

Anti-Fertility Role of *Aegle Marmelos* (Bael)

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Abstract: Antifertility agents are those which are capable of stopping ovulation or fertilization. Man uses a variety of herbs and plant extracts to treat and relieve physical and mental illnesses. *Aegle marmelos* (L.), also known as Bael, is a spiny tree that belongs to the family Rutaceae. Due to the numerous medicinal properties that this tree possesses, it has been utilised extensively in traditional Indian medicine. The fact that bael contains a wide Its phytochemical composition, which includes alkaloids, tannins, essential oils, gums, resins, coumarin, and polysaccharide, enables it to treat a wide range of conditions. It has been demonstrated that the leaf, seed, and fruit of the *A. marmelos* plant all have reversible effects on male fertility. *A. marmelos* bark extract is high in marmin and fagarine, both of which are known to reduce male fertility. In *Aegle marmelos* bark, two chemical compounds such as marmin and fagarine are present which is claimed to be responsible for the reduction of male fertility.

Keywords: Phytochemicals, Fertility, Marmin, Fagarine, Antiandrogenic

1. Introduction

Antifertility agents are those which are capable of stopping ovulation or fertilization and able to result in termination of being pregnant and the drugs which used for stopping fertilization are called as antifertility effects [1]. Because population growth is a major cause of poverty and pollution in developing nations, many herbs and plant extracts are being used to treat and relieve various physical and mental illnesses [2]. Over the years, several potential treatments for infertility have been researched, including pharmacological, hormonal, and immunological techniques [3]. However, no viable approach that is both effective and free of negative effects has developed. Due to its numerous therapeutic properties, *Aegle marmelos* (L.), also referred to as Bael, is a prickly tree in the Rutaceae family that has been widely used in traditional Indian medicine [4]. Asthma, anaemia, fractures, wound healing, swollen joints, high blood pressure, jaundice, and diarrhoea are treated with skimmianine, aegeline, lupeol, cineol, citral, citronella, cuminaldehyde, eugenol, and marmesinine. Agrawal and others [5] described *Aegle marmelos* leaf, seed, and fruit extracts have been shown in earlier studies to affect male fertility by slowing sperm motility, according to Rahman and colleagues [6]. Ancient texts on indigenous medicine

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describe the management of fertility using plants or plant-based compounds. There are numerous plant species that have anti-fertility properties impacts have been studied in China and India for about 50 years, and have since been strengthened by national and international institutions. [7]. The leaves of *Aegle marmelos* are astringent, laxative, and expectorant, and they can be used to treat ophthalmia, deafness, inflammations, cataract, diabetes, diarrhoea, dysentery, heart palpitations, and asthmatic problems. Cardiogenic impact in mammals, regeneration of injured pancreatic beta cells, and enhancement of peroxide activity in liver tissues, possible antioxidant medication that lowers blood sugar levels. [8]. Sukanth et al. [9] reported that the ethanolic extract of *A. marmelos* leaf possesses anti-spermatogenic activity because its leaf has antimotility action on spermatozoa. Mali et al. [10] reported that bael contains various phytochemicals like alkaloids, tannins, essential oils, gums, resins, coumarin, polysaccharide that makes it useful in many ailments and its nutritional aspect is much more significant as compared to other fruit. It also has great importance in the environment. Sing et al. [11] described in his article that it acts as climatic purifier; it releases greater percentage of oxygen in comparison to other trees and it also has numerous crucial therapeutic applications like antifungal, analgesic, anti-inflammatory, antipyretic, hypoglycaemic, anti-lipidemic, and immune-modulatory, anti-proliferative, wound healing, anti-fertility and insecticidal. They also described that *Aegle marmelos* have been used as a natural source of medicinal compounds. The present review was carried out to focus the antifertility activity of aqueous leaf extract of *Aegle marmelos* on male albino rats.

Taxonomic Position.

Kingdom: Plantae

Order: Sapindales

Family: Rutaceae

Subfamily: Aurantioideae

Genus: *Aegle*

Species: *A. marmelos*

2. Phytochemistry

According to Rahman and Parwin [4] *A. marmelos* contains a variety of phytochemicals, including psoralen, alloimperatorin, rutaretin, scopoletin, aegelin, marmelin, fagarine, anhydromarmelin, limonene, α -phellandrene, betulinic acid, marmesin in addition, they reported that the seed oil contained palmitic, stearic, oleic, linoleic, and linolenic acids. According to Ankita et al. [12], bael contains several coumarins, alkaloids, steroids, and essential oils. Scoparone, scopoletin, umbelliferone, marmesin, and skimming are coumarins found in the root and fruits of this plant. The fruits include alkaloids such as aegeline and marmelline in addition to xanthotoxol, imperatorin, and alloimperatorin. Patel and colleagues claim [13], it also contains polysaccharides such as galactose, arabinose, uronic acid, and L-rahaminose, which can be obtained after hydrolysis. They also reported that various carotenoids have been found in *Aegle marmelos*, which are responsible for the fruit's yellow pale colour. According to Rakulini and Kalaichelvi [14], the therapeutically active principals of the bael plant are marmelosin, skimmianine, and umbelliferone, with minor components including ascorbic acid, sitosterol, crude fibres, tannins, - amylin, carotenoids, and crude proteins.

3. Antifertility Activity

According to Agrawal et al. [15], the leaf, seed, and fruit of *A. marmelos* have been shown to have an effect on male fertility that can be reversed. They also noted that the extract of *A. marmelos* bark contains marmin and fagarine, both of which are known to reduce male fertility. Additionally, they discovered that the *A. marmelos* bark methanolic extract causes dose- and duration-dependent infertility by reducing reproductive organ mass and serum testosterone concentrations. As a result, sperm density, motility, viability, and acrosomal integrity all decline. Rahman and Parwin [4] reported their findings in animals that had been treated. In testicular histological examinations, it was found that there was Elongated spermatid exfoliation, nuclear chromatin condensation, and degeneration. Additionally, there were gaps within the germinal epithelium, which indicated cytotoxicity and necrosis. These findings suggest that the testicles had been damaged. They also reported that, following the cessation of treatment, all morphological and physiological parameters in extract-treated rats returned to normal. *A. marmelos* extract is an excellent choice for male contraception, according to Chauhan and Agrawal [16]. The extract has the ability to completely suppress pregnancy and restore fertility rapidly after treatment cessation. Patel and Patel [17] reported the antiandrogenic activity of hydroalcoholic extract of *Aegle marmelos* in female Wistar rats and investigated the effect of this extract on physical and biochemical parameters as well as the histology of the ovary. They noticed a considerable increase in serum LH and a drop in serum FSH levels, as well as an increase in the number of developing follicles and corpus luteum, oocyte surrounded by granulose cells. Pramila and Jirekar [18] update in his review article that in *Aegle marmelos* bark, two chemical compounds such as marmin and fagarine are present which is claimed to be responsible for the reduction of male fertility and it cause inhibition of ovulation and steroidogenesis. They also described that Reduced corpus luteum formation is closely related to the amount of ovum that is ovulated, and it will also lead to suppression of follicular numbers and development, leading in diminished western ovaries and steroidogenesis, since ovulation is inhibited as a result of reduced oestrogen and progesterone production. Sathiyaraj et al. [19] reported aqueous leaf extract on male reproductive system of albino rat and found that significant decrease in the weight of testis, epididymis, seminal vesicle. There was a dose-related increase in testicular sperm count, epididymal sperm count, motility, and aberrant sperm count. three different doses of a 50% ethanolic extract from *A. marmelos* leaves on the reproductive system of male albino rats, namely 100, 200, and 300 mg/kg 1 day⁻¹ for each rat for 60 days, according to Lambole et al. [20]. Recovery after a 120-day abstinence period was also researched. Following ingestion of the extract, all of the major accessory sex organs lost weight. The motility and density of sperm produced by the treated animals' cauda epididymis were significantly reduced. At 300 mg, *A. marmelos* reduced male rat fertility by one hundred percent. In all experimental groups, serum testosterone levels were also found to be significantly lower. According to Remy et al. [21], sperm motility is the capacity of sperm to move toward an egg in an appropriate manner. Contrary to 'quantity,' this can also be viewed as 'quality,' which contributes to successful pregnancies. Sperm that does not 'swim' properly cannot fertilise the egg. Sperm motility has an impact on sperm quality. Sperm motility issues are frequently the cause of infertility and sub fertility. Several plant compounds suppress male and female fertility and may one day be used as contraceptives Vijaya et al. [22]. A 50 percent ethanolic extract of *A. marmelos* leaves prevented the rise of blood cholesterol and triglyceride levels in hyperlipidaemic mice. They also noted that the leaf extracts have been found to attenuate Wistar rats exhibited CCl₄-mediated hepatic oxidative stress, toxicity, tumour promotion, and subsequent cell proliferation. Pancreatic protection is exhibited by aqueous extracts of *A. marmelos* fruit. This plant's leaves are said to be

beneficial for spermatorrhea. Previous research has demonstrated that ethanolic extracts of *A. marmelos* leaves inhibit spermatogenesis in rats. It has also been observed that aqueous extracts of *A. marmelos* leaves diminished the viability of human sperm. Kumar [23] reported in his thesis that methanolic extracts *Aegle marmelos* was administered orally for 60 days at doses of 200, 400, and 600 mg/kg and found to cause dose and lowering serum testosterone levels and the weight of the reproductive organs over time. Acrosomal integrity, motility, density, and viability of the sperm were all reduced, according to sperm analysis. without affecting important organ body weight. Histopathological examinations revealed elongated spermatid exfoliation, nuclear chromatin condensation, degeneration, and conspicuous gaps within the germinal epithelium, all of which indicated testicular cytotoxicity and necrosis. In all doses, time-dependent total infertility was reported. After 30 days of no treatment, animals showed restoration of morphological and physiological markers in extract-treated rats. They also discovered a considerable reduction in the weight of the testis, epididymis, and seminal vesicle.

4. Conclusion

This research gathered scientifically confirmed material on the antifertility actions and extract types of numerous traditionally used herbal medicinal plants for both males and females. The animal models used to examine the antifertility activity of the aforementioned herbs were also discussed. In both males and females, these medicinal plants function as antifertility agents via distinct methods. Future research is also required to ensure the safety and efficacy of the herbal preparations of these plants.

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