Bulletin of Pure and Applied Sciences.
Vol.40 B (Botany), No.1.
January-June 2021: P.35-43
Review Article

Print version ISSN 0970 4612
Online version ISSN 2320 3196
DOI: 10.5958/2320-3196.2021.00007.0
Available online at www.bpasjournals.com

Contraceptive Capability of Herbs and Plants: A Review

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Received on 09.01.2021
Accepted on 13.04.2021

Keywords:
Phytochemical, Anti-fertility, Herbal plants, Review.

Abstract
Nature has been source for thousand years for isolation of various phytochemical that have been used as anti-fertility agents for both the sexes. Recent research has been focused on various herbal plants as a contraceptive agent with comprehensive review. This article deals with the documented isolated and independent research by various experimentalist and organizations.

How to cite this article: Shubhangi S. (2021). Contraceptive Capability of Herbs and Plants: A Review. *Bulletin of Pure and Applied Sciences-Botany,* 40B(1), 35-43.

INTRODUCTION

Leafy green or flowering parts of plant either dried of fresh is known as herbs; while other parts of plants including seeds, bark, roots and fruits with green leaf and flowering plant usually dried gets produced in the form of spices (Si-Yuan Pan et al., 2013). Herbs are slightly esteemed all over the world as a rich source of therapeutic agents for the treatment and prevention of diseases and aliments. At present more than 35,000 plant species are used for medicinal purpose around the world (Yirga G et al., 2011). Plants with anti-fertility activities are summarized.

PLANTS WITH ESTROUS CYCLE DISRUPTOR ACTIVITY

Ethanolic extract of *Rivea hypocrateriaformis* induces estrous cycle in irregular pattern (Shivanligappa H et al., 2002). Ifeanyi AC et al., 2011 marks a disrupted estrous cycle by inhibiting estrogen production. Prolonged proestrous and reduced diestrous was observed when *Aspilia africana* leaf extract was administrated (Oyesola et al., 2010). Monsefi M in 2016 observed that diestrous phase gets enlongated as a result total timing of estrous cycle gets prolonged by ethanolic extract of *Anethum gravoelens*.

Administration of *Cissampelos pareira* leaf extracts to albino rats alters the cyclic pattern of estrous and period of estrous gets lengthen and extended diestrus period is marked by Ganguly et al., 2007. *Citrus medica* seeds caused irregular estrous cycle (Patil and Patil 2013). Lilaram (2012) observed that seeds extract of *Cnidoscolous acnitifolius* extents period of estrous cycle. Jhade et al. (2012) observed phytochemicals of *Acacia leucophloea* increased the weight ovary and cholesterol content which significantly reduces estrus and metaestrus period while proestrus phase gets enlongated.

PLANTS WITH ANTI-OVULATORY ACTIVITY

Mentha arvensis and *Polygonum hydropiper* showed significant anti-ovulatory activity in rabbits (Kapoor et al., 1979) but only little

activity also shown by *Areca catechu* and *Daucus carota*. Gopalakrishnan and Rajasekhar Setty (1978) reported that feeding of unripe fruit of *Carica papaya* leads to the interruption of estrous cycle in albino rats. Administration of oily extract of *Abrus precatorius* interfere with estrous cycle of rats (Haque et al., 1983). Neem oil showed mild anti-ovulatory activity in both rat and rabbits (Reddy et al., 1984).

Anti-ovulatory effect in *Azadirachta indica* and *Embelia ribes*, studied in terms of prolongation of diestrous phase of estrous cycle in rats (Reddy et al., 1984). Significant prolongation of estrous cycle of rats by administration of crude combination of aqueous extract of *Azadirachta indica, Piper longum* and *Gossypium indicum* evaluated by Reddy and Ravi (1984).

PLANTS WITH ANTI-IMPLANTATIONAL ACTIVITY

Garg (1972) found sufficient anti-implantational activity in leaves of *Taxus baccata.* Prakashi and Saha (1977) reported anti-implantational activity of sesquiterpene. Anti-implantational activity of *Samanea saman* and *Schefflera capitata* were reported by Dhawan et al., (1977). Chloroform-methanol and petroleum-ether-ethanol extracts of *Daucus carota* showed anti-implantational activity (Garg et al., 1978). Prakashi and Chakrabarty (1978) reported aristolic acid as anti-implantational substance extracted from *Aristolochia indica*.

Mishra et al., (1979) found that ethanolic extract of *Annona squamosa* seeds possess anti-implantational activity. Anti-implantational activity of *Polycarpaea corymbosa, Sesbanea sesban* and *Strophanthus gratus* reported by Dhawan et al., (1980). Singh et al., (1982) found anti-implantational activity in ether and water-soluble fraction of benzene extract from flower of Hibiscus rosasinensis. Anti-implantational activity has been reported in neem oil (Sinha et al., 1984; Khare et al., 1984). Anti-implantational activity of 15 plants (*Abelmoschus manihot, Annona squamosa, Bambusa burmanica, B. vulgaris, Bupleurum marginatum, Chone-morpha fragrans, Cressacretica, Crotalaria juncea, C. verrucosa, Dendrocalamus membranaceus, Ferula jaeschkeana, Phlogacanthus thyrsiflorus, Pluchea lanceolata, Saccharum officinarum* and *Scirpus articulatus* have been reported by Aswalet al., (1984a).

In another study Aswalet al., (1984b) have confirmed anti-implantational activity among rats in *Lonicera japonica, Lepidium capitatum, Juniperus communis* and *Acacia farnesiana*. Indigenous preparation consisting of gold, sugar, Saraca indica, Areca catechu and Coccus lacca (Ayush 47) when administrated to pregnant albino rats for 1-5 days exhibited about 33.3% to 85.7% of anti-implantational effect. Anti-implantational effect of neem oil was reported by Sinha et al., (1984a).

PLANTS WITH ABORTIFACIENT ACTIVITY

Administration of specific fraction of *Taxus baccata* leaf extract caused partial and complete foetal resorption in rats (Garg, 1972). Unripen fruit of *Carica papaya* showed abortifacient activity (Gopalakrishnan and Rajasekhara setty, 1978). Abortifacient activity of alcoholic extract of *Acacia farnesiana, Arnebia euchroma, Juniperus communis* and *Lepidium capitatum* were reported by Aswal et al., (1984a & b). Abortifacient activities have been confirmed in fractions of the extract from *Bupleurum marginatum, Ferula jaeschkeana, Pulicaria angustifolia, Ipomoea pescaprae* and *Zingiber roseum* (Aswal et al., 1984a). Intravaginal application of neem oil (*Azadirachta indica*) induced abortion and faetal resorption in 80% of female rats (Lal et al., 1986).

Subcutaneous administration of petroleum-ether extract of carrot seed (*Daucus carota*) from 7 days onwards of pregnancy caused abortion in all rats (Kalowal & Ahmad, 1984). Mukherjee et al., (1996) reported abrogate pregnancy in primates by the action of purified Neem (*A. indica*) seed extracts. Abortifacient activities in increasing order have been reported in leaf, root and seed of *Phytolacca acinosa* (Yeung et al., 1987). Bhargava and Prakash (2000) reported effect of herbal preparation from neem bark on early and late pregnancy in rats, which leads to termination.

PLANTS WITH ANTIFERTILITY ACTIVITY

Till date several medicinal plant extracts are in practice for the fertility control in both male as well as female. A number of scientists have

evaluated various plants for fertility regulation in males (Deshpande et al., 1980; Qian et al., 1980; Chattopadhyay et al., 1983; Choudhary et al., 1990; Jacob et al., 1991; Upadhyay et al., 1993; Zhen et al., 1995; Lohiya and Ansari, 1999; Naseem et al., 1998; Melis, 1999; Sharma and Jacob, 2001; Dehghanet al., 2005; Remya et al., 2009 a, b).

Roc 101 (Munshi et al., 1972) composed of a mixture of three different plants causes antifertility effects on both rats and mice. Alcoholic extract of seed of *Crotalaria juncea* at a dose of 400 mg/kg body weight revealed 83.3% antifertility activity but only 50% of antifertility effects were observed in extract of *Annona squamosa* at a dose of 200 mg/kg body weight and *Cuscutareflexa* at a dose of 800 mg/kg body weight (Rao et al., 1979). Haque et al., (1983 a & b) reported antifertility properties of active components isolated from seeds of *Abrus precatorius*. Lal et al., (1984) could find 40% antifertility activity in rats by alcoholic extract and 20% in petrol extract from seeds of *Daucus carota*. Sharma et al., (1983) reported 50% anti-implantational activity of *Nerium odorum* while Mathur et al., (1983) 30% anti-implantational activity of acetone extract of *Nerium odorum*.

Extract of flower of *Hibiscus rosasinensis* (Kholkute, 1977, Reddy et al., 1997), leaf powder of *Andrographis paniculata* and *Vinca rosea* (Akbarsha et al., 1990; Murugavel and Akbarsha, 1991), seeds of *Carica papaya* (Lohiya and Goyal, 1991), leaves of *Ocimum sanctum* (Kantak and Gogate, 1992), and seeds of *Solanum xanthocarpum* (Rao, 1988) have shown anti-spermatogenic activities in male rats and mice. Chopra et al., (1982) reported the anti-spermatogenic activity of fruits of *Momordica charantia*.

Khare et al., (1984) evaluated antifertility activity of neem oil in rabbits and rats. Lal et al., (1986) reported antifertility effect of neem oil in female albino rats by the intravaginal and oral routes. Aqueous extract of *Cassia fistula* causes antifertility effects in female rats (Yadav & Jain 1999). Bhargava and Prakash (2001) reported effect of ethanolic extract of bark of *Azadirachta indica* on the estrous cycle in rats. Sur et al., (2002) reported the antifertility effect of *Aegle marmelos* leaf in rats. Alcoholic extract of neem oil (*Azadirachta indica*) causes antifertility activity in male mice (Dehghan et al., 2005).

Mishra et al., (2009) evaluated antifertility potential of aqueous extract of *Bougainvillea spectabilis* leaves in swiss albino mice. Aqueous extract of *Aglemarmelo*s reduces the vitality of human sperm (Remya et al., 2009a) and ethanolic extract of *Aegle marmelos* decreases the motility of the human sperm (Remya et al., 2009 b). Kumar and Singh (2010) observed antifertility activity of *Azadirachta indica* (Neem oil) on seminal quality of mice and Sathiyaraj et al., (2010) reported spermicidal activity of leaf extract of *Azadirachta indica* in rats.

PLANTS WITH SPERMICIDAL ACTIVITY

Setty et al., (1977) reported extracts of 30 plants (*Aeschynomene indica*), *Albizia lebbeck, Anisomeles malabarica, Ardisia neriifolia, Caltha palustris, Clerodendrum serratum, Dimeria gracilis, Gypsophila cerastioides, Madhuca butyracea, Pittosporum nilghirense, Petrobium indicum, Samanea saman, Sapindus mukorossi, Schefflera capitata, Solidago virgaurea and Trigonella foenumgraecum* showing spermicidal activity in rats. Some of these caused instantaneous immobilization of human spermatozoa also.

Saponin isolated from some of these plants was reported to cause instantaneous immobilization of human spermatozoa (Setty et al., 1976). Jain et al., (1980) reported two new spermicidal saponins named as Pittoside A and Pittoside B isolated from *Pittosidenilghrensis*. Neem oil shows direct spermicidal activity in-vitro and in-vivo (Riar et al., 1990, Bardhan et al., 1991). Juneja and Williams (1994) also find spermicidal nature of neem oil in mice. Kumar et al., (2010) reported spermicidal activity of *Azadirachta indica* (Neem) aqueous leaf extract on male albino rats.

PLANTS WITH ANTI-SPERMATOGENIC ACTIVITY

A number of scientists have evaluated the anti-spermatogenic activity of different plant extract in different animals. Kholkute (1977) reported the anti-spermatogenic activity of extract of flower of *Hibiscus rosasinensis*. Neem seed oil (*Azadirachta indica*) arrested the spermatogenesis along with decline in sperm

motility and density in rat and rabbit (Sharma et al., 1987).

Momordica charantia seeds extract of petroleum-ether of petroleum seeds extract of petroleum-ether benzene and alcohol when administrated at the dose of 25mg/100ml BW to rats for 35 days showed anti-spermatogenic activity (Naseem et al., 1998). Sur et al., (2002) reported anti-spermatogenic activity of ethanolic extract of *Aegle marmelos* in rat. Shubhangi et al., 2018 reported aqueous extract of *Momordica charantia* seeds extract at the dose level 250mg/kg/bw/day for 50 days showed anti-spermatic effect.

Akbarsha et al., (1990) evaluated the leaf powder of *Andrographis paniculata* as anti-spermatogenic agent in male albino rats. 50% ethanolic extract of *Curcuma longa* impede spermatogenesis in rats (Purohit, 1991). In same year, Lohiya and Goyal (1991) reported anti-spermatogenic activity of chloroform extract of *Carica papaya* seeds in male albino rats. Short term administration of Tulsi (*Ocimum sanctum*) leaf extract showed anti-spermatogenic activity in adult male rats (Kantak and Gogate, 1992). Reddy et al., (1997) also reported the antispermatogenic activity of flower extract of *Hibiscus rosasinensis*.

PLANTS WITH ANTI-ANDROGENIC ACTIVITY

The process of spermatogenesis and epididymal functions are androgen dependent (Chowdhury and Stenbergor, 1975). Decreased androgen production was reflected in reduced number of leydig cells and their functional status. The number of degenerating leydig cells were significantly increased which reflects the depletion of androgen level (Purohit, 1991). It was also confirmed that the decreased number of spermatids is completely androgen dependent (Chowdhury, 1979). *Curcuma longa* possibly affects the paracrine and autocrine regulatory mechanisms which in turn affect leydig cell functions (Tahka, 1986).

Administration of petroleum ether, benzene and alcohol extracts of *Momordica charantia* seeds showed the reduction in weight of testis and an inhibition in spermatogenesis as the number of spermatogonia, spermatocytes and spermatids were decreased, suggesting indirectly the inhibition or non-availability of pituitary gonadotrophins, specifically Follicle Stimulating Hormone (FSH), which is essential for spermatogenesis (Connel and Eik-Nes 1968; Johnson and Ewing 1971; Holt et al., 1973; Dorrington and Armstrong, 1975).

The studies on *Embeliaribes* have been shown to reduce circulating testosterone levels and secretory activity of the accessory organs resulting in the decrease in the volume of semen (Purandhare et al., 1979). Reddy et al., (1997) reported anti-spermatogenic and androgenic activity of *Hibiscus rosasinensis* flower extracts. Oral administration of crude methanol extract of *Mentha arvensis* leaves leads to a reversible sterile state in the male mouse, due to interference on the testicular androgen level altering structure, function, viability and concentration of spermatozoa in the cauda epididymis (Sharma and Jacob 2002).

An increase level in cholesterol and sudanophilic lipids indicate the non-utilization of these precursors for steroidogenesis which may be due to inhibition in the availability of gonadotrophins such as ICSH/LH or FSH which are necessary to stimulate the leydig cells to produce androgen that in turn stimulate the germinal epithelium (Soez, 1994). The normal secretory activity of epididymal epithelium and other accessory sex organs depend upon the circulating androgens (Mann and Lutwak-Mann 1981).

Increase in weight of epididymis, prostate and seminal vesicle are due to the administration of various extracts of *Momordica charantia* that shows androgenic activity (Naseem et al., 1998). The serum testosterone level decreases significantly in Bougainvillea spectabilis leaf extract treated mice Mishra et al., (2009). Kumar & Singh (2010) reported that the aqueous extract of neem leave extract reduces the serum testosterone level in rat.

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