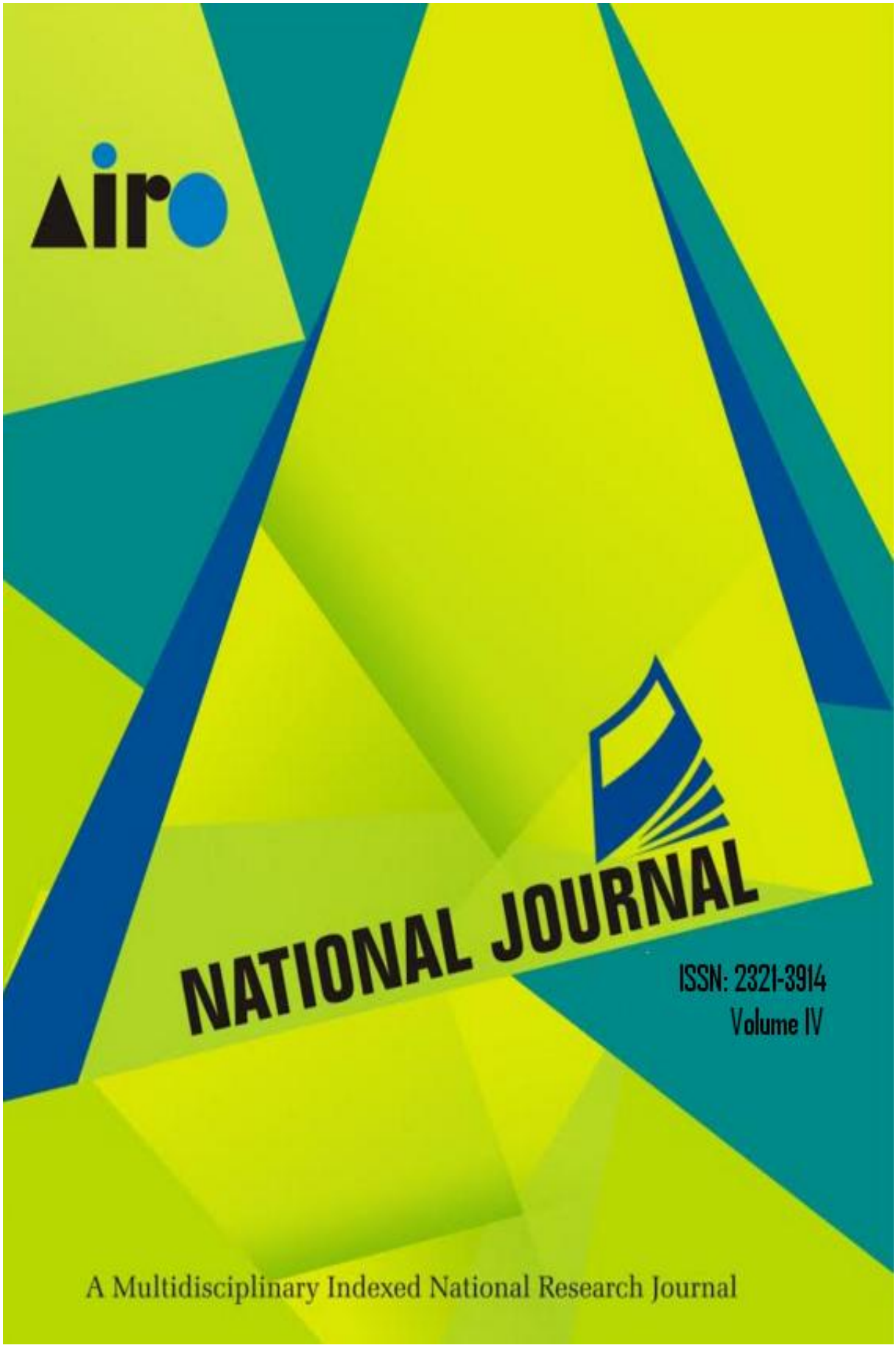
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Medicinal plants as a possible source of birth control

Ms. Namrata Das

Research Scholar, Department of Chemistry Sainath University

Abstract:

To control the population explosion in the world, new methods of contraception involving men is an attractive alternative. Since ancient times, plants and plant based products have been used as a valuable and safe natural source of medicines for treating various ailments. India possesses a vast reserve of medicinal plants which have been used extensively in the treatment of various diseases. The reversibility of anti fertility effects of plants and its active components, play a major role in development of male contraceptive agents. The present review attempts to discuss medicinal effects of plant derived products on male reproductive system.

Keywords: male contraception, medicinal plants, spermatogenesis, anti fertility effect, testosterone.

Introduction

The world's population has risen to an alarming level especially in developing and underdeveloped countries and has detrimental effects on life supporting system [1]. Plants continue to be major source of medicines throughout human history. A wide majority of herbal plants possess pharmacological principles, which has rendered them useful as curative for numerous diseases. The World Health Organisation (WHO) reports that 70%-80% of the world's population confide in traditional medicines for primary health care [2]. Therefore, exploring traditionally reported medicinal plants to liberate their potential for the betterment of human health is of paramount importance. Several plants are reported to exert toxic effects on male reproductive organs including testis, epididymis, accessory sex glands and associated hormones [3] [4].

The present review highlights the plants and their products that can be used as potential male antifertility agents.

Main Body

Plants possessing antifertility activities include the following:-

Abrusprecatorius Linn (Fabaceae) Eng- Indian Liquorice, Hindi- Gunchi, Rati. A climber found throughout India, upto an altitude of 1050meters in the outer Himalayas. It's alcoholic seed extract given to sexually mature rats (100mg/kg, p.o.) for 60 days resulted in significant lowering of sperm motility and sperm morphology (decapitation, acrosomal damage and formation of bulges on mid-piece region of sperm) [5]. Steroidal fraction of this seed injected in rats (30 mg i.m., alternating days for 20 days) caused testicular lesion manifesting in cessation of spermatogenesis [6]. A dose dependent testicular degeneration was observed with rats injected with (100, 200 and 300mg respectively) of steroidal fraction of seeds [7]. Ethanolic extract of air dried seed powder (1mg/ml/day, IP for 12 days) exhibited antispermatogenic activity in albino rats. Histology of testicular follicle showed degeneration and spermatogenic arrest, reduced leydig cells and shrunken seminiferous tubules Oral administration of 50% ethanolic extract of seed (250mg/kg) for 30days and 60 days induced a total infertility in male albino rats, a condition which however was reversible. Suppression of sperm motility was most pronounced effect of this treatment.

Aeaciaauriculaeformis A. Cunn ex.Benth (Minosaceae). Sperm immobilizing effects of mixture of the triterpenesaponinsacaciaside A and B (obtained from this plant) have been studied in in-vitro. The lowest concentration (ED) required for immobilization of human sperm using a modified Sander-Crammer test was found to be 0.35 mg/ml. Compounds were more potent as compared to Tritonx -100 using the cervical mucus penetration test. The ED successfully prevented the sperm entry in the human cervical mucus. Electron microscopy revealed plasma membrane disintegration and dissolution of acrosomal cap of the sperm [9]. The 50% ethanolic extract of plant has been reported to have spermicidal activity. A sinuata-the saponin (acacic acid) obtained from the bark was also found to exhibit spermicidal activity against human spermatozoa. Its maximum activity was observed at 0.04% dilution.

Aeglemarmelos Linn (Rutaceae) Eng- Bael tree, Hindi-Bael. A moderate size

slender tree, growing wildly throughout the deciduous forest of India up to an altitude of 1200 meters in height. Administration of ethanolic extract of its leaves in rats (25 and 50 ml/kg, p.o.) for 30 days led to significant decrease in weight of testis, reduced sperm count, decreased sperm motility and decrease in both protein and RNA content of testis [10].

Aeschynomeneindica Linn (Fabaceae) Eng- Hard Sola, Hindi- Laugauni

An erect, slender, shrubby, annual found throughout India. It ascends up to 1500meters in foot hills and in Andaman Islands. Fifty percentethanolic extract (in 2% concentration in-vitro) has been reported to possess spermicidal activity against both rat and human spermatozoa [11].

Agave cantala (Haw) (Agaraceae) Eng- Bombay aloe. A perennial stout scapigerous plant with short woody stem native to Mexico.Ethanolic extract (2%) of its rhizome and its spirostomal constituents has shown to possess spermicidal activity against human spermatozoa [12].

Aisandrabutyracea (Roxb) sapotaceaeEng- Hill mahua, Indian-Butter tree, Hindi – Phalwara. Large deciduous tree found in the sub-Himalayan tract from Gharwal to Bhutan up to an altitude of 1500 meters and in Andaman Islands. Bassicacid, asapogenin isolated from the seeds has been reported to possess some spermicidal activity against human semen [13].

Albiziachinensis (Osbeck) Mimosaceae, Hindi- siran. A large deciduous tree distributed throughout the sub-Himalayan valleys up to 1200meters altitude. They are found in Assam, West Bengal, Bihar, South India and Andaman. Ethanolic extract of bark and its triterpenic constituents possess spermicidal activity against human spermatozoa. Oleanolic acid, echinocystic acid and its two echinocystcic acid based saponins led to complete immobilization of human spermatozoa at 0.5, 0.09, 0.008 and 0.006% concentrations, respectively [14].

A. lebbeck (Linn)-Ethanolic extracts of its pods and root at a concentration of 2% as well as saponinlebbekanin E exhibited spermicidal activity in rat and human semen [15].

Allium sativum Linn (Alliaceae) Eng- Garlic, Hindi-Lahsan. A hardy perennial herb is cultivated all over India. Chronic administration of garlic powder (50mg for 70 days) resulted in inhibition of spermatogenesis in albino rats. Reduced

concentration of sialic acid in testis, epididymis and seminal vesicle with decreased Leydig cells function reflected antiandrogenic nature of garlic [16].

Aloe vera Linn (Liliaceae) Eng- Indian aloe Hindi-Gheekanwar. A coarse looking perennial herb with a short stem and fleshy leaves, found wild in many parts of the country but now widely cultivated. Aloin, a glycoside isolated from its leaves was given to Presbytislangurs (62.5 mg/day, p.o.) for 120 days. A significant reduction was observed in spermatid cells (33.68%), semniferous tubules and leydig cells was observed [17].

Anagallisarvensis Linn (Primulaceae) Eng- Blue Pimpernel Hindi- Joukumari Krishna Neel. A small much branched annual herb found over the greater parts of India that growup to an altitude of 2400 meters in the hills. Anagalligenone, the sapogenin isolated from the plant, revealed spermicidal activity in human semen at a concentration of 0.008% [13].

Andrographispaniculata (Burm f) Acanthaceae) Eng-The creat, Hindi-Kalmegh. An erect annual herb found in the plains throughout India. Supplementation of dry leaf powder to male rats (20 mg/day, p.o.) for 60 days resulted in cessation of spermatogenesis, degenerative changes in semiferous tubules, epididymis, seminal vesicle and leydig cells. Results suggested anti-spermatogenic and/ or an anti androgenic effect of the plant [18].

AnethumsowaRoxb (Apiaceae) Eng-Indian Dill, Hindi-Sowa. An annual aromatic herb cultivated throughout India mainly in Punjab, Uttar Pradesh, Gujarat, Assam, Maharashtra and West Bengal. Volatile oil was tested for its spermicidal activity in the ejaculated human spermatozoa in vitro. At a dilution of 1:10 the oil exhibited spermicidal activity, in just 30 seconds [19].

Anisomelesmalabarica Linn (Lamiaceae) Eng- Malabar. A densely pubescent, perennial herb commonly found in the western ghats from Maharashtra to Karnataka and Andhra Pradesh, Kerala and Tamil Nadu. Spermicidal activity in rat was observed with 5% ethanolic extract and in human semen at 2% concentration [11].

Centratherumanthelminticum Linn (Asteraceae) Hindi-Somraj. A tall, leafy, annual herb distributed throughout India that grow up to 1677meters in the Himalayas and Khasia hills. The seed extract has been reported to have spermicidal activity in rats but not such activity in human beings [11].

Cheiranthuscheiri Linn (Brassicaceae) Eng- Gilli, Hindi-Todri-Surkh. An erect or ascending perennial herb native to southern Europe. It is sometimes cultivated in gardens in northern and western India. Oral administration of Kaemopferol (250mg/kg/day x 60 days), a compound isolated from the herb's stem, induced antifertility (71%) in male rats [36].

Cichoriumintybus Linn (Asteraceae) Eng- Chicory Hindi-Hinduba. An erect perennial herb native to temperate parts of the world and is found wild in Punjab and Andhra Pradesh. It is often cultivated in Bihar, Himachal, Assam, Maharashtra, Gujarat, Tamil Nadu, Orissa, Andhra Pradesh and Kerala. Chicory dry root powder extracted from the herb and administered to mice (8.7 g/kg x 10 days) demonstrated impairment of spermatogenesis [37].

CinnamomumzeylanicumNees (Lauraceae) Eng-Cinnamon Hindi-Dalchini. A moderate sized tree, native to Sri Lanka and cultivated in southern India. The oil of cinnamon has demonstrated in vitro spermicidal activity against human spermatozoa at a dilution of 1:400 [19].

Citrulluscolocynthis Linn (Cucurbitaceae) Eng- Indian wild Gourd Hindi- Indrayan. Ascabrid perennial with prostrate or climbing angular stems and bifid tendrils found in warm, arid and sandy parts throughout India.The 50% ethanol extract of its root administered at various concentration (50, 100 and 200 mg/kg/day p.o. for 60 days) to male rats showed decreased sperm motility, density and spermatogenesis arrest. A marked reduction in serum testosterone was also observed in all treatment groups [38].

Clerodendrumserratum Linn (Verbenaceae) Hindi-Bharangi. A blue flowered shrub widely distributed throughout India. The 50% ethanolic extract of the plant demonstrated in vitro spermicidal activity in rat and human semen [11]. An N-butanol fraction of 50% ethanolic extracts of the plant also exhibitedin vitro spermicidal activity in humans.

Clinopodiumumbrosum (BiebLabiataeceae) Eng-Catmint, Hindi-Janglipudina. A slender, pubescent, profusely branched herb distributed in the Himalayas from Kashmir to Bhutan, Andhra Pradesh, Khassi hills and throughout the hills of peninsular India. The 50% ethanolic extract of the plant has been reported to possess spermicidal activity in rat semen in vitro [11].

Colebrookiaoppositifolia Smith (Lamiaceae) Hindi-BindaPansra. A densely tomentose hoary, widely branched shrub or small tree found throughout the hilly areas of India. Supplementation of ethanolic extract of its leavesin rats at different concentrations (100, 200 mg/kg p.o.) for 10 weeks significantly decreased the weight of testis and epididymis and reduction in spermatogenesis in rats. Reduction in sperm motility and count resulted in 100% infertility in rats by 200mg/kg of ethanol extract [39].

Cotulahemisphaerica (Roxb) Asteraceae. An annual prostrate or erect herb that grows upto a height of 800meters, found in Indo-gangetic plain, UP, Bihar, West Bengal, Assam, Manipur and Meghalaya. The ethanolic extract (50%) of the plant has been demonstrated to possess spermicidal activity in rats [40].

Deeringiaamaranthoides (Lamk) Amaranthaceae. Hindi- Latman. A climbing shrub found in the sub-Himalayan tracts from Chenab to Bhutan, Bihar, west Bengal and Assam. The 50% ethanolic extract of plant revealed spermicidal activity in rats in vitro. Ethanolic extract of its fruits (1%) also showed spermicidal activity against rats and human spermatozoa [41].

Derris indica (Lank) Fabaceae. Eng- Pongam oil tree Hindi- Karaj. A medium-sized, glabrous tree found almost that growsupto an altitude of 1200meters in height. Seed oil has been reported to produce strong spermicidal activity. Motility of sperm from healthy men was completely lost (0.2%) within 20 seconds in presence of its three oil [42].

[***DimeriagracilisNees*** (Poaceae). A perennial stout grass found in Tamil Nadu and Karnataka. The 50% aqueous ethanolic extract possess strong spermicidal activity against rat and human spermatozoa (2% concentration) in vitro 43].

Diploknemabutyracea (Roxb) Sapotaceae.Eng – Indian Butter tree, Hindi- Phulwara. A large deciduous tree commonly found in sub-Himalayan tracts from Uttrakhand east wards to Sikkim, Bhutan and the Andaman Islands. The sapogenin (bassic acid) obtained from seeds has exhibited spermicidal activity against human spermatozoa. Its maximum activity was observed at 0.006% dilution [44].

Miscellaneous

Sarcostemmaacidum- Methanol extract (100mg) when administrated to male albino rats for 60 days, caused a decrease

in the number of mature leydig cells and an increase in degeneration of leydig cells [45].

Martyniaannua- Ethanol extract (100 mg, 200mg/kg) administrated for 60 days resulted in Leydig cell atrophy and reduction in serum concentration of LH and testosterone [46].

Leptadenia hastate Decne- Aqueous extract of leaf and stem has been reported to reduce velocity, linearity and sperm motility of male wistar rats [47]. Leydig cell nuclear area and mature leydig cells numbers were also significantly reduced on oraladministrationof70%methanolextractof*Tinosporacardifolia* stem to male rats (100 mg/rat for 60 ays) [48].

Menthapiperitalabialae (20 mg/L) and ***Menthaspicatalabiatae*** (20mg/L)- These herbal teas when fed to wistar rats increased serum FSH and LH levels and decreased total testosterone levels [49]. Administration of ethanol extracts of *Colebrookeaoppositifolia*(200mg, p.o. for 8-10 weeks) was associated with a decrease in the nuclear and cytoplasmic surface area of Leydig cells [50].

Conclusion

Keeping in view of the above discussion, medicinal plants can be used as effective anti-fertility agents, especially considering their effects on male reproductive physiology. Isolation and characterization of pharmacologically active compounds, safety, quality, efficacy of plant preparations are key issues, all of which need to be addressed before developing a potential herbal male contraceptive agent.

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