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Traditional herbal medicines used for fertility control in North East India: potential for discovery of contraceptive drugs

Introduction

One of the most critical problems of developing countries like India is tremendous rise in human population. The individual population of some states of India is equal to the total population of many countries. For example, population of Uttar Pradesh almost equals the population of Brazil. As per the 2001 Population Census of India, it has 190 million people and the growth rate is 16.16%. The second most populous state, Maharashtra, has a growth rate of 9.42%. According to the 2011 population census, the population of India has increased by more than 181 million during the years 2001–11. Some of the reasons for rapidly growing population are poverty, illiteracy, high fertility rate, rapid decline in death rates or mortality rates, etc. Despite significant advances in contraceptive options for women over the last 50 years, world population continues to grow rapidly (Page et al. 2008). Various birth control methods are promoted by the government but due to lack of their availability in the rural market, illiteracy, lack of medical personnel availability to rural people as well as the lack of acceptability of synthetic drugs due to various socio-cultural and religious perceptions prevailing among many communities, these methods have largely remained unsuccessful.

Birth Control Methods used in India

Family planning has been promoted through several methods of contraception. But all these methods have largely remained unsuccessful.

The Contraceptive Prevalence Rate is 48.3% in India. It is obvious that despite good intentions, the methods for population control have failed. Even in ancient times, people limited the size of their families. Since the major responsibilities of pregnancy, birth, and child rearing fell on women, they found the methods for controlling fertility and aborting unwanted children using traditional herbal medicines. They have passed this knowledge as an oral tradition that survives in India. It is

obvious that now there cannot be an ideal contraceptive, suitable for everybody. As a result there is a growing interest in searching for contraceptives of natural product origin, which have cultural acceptability, better compatibility with human body, lesser side effects and better effectiveness. Traditional herbal medicines practiced in India comprise of plants which produce a great diversity of substances that are of therapeutic significance. A number of traditional systems of medicine exist which have been in use for more than 3000 years (Lodha, Bagga 2000). In different regions of India ethnic people have been using plant based medicine till today. Due to adverse effects produced by synthetic contraceptives, attention has now been focused on indigenous plants for possible contraception. Since ancient times, mankind has been using plants and plant parts as a means to reduce fertility.

Tab. 1. Contraceptive Prevalence Rate in India (Source: DHS, 1999/2000)

Contraceptive Prevalence Rate in India	48.3%
Pills	2.1%
Injectables	0%
Implants	0%
IUD	1.6%
Female Sterilization	34.2%
Male Sterilization	1.9%
Condom	3.1%
Traditional or Natural Method	5.4%

Important plants found in North Eastern India having contraceptive property

North East India, being characterized by high biodiversity, is affected by different climatic conditions, varying from tropical, subtropical, temperate and alpine zones, which is adorned with abundance of medicinal plants. Several states of North East India belong to different hill zones, like Eastern Himalayas beginning from Sikkim to Lohit district of Arunachal Pradesh, Naga Hills covering the areas of Nagaland and Manipur states, Lusai Hills with Mizoram and Tripura states, while Garo, Jaintia and Khasi Hills occupy the state of Meghalaya. The biodiversity distribution extends to the neighbouring countries, like China, Myanmar and Bangladesh. Plants produce a great diversity of substances that are of therapeutic significance in many areas of medicines. India has a valuable heritage of herbal remedies. Particularly in the North East India ethnic and tribal people use plant based medicines even today. These days natural herbal contraception has become one of the foci of modern contraceptive research (Gediya et al. 2011). Due to adverse effects produced by synthetic contraceptives, attention has now been focused on indigenous plants for possible contraceptive effect. Since ancient times, mankind has been using plants to cure diseases and relieve physical suffering. Because of better cultural acceptability, higher compatibility with the human body, lesser side effects and better effectiveness of many traditional medicines, it is now an accepted fact.

More than 35,000 plant species are being used in various human cultures around the world for medicinal purposes. Nearly 80% of the world population rely on traditional medicines for primary health care, most of which involves the use of plant extracts (Sandhya et al. 2006). Some of the important medicinal plants found in North East India which are attributed with contraceptive properties include:

1.



Prickly Chaff Flower: Commonly known as Prickly Chaff Flower, *Achyranthes aspera* is locally called 'Apang' (in Bengali) and 'Apamarga' (in Hindi). It belongs to the family Amaranthaceae. It is an annual herb that also been attributed with abortifacient, contraceptive, cardiac stimulant, astringent, diuretic and purgative properties (Satyavati et al. 1976). This plant is used by the ethnic people of Tinsukia district of Assam to treat many ailments, including the root decoction for swelling and wounds of nipples (Borgohain 2011).

2.



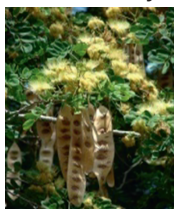
Neem: *Azadirachta indica* is commonly and locally known as Neem. The seed/leaf extract of *Azadirachta indica* can act as powerful spermicide and was found to significantly inhibit spermatogenesis, decrease sperm motility, sperm count and cessation of fertility. It can accompany a significant reduction in semen volume and higher incidence of morphological abnormalities of spermatozoa. These conditions were found to be reversible if the neem product is withdrawn from use 4-6 weeks later (Sadre et al. 1983). Neem leaf extracts are also used as a traditional plant product for longterm and reversible blocking of fertility after a single intrauterine application (Deshpande et al. 1981). Leaves have also shown reversible male antifertility activity and 3mg of leaf extract can immobilise and kill 100% of spermatozoa within 20 seconds.

3.



Rosary Pea: Commonly known as Rosary Pea, *Abrus precatorius* is locally called 'Kunch' (in Bengali) and 'Gunja' (in Hindi). Methanolic extract of seeds (70%) is capable of exhibiting contraceptive and toxic effects, particularly on body and organ weights, cauda epididymal spermatozoa, biochemical indices, toxicological profile and fertility rate. When administered on adult male mice, it brought about significant decrease in caudal sperm motility, count and viability. However, contraceptive effect at higher doses can be reversible after 90 days, which suggests induction of reversible antifertility effect by seed extract (Bhat et al. 2012).

4.



Acacia: Commonly known as Acacia, *Albizia lebbeck* and it is called 'Shiris' (in Bengali) and 'Siris' (in Hindi). Oral administration of saponins isolated from *Albizia lebbeck* barks to male rats brought about a significant decrease in the weights of testes, epididymis, seminal vesicle and ventral prostate. Apart from reduction in sperm motility, and *Albizia lebbeck*

was found to lower the fertility of male rats by 100%, the protein, glycogen and cholesterol contents of the testes, fructose in the seminal vesicle and protein in epididymis were found to decrease significantly, too (Gupta et al. 2006).

5.



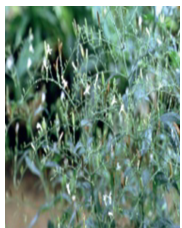
Stephania: Also known as Velvet-Leaf Pareira, *Stephania hernandifolia* is locally called 'Malabuta' (in Bengali) and 'Aknadi' (in Hindi). In North East India, roots are used for treatment of fever, diarrhoea, dyspepsia and urinary diseases. Paul and colleagues (2010) studied duration-dependent antifertility activity of the hydro-ethanolic composite extract of *Stephania hernandifolia* and *Achyranthes aspera* on male rats when administered orally for 7, 14 and 28 days. Treatment for 14 and 28 days showed a significant decrease in the epididymal sperm count, androgenic key enzyme activities and plasma testosterone level, along with an increase in the level of testicular cholesterol.

6.



Madagascar Periwinkle: Commonly known as Periwinkle, *Catharanthus roseus* is locally called 'Nayantara' (in Bengali) and 'Sadabahr' (in Hindi). It belongs to the family Apocynaceae and is a rich source of alkaloids, which are distributed in all parts of the plant. Two alkaloids extracted from *Catharanthus roseus*, that is vinblastin and vincristine, can affect spermatogenic cell lines other than spermatogonia (Murugavel, Akbarsha 1991).

7.



Indian Echinacea: Commonly called Indian Echinacea, *Andrographis paniculata* is locally known as 'Kalmegh' or 'Chirota' (in Bengali) and 'Kirayat' (in Hindi). Dry powdered leaves of this plant exert antispermatogenic and antiandrogenic activity in rat model (Akbarsha et al. 1990).

8.



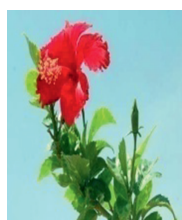
Belliric Myrobalan: The plant *Terminalia bellirica* is commonly known as Belliric Myrobalan, which is locally called 'Bohera' (in Bengali) and 'Behra' (in Hindi). Treatment with bark extracts of the plant can result in a decrease in the weight of accessory reproductive ducts in adult male rats. The total cholesterol content increased while protein content and epididymal sperm count significantly decreased and the changes could be due to non-availability of androgens in *T. bellirica* bark-extract treated rats (Patil et al. 2010).

9.



Pergularia: The plant *Pergularia daemia* is locally known as 'Chagalbati' (in Bengali) and 'Utaran' (in Hindi). Sadik and co-workers (2001) reported that ethanolic extract of the plant and its steroidal fractions are responsible for antifertility activity. Both the ethanolic extract and the steroidal fractions showed significant antifertility activity in the preimplantation stage in female mice apart from late abortifacient activity. This perennial twining herb has a folkloric reputation as an antifertility agent and is used by the rural people to induce abortion in the region including Bangladesh. It is also a drug of good repute in Ayurvedic literature in uterine complaints and it facilitates parturition (Kirtika, Basu 1994), and has been documented for antifertility properties (Nama, Joseph 2010).

10.



China Rose: Commonly known as China Rose, *Hibiscus rosa sinensis* is locally called 'Joba' (in Bengali) and 'Jasum' (in Hindi). Anti-implantation, uterotropic, antispermatogenic and antiandrogenic activity has been observed when using extracts of flowers (Reddy et al. 1997). It is also used when there is excessive bleeding during menstruation: one cup of juice obtained from a macerated mixture of flowers of

Hibiscus rosa sinensis, flowers of *Punica granatum*, and bark of *Mangifera indica* is taken thrice daily (Jahan et al. 2011).

Conclusion

It can be noted that the commercial birth control methods have not proved to be popular among the rural and ethnic communities of North East India, which can be attributed to various factors. On the other hand, this contributed to the growing interest of researchers in developing new herbal contraceptive drugs which are of natural product origin. A study on such plants has been carried out which are attributed with contraceptive properties and are components of traditional herbal medicines used in North East India. The plants focused on in this review are traditionally known for antifertility properties, which offers the potential for possible manipulation and evaluation using suitable mammalian models for discovery of contraceptive drugs.

Literature

- Akbarsha M.A., Manivannan B., Shahul H.K., 1990, *Antifertility effect of Andrographis peniculata* (Nees) in male albino rat, Indian J. Exp. Biol., 28, 421–426.
- Bairagi R., Datta A.K., 2001, *Demographic transition in Bangladesh: What happened in the twentieth century and what will happen next*, Asia-Pacific Population Journal, 16(4), 3–16.
- Batta S.K., Santhakumari G., 1971, *The antifertility effect of Ocimum sanctum and Hibiscus rosa sinensis*. Indian Journal of Medical Research, 59(5), 777–781.

- Bhat M.A., Mahajen N., Gandhi G., 2012, *Oxidative stress status in coronary artery disease patients*, Int. J. Life Sc. Bt & Pharm, 1, 2.
- Borgohain J., 2011, *Ethnomedicinal plants used by the ethnic communities of Tinsukia District of Assam, India*, Recent Research in Science and Technology, 3(9), 31–42.
- Deshpande K.L., Katze J.R., Kane J.F., 1981, *Effect of glutamine on enzymes of nitrogen metabolism in Bacillus subtilis*, Journal of Bacteriology, 145, 2, 768–774.
- Dutta B.K., Dutta P.K., 2005, *Potential of ethnobotanical studies in North East India, Overview*, Indian Journal of Traditional Knowledge, 4(1), 7–14.
- Gediya S., Ribadiya C., Soni J., Shah N., Jain H., 2011, *Herbal plants used as contraceptives*, International Journal of current Pharmaceutical Review and Research, 2, 47–53.
- Gupta R.S., Sharma R., 2006, *A review on medicinal plants exhibiting antifertility activity in males*, Natural Product Radiance, 5(5), 389–410.
- Jahan F.I., Hasan M.R.U., Jahan R., Seraj S., Chowdhury A.R., Islam M.T., Khatun Z., Rahmatullah M., 2011, *A comparison of medicinal plant usage by folk medicinal practitioners of two adjoining villages in Lalmonirhat district, Bangladesh*, American-Eurasian Journal of Sustainable Agriculture, 5(1), 46–66.
- Kamboj V.P., 2000, *Herbal medicine*, Current Science, 78(1), 35–51.
- Kirtika K.R., Basu B.D., 1994, *Asclepiadaceae*, Indian Medicinal plant, India, 3, 1615–1617.
- Lodha R, Bagga A., 2000, *Indian system of traditional medicine*, Annals Academy of Medicine, Singapore, 29(1), 37–41.
- Murugavel T., Akbarsha M.A., 1991, *Antispermatic effect of Vinca rosea Linn.*, Indian J. Exp. Biol., 29, 810–812.
- Nama G. Joseph L., 2010, *A review on pharmacological profile for phytomedicine known as Pergularia Daunia (Forsh.) Chiov*, Journal of Medicine and Biomedical Sciences, 4–7.
- Page S.T., Amory J.K., Bremner J.W., 2008, *Advances in male contraception*, Endocrine Reviews, 29(4), 465–493.
- Patil M.M., Patil S.J., Patil S.B., 2010, *Atropine sulphate induced changes in uterine adrenal, liver and thyroid gland in female albino rats*, J. Pharmacol, Toxicol., 4, 236–245.
- Paul D., Mallick C., Ali K.M., Nandi D.K., Ghosh D., 2010, *Duration dependent effect of hydro-ethanolic extract of leaf of S. hernandifolia and root of A. aspera on testicular androgenic and gametogenic activity: An approach for male herbal contraceptive development*, Int. J. of Applied Research in Natural Products, 2(4), 1–10.
- Rahmatullah M., Mollik M.A.M., Ali Azam, A.T.M., Islam M.R., Chowdhury M.H., Rahman T., 2009, *Ethnobotanical survey of the Santal Tribe residing in Thakurgaon District, Bangladesh*, American-Eurasian Journal of Sustainable Agriculture, 3(4), 889–898.
- Reddy P.S., Narahari D., 1997, *Utilization of foxtail millet (Setaria italica) and its processed forms on performance of broilers*, Indian J. Anim. Sci., 67(3), 237–240.
- Sadik G., Gafur M.A., Shah M., Bhuiyan A., 2001, *Antifertility activity of Pergularia daemia*, The sciences, 1(1), 22–34.
- Sadre N.L., Deshpande V.Y., Mendulkar K.N., Nandal D., 1983, *Male antifertility activity of Azadirachta indica in different species* Rauischhol zhausen, 473–482.
- Satyavati G.V., Raina M.K., Sharma M., 1976, *Medicinal Plants of India*, 1, Indian Council of Medical Research.

Sharangouda J., Patil., Satishagouda S., Vishwanatha T., Saraswati B. Patil, 2010, *Effect of Terminalia bellirica barks extracts on activities of accessory reproductive ducts in male rats*, International Journal of Pharmaceutical Sciences Review and Research, 1, 75–79.

WHO Report, India and Family Planning: An Overview. 1999/2000. The Department of Family and Community Health, WHO, Regional office for South-East Asia, New Delhi.

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Traditional herbal medicines used for fertility control in North East India: potential for discovery of contraceptive drugs

Abstract

One of the most critical problems of developing countries like India is its enormous increase in human population. Contraceptive Prevalence Rate of India is 48.3 and as the vast majority of population belong to rural areas, the family planning programmes have largely remained unsuccessful because of many factors including lack of availability of contraceptive drugs in rural markets, lack of availability of medical personnel to rural people, as well as the lack of acceptability of synthetic drugs due to various socio-cultural and religious perceptions prevailing among ethnic communities. These contributed to a growing interest among researchers in developing contraceptives of natural origin and at present natural herbal contraception have become one of the major focuses in modern contraceptive research. Since time immemorial herbal drugs have been practiced by various rural communities and ethnic tribes in North East India, and hence the acceptability of herbal contraceptives is expected to be much higher among rural folk. Ethnic communities are using plant based medicinal products even today. This study aims at highlighting the contraceptive property of some plants used for fertility control as components of traditional herbal medicines in North East India, which need evaluation for the potential discovery of contraceptive drugs.

Key words: herbal medicine, fertility, contraceptive

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