulus terrestris'* ability to shield male reproductive organs from cyclophosphamide-induced harm in mice was carried out. Mice were gavaged with either a vehicle or a dry extract of TT (11 mg/kg) for a period of 14 days. One intraperitoneal

injection of either saline or CP (100 mg/kg) was given on the fourteenth day. The animals were put to sleep 24 hours after CP was given, and the testes and epididymis were removed for examination of the sperm and biochemical and histological analysis. .. The dry extract of TT was evaluated using HPLC analysis, which revealed the presence of protodioscin (1.48%, w/w). Changes in antioxidant enzymes (SOD, CAT, GPx, GST, and GR) as well as elevated levels of reactive species, lipid peroxidation, and protein carbonylation were observed following exposure to CP. After acute exposure to CP, there was also a decrease in 17 β -HSD activity, which may be related to the decrease in serum testosterone levels, the testicular histopathological changes, and the semen quality. The current study showed that TT dry extract can counteract the CP-induced alterations in mice's testes, which are most likely the consequence of protodioscin. (10)

2. Treat sperm abnormalities:

Tribulus terrestris has antioxidant and free-radical-scavenging properties. Effects of the *Tribulus terrestris* extract on the vitality and motility of human sperm after cryopreservation. Eight groups were established using the semen specimens of eighty healthy volunteers: group I served as the fresh control group, group II as the freeze control group, groups III, IV, and V as the cryopreservation control group, groups VII, VIII, and VI as the post-freeze-thaw group, and groups VI as the extract doses added after the cryopreservation process. To evaluate the effects of the *Tribulus terrestris* extract, the semen samples were incubated with the extract Next, the samples' viability and motility were evaluated using a light microscope. The outcomes show that after cryopreservation, group VII's spermatozoa viability considerably increased. According to World Health Organization (WHO) standards, groups VII and VIII had a significant ($p < 0.001$) increase in motility. There was no appreciable difference between groups III, IV, and V. This study shows that *Tribulus terrestris* increases human sperm motility and viability, potentially due to its antioxidant properties. (11).

Properties of *Tribulus terrestris* on female reproductive health:

1. Hormonal Balance:

Tribulus terrestris is believed to interact with hormone levels, including testosterone. While often associated with male hormones, testosterone is also present in females, albeit in smaller amounts. Research into how *Tribulus terrestris* may influence hormonal balance in females is an area that warrants further exploration.

2. Menstrual Cycle Regulation:

Some traditional medicine practices suggest that *Tribulus terrestris* may have a regulatory effect on the menstrual cycle. Understanding the potential influence on menstrual regularity and associated hormonal fluctuations could be a unique aspect of research in female reproductive health.

3. Polycystic Ovary Syndrome (PCOS):

For women who are of reproductive age, PCOS is a common endocrine disorder. Preliminary studies have explored the use of *Tribulus terrestris* in the management of PCOS symptoms, including irregular menstrual cycles and hormonal imbalances. However, larger and more rigorous clinical trials are needed to establish its effectiveness.

4. Libido and Polycystic Ovary Syndrome:

While studies on this aspect are limited, there is some anecdotal and traditional use suggesting that *Tribulus terrestris* may have positive effects on female libido and sexual function. This potential influence on sexual health could be an interesting focus for future research.

5. Ovulatory Function:

Ovulatory dysfunction can be a concern for some women trying to conceive. *Tribulus terrestris* has been investigated for its potential to improve ovulatory function, with some studies suggesting a positive impact. To validate these results and comprehend the underlying mechanisms, more study is necessary.

6. Antioxidant Properties:

Tribulus terrestris is known for its antioxidant properties. Antioxidants play a role in protecting cells from oxidative stress, and this may have implications for reproductive health. Investigating how these antioxidant properties specifically affect female reproductive tissues is an area that could be explored.

7. Combination with Women's Health Herbs:

Just as with male reproductive health, *Tribulus terrestris* may be combined with other herbs traditionally used for women's health, such as Vitex (Chaste Tree). Exploring these

combinations and potential synergies could provide a more holistic understanding of its effects.

It's essential to emphasize that research on the effects of *Tribulus terrestris* on female reproductive health is still in its early stages. As with any herbal supplement, individuals considering its use should consult with healthcare professionals, especially if they are pregnant, breastfeeding, or have pre-existing health conditions. Overall, the unique aspects of *Tribulus terrestris* in the context of female reproductive health present an interesting area for future scientific inquiry.

Study of *Tribulus terrestris* on female reproductive health :

1. Treat menopausal syndrome:

Tribulus terrestris's effects on menopausal women's sexual function were investigated. Sixty postmenopausal women with sexual dysfunction participated in this prospective, randomized, double-blind, placebo-controlled clinical trial. The female participants were split into two groups: the placebo group and the *Tribulus* group. The study employed the Female Intervention Efficacy Index (FIEI) and the Sexual Quotient-female version (SQ-F) questionnaires for evaluation. Results from a 90-day treatment period indicate that *Tribulus terrestris* is useful in treating menopausal women's sexual issues.(12)

2. Effective on Hypoactive sexual:

Opioids may have negative physiological effects. The opioid medication morphine lowers hormone levels, impairs fertility, and leads to problems with sexual function. A traditional herbal remedy called *Tribulus terrestris* (TT) is used to improve erotic activity. To demonstrate the effectiveness of TT in treating reproductive disorders in opioid users, this study looks into the potential impact of TT on gonadotropins and sex hormones. investigation of the effects of oral feeding *Tribulus terrestris L.* on the levels of gonadotropin and sex hormones in male addicted rats was carried out. In this experiment, 48 rats were split into four groups at random: control, TT-treated, addicted, and TT-treated addicted. Following a four-week period of oral administration of plant-mixed pelleted food (6.25%) to treated groups 2 and 4 water-soluble morphine was administered orally for 21 days to induce addiction. Elisa kits and radioimmunoassay were used to measure the gonadotropin and sex hormone levels in each rat's serum at the conclusion of the treatment period. The collected data were subjected to a post-hoc Tukey test and one-way analysis of variance for statistical

analysis. P less than 0.05 was deemed significant. The findings indicate that oral TT consumption may significantly counteract the gonadotropin and sex hormone reduction brought on by morphine addiction (except FSH).(13)

3. Breast cancer:

Through a series of steps, *T. terrestris* was extracted using a Soxhlet apparatus. To determine the phytochemical constituents, GC-MS was employed. Through the use of spectrophotometric analysis, the amounts of flavonoids and phenolic compounds in the plant extracts were determined. First, non-malignant L929 cells were used to test the cytotoxicity of plant extracts; subsequently, carcinogenic MCF-7 and A549 cell lines were used for the evaluation. The underlying molecular mechanisms were then examined by performing an anti-Bcl-2 assay, an Annexin V assay, a Caspase-3 assay, and a DNA fragmentation (TUNEL) assay using flow cytometry. The results showed that the *T. terrestris* methanolic extract had the highest concentrations of flavonoids and phenolic compounds, with values of 160.12 $\mu\text{g QE/g dwt}$ and 169.87 $\mu\text{g GAE/g dwt}$, respectively. The presence of bioactive phytochemicals with established cytotoxicity was discovered through GC-MS analysis. The MTT experiment allowed us to calculate the IC₅₀ values of 218.19 and 179.62 $\mu\text{g/mL}$ respectively, for the effects of the methanol extract on the viability of the MCF-7 and A549 cell lines. Tested against the cancer-free L929 cell line, the aqueous and methanol extracts showed less cytotoxicity (IC₅₀ = 224.35 $\mu\text{g/mL}$). The methanolic extract was found to inhibit Bcl-2 and activate caspase-3 in breast and lung cancer cells, causing early and late apoptosis as well as DNA damage-induced cell death. These results indicate that *T. terrestris* methanol extract has cytotoxic effects on cell lines related to lung and breast cancer. *T. terrestris* deserves more research due to its potential as a source of anti-cancer chemotherapeutic drugs. (14)

4. Treat Polycystic ovary syndrome:

One of the most prevalent endocrine disorders in women is a polycystic ovarian syndrome, or PCOS. It is identified by the presence of a hypervascularized androgen-secreting stroma and enlarged ovaries with several tiny cysts. Menstrual irregularities, polycystic ovary syndrome, obesity, infertility, acne, and hyperandrogenism are among the clinical symptoms¹. A clinical diagnosis of polycystic ovary syndrome is defined by the presence of two or more of the following characteristics: polycystic ovaries, androgen excess, and chronic oligo- or an-ovulation. The Zygophyllaceae plant *Tribulus terrestris*, also referred to as Devil's eyelashes

or Puncture vine, and is used extensively in traditional medicine. It has been discovered that *Tribulus terrestris* works well for polycystic ovarian syndrome. Rats with polycystic ovaries caused by estradiol valerate were used in the study, and it was discovered that *Tribulus terrestris* extract effectively improved ovulation in these animals. Normalized ovarian follicular growth, steroidal hormone levels, and estrous cyclicity were all brought back to normal by the extract treatment. Tribulus is a great option for women with polycystic ovarian syndrome because it is a well-liked ovarian stimulant and female fertility tonic, according to many herbalists. (15)

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