

# Herbs Used for Fertility of Male Animals: A Review

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Paper No. 949

Received: 09-09-2021

Revised: 10-11-2021

Accepted: 25-11-2021

## ABSTRACT

Fertility of male animals is influenced by various factors such as neurohormonal imbalances, reproductive organ tissue changes, seminal attributes, libido and sexual behavior. The global decline in male reproductive health is a big worry, and modern therapeutic options to prevent male infertility are costly, less accessible, require long-term treatment, and have a variety of adverse effects. Herbal remedies, on the other hand, are better suited to providing more comprehensive approaches to improve the male reproductive health. There is a particular set of herbs known as vajikarana or aphrodisiacs in Ayurvedic pharmacology that nourishes and stimulates the sexual tissues. This review focuses on the Ayurvedic approach to improving male reproductive health, referring to some of the most important scientifically tested herbs that have been found to boost male fertility by having stimulating or nourishing effects on the male reproductive organs.

## HIGHLIGHTS

- Fertility of male animals is influenced by various factors such as neurohormonal imbalances, reproductive organ tissue changes, seminal attributes, libido and sexual behavior.
- Herbal remedies are better suited to providing more comprehensive approaches to improve the male reproductive health.

**Keywords:** Herbs, male fertility

Fertility of male animals is influenced by various factors such as neurohormonal imbalances, reproductive organ tissue changes, seminal attributes, libido, sexual behavior, environment, genotype which may result flawed spermatogenesis (Toshimori *et al.* 2004). It is usually said that male is the half the herd. In spite of recognizing the role of males in improving the breed, male infertility has received lesser attention. Large scale adoption of A.I. has permitted extensive utilization of bulls and some bulls are known to have sired 100,000 to 200,000 cows in their lifetime. The spermatogenesis is a highly complex synchronized process in which the male germ cells i.e. spermatozoa are formed from the precursor diploid cells, leading to ultimate development of normal, viable haploid cells i.e. spermatozoa. The significance of spermatozoa lies in the production of maximum number of

normal, viable and fertile spermatozoa. Factors that hamper the spermatogenesis process are divided into several categories namely: (1) Foetal determinants of spermatogenesis at maturity (i.e. decreased sertoli cell, germ cell expansion, Testicular germ cell cancer and testicular dysgenesis syndrome), (2) Managemental and environmental stimuli (i.e. rough handling, malnutrition, scrotal temperature, obesity), (3) Occupational exposures of environmental pollutants, chemicals (Sharpe 2010). In recent era of medical therapy, various drugs are available to treat the infertility cases; however, researchers are giving more emphasis

**How to cite this article:** Talukdar, D., Luwang, A.D. and Talukdar, P. 2021. Herbs Used for Fertility of Male Animals: A Review. *Int. J. Ag. Env. Biotech.*, 14(04): 615-626.

**Source of Support:** None; **Conflict of Interest:** None





on traditional medicine which having less adverse effects and toxicity (Austin 1991). In this article, we the authors try to review the available literature on herbal medicines and their potential roles in enhancement of spermatogenesis. Here, we focus on the scientifically tested herbs that have been established to improve male fertility.

### Herbs and their role in spermatogenesis

The initiation or inhibition of neuro-chemicals, inflection of the neuroendocrine axis and their cross communications, as well as neighboring mediators working within the reproductive organs and tissues assist to bring back and manage the male reproductive processes (Sengupta, 2014; Sengupta *et al.* 2015). Herbs can improve the receptivity of male reproductive tissues by acting on the central or peripheral nerve systems. An orchestra of neurochemicals/neurotransmitters mediates neuronal control over male reproductive organs, with serotonin and dopamine being the primary controllers of sexual behavior, with serotonin mediating inhibitory activities and the excitatory effect of dopamine (Argiolas and Melis 2013). The ability of herbal remedies to modulate nitric oxide levels supports their use in the treatment of erectile dysfunction. The endogenous mediator of penile erection is nitric oxide (NO) (Achike and Kwan 2003). NO synthase is mostly found in brain areas involved in sexual activity, where it is synthesised (olfactory bulb, amygdala, septal structures, supraoptic and paraventricular nuclei, etc.) (Anderson 1993; Chaudhuri *et al.* 2014). NO is a recognised vasodilator that can enhance blood flow to the penis, generating penile erection, as well as to other male reproductive organs, allowing for greater hormonal accessibility and promoting strong reproductive function (Nehra *et al.*, 2001). Most of the herbs interfere the HPG axis in the directive of sex hormones, like testosterone, LH, FSH, and interstitial hormones, to synchronise the male reproductive functions such as male sexual organ development, emphasize pubertal changes, and increase overall male fertility (Dohle *et al.* 2003). Plant having antioxidants namely vitamin C, vitamin E, carotenes, phenolic acids, phytate and phytoestrogens have been documented as reduction capacity of disease risk by scavenging the free radical present inside the body. Scientist advocates

that two-thirds of the herbs present in the world have medicinal value and many of them have great antioxidant potential (Duduku *et al.* 2011).

### Herbs used for improvement of male fertility

#### *Alpinia galanga*

*Alpinia galanga* plant belongs to the family of Zingiberaceae (Fig. 1, C). It is a perennial herb with rhizomatous root stocks which found in India, China, Indonesia, Japan, Malaysia and Thailand. The rhizomes and roots are used as spasmolytic, antiphlogistic and antibacterial agent (Mayachiew and Devahastin 2008). *Alpinia galanga* is rich in phenolic compounds namely flavonoids and phenolic acids. It also rich in alcoholic extract such as cineole, methyl cinnamate, myrecene and contains various flavones such as galangin, alpinin, kampferide and 3-dioxy-4-methoxy (Ghasemzadeh *et al.* 2010). The phyto-chemical present in *Alpinia galanga* has antioxidant and anticancer property (Kaushik *et al.* 2011). Antioxidants guard DNA and protects molecules from oxidative damage and can enhance semen quality and thus augment the fertility rate (Khaki *et al.* 2009). The plant extract had a direct affect on the testes that help to amplify the number of spermatozoa and the increased the level of testosterone production (Mazaheri *et al.* 2014).

#### *Apium graveolens*

*Apium graveolens* (Celery) belongs to the parsley (Umbelliferae) species from the Apiaceae family (Fig. 1, B). The height of the plant is 100 cm, and it has a strong scent and fleshy with solid stems (Khare 2007). It was reported that the celery contains phytoestrogens, which having direct effect on fertility (Kooti *et al.* 2014). Previous studies reported that celery can safe testes from functional and structural damages and sperm from toxicity caused by atrazine (Abarikwu *et al.*, 2012) and quinine sulfate (Farombi *et al.* 2012), protects the testes against sodium valproate (Hamza and Amin 2007) and di (2-ethylhexyl) phthalate (Madkour 2014). In a study of Kooti *et al.* (2014) revealed that celery significantly increased in the number of sperms, sertoli cells, and primary spermatocyte compared to the control group while they administered 200 and 300 mg/kg of celery to the rats for 60 days. They also reported that celery increased spermatogenesis

in male rats, without any destructive effects on testicular tissue.

### ***Aloe barbadensis miller (Aloe vera)***

Aloe vera is a perennial herbaceous plant which looks like cactus (Fig. 1, D). This plant easily grows in a dry temperate area, which is found in Asia, Africa, North America and Europe. Aloe vera is used to treat the various ailments of human. Aloe vera extract having antioxidant property which acts circuitously by intensification of vitamin C and E (Modaresi and Khodadadi 2014). The Aloe vera also used orally, as a laxative during anal fissures, hemorrhoids and anorectal surgery in gastrointestinal ailments, tuberculosis, fungal infection, skin irritation, burns, bruises and scratches. Modaresi and Khodadadi (2014) administered @ 100 mg/kg and 200 mg/kg of Aloe vera to the rats for 20 days and they had reported that Aloe vera increased the number of stem cells and primary spermatocytes significantly as compared to control group. They also stated that Aloe vera increased stem cells and primary spermatocytes by preventing apoptosis of germinal cells, enhancing cell division and stimulating the leydig cells to increase testosterone production (Estakhr and Javdan 2011). The flavonoids are natural herbal phytoestrogens present in the Aloe vera having estrogen-like activity. Vitamins, present in Aloe vera improve testicular weight, seminiferous tubule diameter and thickness of the germinal epithelium (Estakhr and Javdan 2011).

### ***Asparagus racemosus (Shatavari)***

Shatavari (Figure 1, O) is a powerful male boost up. Shatavari having cooling properties which equilibrium the heating herbs used to recover sperm count, such as, garlic, onion, ashwagandha. Shatavari prevents reduction of sperm count and enhance the libido.

### ***Citrullus vulgaris***

*Citrullus vulgaris* (Fig. 1, E) or watermelon (seed extract) has copious antioxidants (lycopene, beta carotene) and several amino acids (arginine, citrulline) as reported by Kamil *et al.* (2011). Numerous studies have stated that antioxidants and vitamin A, B, C, and E in diet can protect sperm DNA against free radicals and augment blood-testis

barrier stability (Jedlinska-Krakowska *et al.* 2006; Fathiazad *et al.* 2013). Khaki *et al.* (2013) reported that administration of 55 mg/kg *Citrullus vulgaris* extract for 28 successive days, significantly increased sperm concentrations, motility and viability in experimental group as compared to control.

### ***Cinnamomum zeylanicum***

Cinnamomum belongs to the family Lauraceae species (Fig. 1, F) which contains volatile oils, tannins, terpenoids, mucilage, oxalates and starch. Phytochemical present in *C. zeylanicum* have significant germicidal, antiulcerogenic and cytotoxic effects. Shah *et al.* (1998) reported that the extract of Cinnamomum increased the weight of testes, cauda epididymis and seminal vesicles also sperm count and motility in the treated male mice. Khaki (2015) stated that the administration of 75 mg/kg of Cinnamomum for 28 days had significantly increased the sperm concentration, motility, viability and total testosterone concentration. Shalaby and Mouneir (2010) reported that the oral administration of *C. zeylanicum* extract @ 500 mg/kg to diabetic male rats for 65 days increased the weight of testes and seminal vesicles, improved semen quality and quantity, and increased serum insulin and testosterone levels and decreased the degenerative lesions seen in the testes of diabetic rats.

### ***Cardiospermum halicacabum***

*Cardiospermum halicacabum* (balloon vine) is a perennial herb (Fig. 1, G). It is found in the country of Sri Lanka. The roots of the plant are used against nervous disorders (Kapoor and Kumar, 2013). The leaves of the plant are used in abnormal suppression of menstrual cycle. The plant having the phytochemical of flavones, aglycones, triterpenoids, glycosides, and a variety of fatty acids and volatile ester (Annadurai *et al.* 2013). Peiris *et al.* (2015) reported that administration of aqueous leaf extract of *Cardiospermum halicacabum* increased the total sperm count and percentage of motile sperm. It is also used as a diaphoretic, diuretic, emetic, emmenagogue, laxative, refrigerant, stomachic, and sudorific (Menichini *et al.* 2014).

### ***Chlorophytum borivillianum***

*Chlorophytum borivillianum* (Safed Musli) having spermatogenic assets and it helps to enhance the



sperm quality as well as the sperm count (Fig. 1, Q). It also increases the testosterone levels which further enhances blood circulation to the genitals for lengthier erections. It can be efficient in the treatment of male infertility and other sexual disorders like erectile dysfunction, prevent premature ejaculation as well as to improve the sperm count.

### *Cynomoriumcoccineum*

*Cynomoriumcoccineum* Linn. (Cynomoraceae) is a parasitic plant with no leaves and no chlorophyll. This herb's aqueous extract has been proven to improve sperm count, percentage of viable sperm, and sperm motility, decrease the quantity of aberrant sperm, and increase spermatogenesis (Abd El-Rahman *et al.* 1999).

### *Danae racemose*

Khaki *et al.* (2009) reported that administration of *Danae racemose* (Fig. 1, H) @ 200 mg/kg and 400 mg/kg to the rats for 28 successive days significantly increased the sperm motility and viability. The *Danae racemosa* plant extract considerably reduced the Malondialdehyde (MDA) level and sperm abnormality in treated groups as compared to control.

### *Eurycoma longifolia*

*Eurycoma longifolia* or Jack (Simaroubaceae), is a popular aphrodisiac herb in Malaysia (Cyranoski, 2005). In naive male rats, administration with *E. longifolia* extract resulted in successful induction of sexual drive (Chopra *et al.* 1958). By increasing the duration of coitus and copulation frequency, an ethanol extract of this herb boosted the sexual drive and performance of the treated male rats (Ang and Sim 1997).

### *Mucuna pruriens*

This thick, oily plant has a sweet, yet occasionally bitter flavour. In the male albino rat, alkaloids produced from *M. pruriens* seeds were discovered to enhance spermatogenesis and overall weight of the testicles and accessory glands (Saksena and Dixit 1987). Increased mounting frequency, ejaculation latency, and intromission frequency indicate that *M. pruriens* can stimulate sexual activity in male rats (Amin *et al.* 1996; Suresh *et al.* 2010). *M.*

*pruriens* was proven in a study to effectively recover spermatogenic loss caused by ethinyl estradiol treatment in male rats, and the herb's therapeutic effects were mediated by reduced ROS, apoptotic regulation, and an increase in the number of germ cells. *M. pruriens*' main ingredient, L-DOPA, is mostly responsible for its pro-spermatogenic characteristics (Singh *et al.* 2013). Sexual potency and behavior, libido, sperm parameters, and endocrine levels all improved significantly when *M. pruriens* seed extract was used (Suresh and Prakash 2012). Lipids, triglycerides, cholesterol, phospholipids vitamin A, C, and E levels have all been improved by *M. pruriens* and restored the levels of SOD, catalase, GSH, and ascorbic acid in seminal plasma after fructose nullified oxidative stress-induced lipid peroxidation in seminal vesicles (Ahmad *et al.* 2008; Shukla *et al.* 2010). The *Mucuna pruriens* increases testosterone, LH, dopamine, adrenaline, and noradrenaline levels whilst declining FSH and PRL levels in infertile men, according to neuroendocrine studies. Treatment with *M. pruriens* enhances steroidogenesis and semen quality in infertile men (Shukla *et al.* 2008).

### *Nigella sativa*

*Nigella sativa* is known as black seed (Fig. 1, I), belongs to the family of Ranunculaceae. *Nigella sativa* seeds rich in nutritional compounds like carbohydrates (glucose, rhamnose, xylose, and arabinose), fats, vitamins, minerals and proteins including essential amino acids (El-Mahmoudy *et al.* 2002; Mohammad *et al.* 2009). The seed also contains unsaturated fatty acids (linoleic and oleic acid), carotene, calcium, iron, and potassium (Ghosheh *et al.* 1999; Mohammad *et al.* 2009). *Nigella sativa* has important role in correcting the CNS functions by the abilities of Thymoquinone TQ to reduce the stress of epilepsy in rats, acts as an anticonvulsant, muscle relaxant, analgesic agent and CNS depressant action (Filippo *et al.* 2002; Hosseinzadeh *et al.* 2005). The majority of the pharmacological actions are accredited to the existence of thymoquinone as a major compound (Gilani *et al.* (2004). Thymoquinone have antioxidant effects and it increasing the oxidant scavenger system as well as its potent anti-inflammatory mediators, prostaglandins and leukotrienes (Salem 2005). Al-Sa'aidi *et al.* (2005) found that alcoholic



extract of *Nigella sativa* @ 0.5 and 1.5 g/kg body weight significantly increased the body weight, reproductive capacity in males by increasing the thickness and diameters of seminiferous tubules, enhanced the spermatogenesis, increased sertoli and Leydig cells, testosterone and follicle stimulating hormones production.

### ***Ocimum basilicum***

*Ocimum basilicum* is belonging to the family Lamiaceae, found in Asia, which is used as a nutritious food and herbal medicine. This plant is used as an antispasmodic, aromatic, digestive, carminative, stomachic and tonic agent (Supawan *et al.* 2007). It has antioxidant effects which might be due to the presence of flavonoids, phenylpropanoids, and rosmarinic acid in the aerial parts of the plant (Bors *et al.* 1997; Peluso, 2006). Supawan *et al.* (2007) reported that *Ocimum basilicum* significantly increased sperm motility, viability and sperm count when it fed @ 1.5 and 3 g/kg body weight of extract for 40 consecutive days. It has significantly decreased the level of malondialdehyde (MDA) in treated animals.

### ***Phaleria macrocarpa***

*Phaleria macrocarpa* found in Indonesia. *Phaleria macrocarpa*, usually used for the treatment of cancer, diabetes, hypercholesterolemia, hypertension, heart disease, allergy etc. (Winarto and Mahkota 2002). The fruits of the plant contain alkaloid, saponin, flavoid, and polyphenol which can enhance the testicular function of male mouse (Gauthaman *et al.* 2002; Zhang *et al.* 2006). Parhizkar *et al.* (2014) reported that *Phaleria macrocarpa* enhance the number of spermatogonia cells and thickness of seminiferous tubules as well as improved rat's fertility when it administered @ 240 mg/kg of aqueous extract for 7 weeks. Rosen and Ashton (1993) reported that the saponin content of plants increases aphrodisiac properties by stimulating the androgen production.

### ***Phoenix dactylifera* L.**

*Phoenix dactylifera* L. (Fig. 1, K) or Date Palm Pollen (DPP) has been used to support good health and improving male or female fertility in Middle East and Asian countries (Mehraban *et al.* 2014). Mehraban *et al.* (2014) reported that *Phoenix*

*dactylifera* significantly increased the sperm count, sperm motility and estradiol concentration in experimental rats as compared to control group when administered @120 mg/kg and 240 mg/kg for 35 days. The phytochemical present in DPP is estrone,  $\alpha$ -amirin, triterpenoidal saponins, flavonoids, cholesterol, rutin carotenoids, oestrogen-gonad stimulating agents which improves the male fertility and elicit gonadotrophin activity, regulates the spermatogenic cycle and increases estrogen receptors (Drew and Myers 1997; Zhang *et al.* 2006).

### ***Phyllanthus emblica* (Amla)**

Amal is one of the most vital fruits in Ayurveda (Fig. 1, P). The plant grows in a warm climate. The fruit is recognized as rich source of Vitamin C. It also contains polyphenols, minerals like iron and zinc and vitamins like Carotenes and Vitamin B complex. As because of rich in Vitamin C and polyphenols, amla is a immense resource of antioxidants. Research has revealed that it has a high amount of tannins, which combined with polyphenols and gives the fruit a unique free radical scavenging property. This will helps to reduce the damage caused by free radicals on the body. It also sustains the cholesterol levels in the body by inhibiting the oxidative properties of a chemical called as thiobarbituric acid (TBA) that induces LDL oxidation.

### ***Piper longum* (Pippali)**

Pippali (Fig. 1, L) is a revitalizing herb that has a warming, reviving, and kapha-reducing action. When it combined with Ashwagandha, it improves blood flow to the reproductive tissues (Dass 2007; Chauhan *et al.* 2014). Pippali, according to Ayurveda, increases life energy and expels toxins through respiration. It also helps with digestion, absorption, assimilation, and breathing, as well as relieving arthritic pain. In complex recipes, the normal dosage of this plant is 1 to 3 parts, or 250 mg to 1.5 grams. In high pitta or inflammatory situations, pippali should be avoided (Dass 2007).

### ***Punica granatum***

*Punica granatum* (Pomegranate) fruit have 52% of total fruit weight, which having 78% juice and 22% seeds (Fig. 1, M). The fresh juice of pomegranate is rich in vitamin C and polyphenolic compounds



such as anthocyanins, punicalagin, ellagic and gallic acid (Seeram *et al.* 2005). Pomegranate has been used as anticancer (Afaq *et al.* 2005), antiproliferative, apoptotic (Seeram *et al.* 2005), HIV-I entry inhibitory, topical microbicidal (Neurath *et al.* 2004), cardioprotective (Sumner *et al.* (2005), antihyperlipidemic (Fuhrman *et al.* 2005) and potent antioxidant agent. Turk *et al.* (2008) stated that administration of 0.25 mL PJ plus 0.75 mL distilled water (PJ-low), 0.50 mL PJ plus 0.50 mL distilled water (PJmiddle) and 1 mL PJ (PJ-high) to the experimental rats for 7 weeks, significantly increased the seminiferous tubule diameter and germinal cell layer thickness. They also said that due to its increased antioxidant capacity which can protect the spermatozoa against peroxidative damage and simultaneously it increased the spermatogenic cell density and sperm quality in healthy rats. For this reason, it has a positive relation between consumption of pomegranate and sperm parameters.

### ***Sida cordifolia* (Bala)**

The word “Bala” referred as strength in Sanskrit, and as a rejuvenative tonic herb for *vata* and *pitta*, which is used to nourish and strengthen all bodily tissues, particularly the muscle, plasma, muscle, bone marrow, and reproductive tissue (Dutta and Sengupta 2018). It's sweet, heavy, and greasy, and when taken in excess, it raises *kapha*. It's also moderately cooling. Bala is a powerful anti-*vata* herb used in Ayurveda to treat both physical and mental ailments. It is an important Ayurvedic herb in the treatment of *balakshaya*, or chronic fatigue, and in the rejuvenation of total health when physical or mental strength is exhausted. It works as a tonic to boost male fertility, stimulate spermatogenesis, and restore sexual strength (Dass 2007; Chauhan *et al.* 2014). This plant can be consumed or used as rubbing oil on the penis in conjunction with Ashwagandha to increase its tone and avoid premature ejaculation. Its use in conjunction with herbs like gokshura, ashwagandha, vidarikandha, saw palmetto, and kapikacchu has been shown to improve prostate health. Bala is usually taken in doses of 2 to 6 grammes twice a day (Dass 2007).

### ***Serenoa repens* (Saw palmetto)**

Saw palmetto herb traditionally used for boosting

sexual health in male. It has also been documented for treating impotence and other physical disabilities associated with poor sexual health in male. It nourishes each facet of male reproductive structure. In addition, this is useful for prostate health, libido and testicular atrophy, balance hormone levels. Modifiable testosterone levels can help in several aspects of health, including body composition, sex drive, mood, and cognition.

### ***Turnera diffusa* (Damiana)**

This herb (Fig. 1, S) is thought to have libido-promoting properties, which may be helpful for both male and female. It might help to bring back reproductive health and treat the premature ejaculation or impotence.

### ***Terminalia chebula* (Shilikh/ Haritaki)**

*Terminalia chebula* tree (Fig. 1, R) is commonly known as Indian walnut or Indian hog plum in English. This tree belongs to the Combretaceae family. *Terminalia chebula* trees are deciduous in nature and mostly raise in tropical and subtropical regions of India, Nepal, China, Sri Lanka, Malaysia, and Vietnam. This tree is relatively tall; growing to a height of 30 m and has alternately given oval leaves growing on the branches. It's having dull whitish-yellow flowers that have a strong pungent smell. The fruit of the plant is yellow to orangish-brown in color and are ovoid drupe-shaped with five distinct longitudinal ridges along its surface. The fruit of *Terminalia chebula* having several bioactive agents like chebulin, chebulagic, and corilagin and antioxidants like pyrogallol, ferulic, vanillic, phloroglucinol, and caeffic acid. It also has twelve fatty acids including linoleic acid, oleic acid and palmitic acid, glucose, quinines and tannins. It can be used as potent laxative, astringent, purgative, anti-bilious and antioxidant for the treatment of several health abnormalities. It is tremendously useful in promoting sexual health of both males and females. Being a natural aphrodisiac, it helps in dropping the stress and stimulates the hormones for increasing libido. It improves the male and female fertility, can be used to treats several reproductive issues and increases virility and stamina in male.

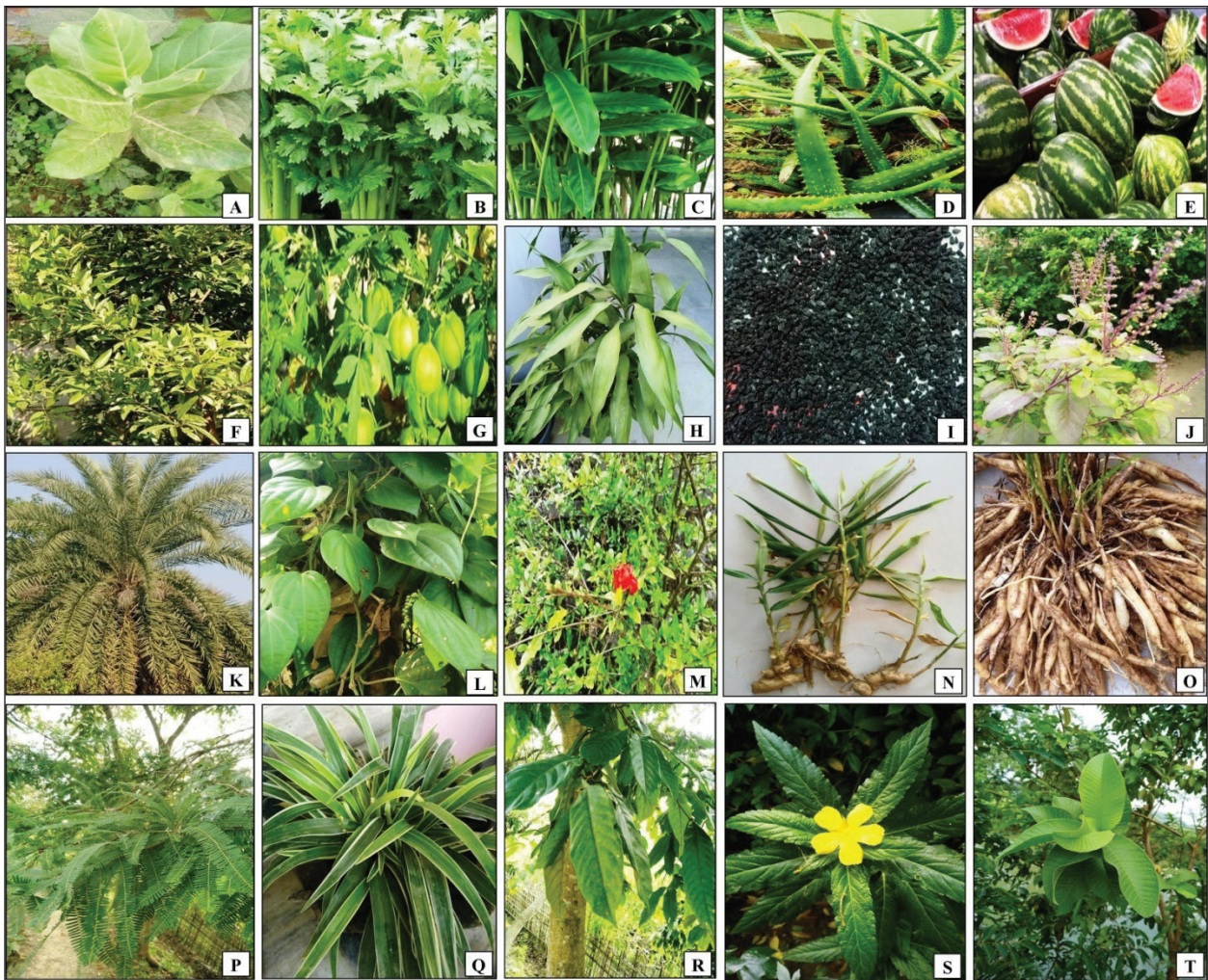
### ***Withania somnifera* (Ashwagandha)**

In India, *Withania somnifera* known as ashwagandha



(Fig. 1, A) means “the smell of a horse” in Sanskrit, because of its root has a strong stench similar to that of horse urine. Another legendary similarity of the sexual vigour it may offer to men with that of a horse led to its moniker. Induction of spermatogenesis, better blood supply to the reproductive tissues, and regulated endocrine activities are only a few of the many benefits for male reproductive problems. It treats spermatorrhea, nocturnal emission, premature ejaculation, and an enlarged prostate, among other things. In rats, *Withania somnifera* protects against swimming-induced endocrine dysfunctions of male reproductive and combats stress-induced male infertility (Misra *et al.*, 2005). Due to increased interstitial cell stimulating hormone and testosterone-mimicking actions, as

well as stimulation of nitric oxide synthase, the aqueous extract of this herb has been demonstrated to promote spermatogenesis (Iuvone *et al.* 2003). Ambiye *et al.* (2013) used concentrated root extract of Ashwagandha @ 225 mg/kg for 90 days which resulted significant improvement of semen parameters and regulated sexual hormone levels in oligospermic males. This herb appears to fight oxidative stress by lowering lipid peroxidation and protein carbonyl content, boosting sperm count and motility, and restoring antioxidant enzyme levels in the seminal plasma. When 5 g/day for 3 months of *Withania somnifera* root powder was given to a normozoospermic infertile male every day for three months, it exhibited a considerable reduction in stress, increased antioxidants, and increased semen



**Fig. 1:** Commonly used herbs for male fertility ((A) *Withania somnifera*; (B) *Apium graveolens*; (C) *Alpinia galangal*; (D) *Aloe barbadensis miller*; (E) *Citrullus vulgaris*; (F) *Cinnamomum zeylanicum*; (G) *Cardiospermum halicacabum*; (H) *Danae racemose*; (I) *Nigella sativa* seed; (J) *Ocimum sanctum*; (K) *Phoenix dactylifera*. (L) *Piper longum*; (M) *Punica granatum*; (N) *Zingiber Officinale*; (O) *Asparagus racemosus*; (P) *Phyllanthus emblica*; (Q) *Chlorophytum borivilianum*; (R) *Terminalia chebula*; (S) *Turnera diffusa*; (T) *Psidium guajava*)



volume and vitamin A, C, and E levels, as well as correcting fructose. Various studies have shown that this herb has an effect on the HPG axis, with one showing significant increases in blood testosterone and LH levels as well as lower levels of FSH and prolactin (PRL) in infertile men (Mahdi *et al.* 2009; Ahmad *et al.* 2010; Sengupta *et al.* 2018).

### *Zingiber officinale*

*Zingiber officinale* (Ginger) plant (Fig. 1, N) belongs to family Zingiberaceae, which having about 1300 species in 50 genera, along with four other families is placed in the order Zingiberales (Garner-Wizard *et al.*, 2006). Ginger is cultivated in Africa, China, India and Jamaica. The phytochemical agents of ginger classified to volatile oils (borneol, camphene, citral, eucalyptol, linalool, phenllandrene, zingiberine and zingiberolpenols (gingerol, zingerone and shogaol) and resin) which constitutes (1-3%) mainly of zingiberene nonvolatile pungent compounds oleoresin constitutes (4-7.5%) mainly gigerols and other constituents with more than 50% of starch (Fnimh, 2001; Ravindran and Babu, 2004). Ginger extract has anticancer, anti-oxidation, anti-inflammation and antimicrobial properties and a potent androgenic activity (Sharma *et al.* 1994; Kamtchouing *et al.* 2002). It is also used as a precursor of vitamin D3 (Kametani and Furuyama, 1987). Aleissa (2014) used 50 mg/kg/mouse and 100 mg/kg/mouse of ginger for 22 consecutive days and he found that it significantly increased the sperm motility and viability in both the groups. In another study of Aleissa *et al.* (2009) said that ginger extract significantly increased sperm functions i.e. sperm count, motility, viability and concentrations when it administered 50 mg/kg or 100 mg/kg/rat ginger for 20 days.

### Homemade preparations for improvement of male fertility

Sarma (2020) reported that the pumpkin seeds have been used for treating infertility in males. The pumpkin seed should be boiled in water and then fed on regular basis. The raw garlic @ 4-5 cloves is helpful in treating male infertility and also improves the male reproductive function. The onion and roots of lady finger enhances male reproductive function and it is one of the most efficient and easiest treatments of male infertility. Grapes also

help to increase the fertility of both male and female. It enhances quality and quantity of semen, sperm count and sperm motility. It also helps to reinforce the female reproductive system. This type of berries is recognized as "Vrishya", which means they help in erectile dysfunction and premature ejaculation. Clove (longg) is a well-liked Indian spice used in soups, stews, meats, sauces and biryani. Clove can increases male libido, prevent premature ejaculation and enhance sperm motility. Guava (Fig. 1, T) is a tropical fruit has the highest vitamin C content. It has powerful antioxidant property and has been shown to significantly improve sperm motility, count, and morphology. *Moringa oleifera* seeds and leaves have high amount of sulfur-containing compounds known as glucosinolates which prevent the growth of prostate cancer cells. The seed and leaf extracts improves the penile blood flow. *Moringa* leaves and seeds have high content of antioxidants, which combat the oxidative damage that can hinder the sperm production process or damage sperm DNA. Studies in rabbits have shown that leaf powder of the plant considerably enhanced semen volume, as well as sperm count and motility.

### DISCUSSION

Reduced vigor, libido, malfunction testicular tissues and leydig cells, failure of spermatogenesis counting azoospermia, asthenozoospermia, oligozoospermia, are the main causes of male infertility (Bener *et al.* 2009; Khojasteh *et al.* 2016). As per report of earlier worker, the chemotherapy, environmental pollution, toxic substances, deficiency of minerals and vitamin have detrimental effects on normal spermatogenesis process (Baynes *et al.* 1999; Talukdar *et al.* 2016). Khojasteh *et al.* (2016) reported that feeding of antioxidants and vitamins A, B, C, and E can guard the sperm DNA from free radicals and augment the blood testis barrier steadiness. As from the present study, we have noticed that most of the plant extracts have foremost bioactive elements such as phenolic compounds (phenols, sterol, lignans and flavonoids), vitamins (B1, B2, B3, B6, C and E), folic acid, bio-trace elements (Ca, Mg, P, Zn, K, Cu and Fe), various essential amino acids, volatile oils, polyphenols and saponins. These type of phytomedicines plays a positive role on spermatogenesis process and increases the



sperm counts, sperm vitality, sperm concentration, increases Leydig cell counts, seminiferous tubule diameters, decreases anomalous spermatozoa and enhancing the sexual vigor, libido, erection, intromission and ejaculatory potency (Mohammadi *et al.* 2013; Talukdar *et al.* 2015; Khojasteh *et al.* 2016).

## CONCLUSION

Herbal tonics replenish the quality and quantity of reproductive tissues by providing greater nutrition. Some herbs have both nourishing and stimulating characteristics. Due to the health risks, limited effectiveness, and high cost of modern male infertility treatments, herbal aphrodisiacs are regaining popularity and having a long-term impact on male reproductive health by improving sexual behavior, vigor, neuro-endocrine control, structural and functional aspects of reproductive tissues, and qualitative and quantitative improvements in semen as well as the shape and motility of sperm. Biomedical study should delve deeper to uncover additional secret mechanisms by which a plethora of herbs can help to eliminate male infertility, which is becoming a huge threat to future generations.

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