

## ROLE OF PLANTS FOUND IN NORTH EAST INDIA AND BANGLADESH IN CONTROLLING POPULATION GROWTH

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doi: 10.15414/jmbfs.2014.4.1.29-32

**ARTICLE INFO**

Received 7. 5. 2014  
Revised 12. 6. 2014  
Accepted 2. 7. 2014  
Published 1. 8. 2014

**Review**



**ABSTRACT**

Being part of the Indian subcontinent both the North Eastern region of India and the Bangladesh share a long common cultural, economic and political history. One of the most critical problems of developing countries like India as well as Bangladesh is their enormous increase in human population. Contraceptive Prevalence Rate (CPR) of India is 48.3 and that of Bangladesh is 53.8. As the large majority of population of both the countries belong to rural area, the family planning programmes have largely remained unsuccessful because of many factors including lack of availability of contraceptive drugs in rural markets, lack of accessibility of rural people to medical personnel as well as the lack of acceptability of synthetic drugs due to various socio-cultural and religious perceptions prevailing among many 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 of modern contraceptive research. Since time immemorial herbal drugs are being practiced by various rural communities and ethnic tribes in North East India as well as in Bangladesh, and hence the acceptability of herbal contraceptives is expected to be much higher among rural folk. In different parts of North East India and Bangladesh, ethnic communities are using plant based medicinal products till today. This study aims at highlighting the contraceptive property of some plants found in North-Eastern India as well as in Bangladesh.

**Keywords:** Herbal contraceptive, human population growth, India, Bangladesh

**INTRODUCTION**

Both India and Bangladesh are part of the Indian Subcontinent and have a long common cultural, economic and political history. The culture and tradition of the two countries are quite similar. One of the most critical problems of developing countries like India and Bangladesh 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 to the population of Brazil. As per 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 2011 population census of India, the population of India has increased by more than 181 million during 2001-11. The area of Bangladesh is near to 55 thousand square miles or 14,570 square kilometres. At the close of the twentieth century, the population of Bangladesh stood at about 130 million (Bairagi and Dutta, 2001). The current population of Bangladesh is approximately over 160 million and is expected to exceed 200 million within 2020. The average population density per square kilometre is almost 1000. 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 governments of both the countries but due to lack of availability in rural market, illiteracy, lack of accessibility of rural people to medical personnel 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 and Bangladesh**

Family planning has been prompted through several methods of contraception. But all these methods have largely remained unsuccessful. Birth control methods are being used by both the countries but the contraceptive prevalence rate varies.

**Table 1** CPR of India (Source: DHS, 1999/2000)

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

**Table 2** CPR of Bangladesh (Source: DHS, 1999/2000)

Contraceptive Prevalence Rate (CPR) in Bangladesh	53.8%
Pills	23.0%
Injectable	7.2%
Implants	0.5%
IUD	1.2%
Female Sterilization	6.7%
Male Sterilization	0.5%
Condom	4.3%
Traditional or Natural Method	10.3%

The CPR of India is 48.3% (Table 1) whereas it is 53.8% in Bangladesh (Table 2). It is obvious that despite good intentions, the methods for population control have failed in both the countries. 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 that the methods for controlling fertility and aborting unwanted children. They have passed this knowledge as an oral tradition in that survives worldwide. It is obvious that, still then, there has been no ideal contraceptive suitable for everybody. As a result there is a growing interest in search of contraceptives of natural product origin and have cultural acceptability and better compatibility with lesser side effect and effectiveness. Plants produce a great diversity of substances that are of therapeutic significance in many areas of

medicine. A number of traditional systems of medicine exist which are being in use for more than 3000 years (Lodha and Bagga, 2000). Ethnic people, dwelling in various parts of India and Bangladesh, use plant based medicine for various ailments still today. Due to adverse effects produced by synthetic contraceptives, attention has now been shifted to indigenous plants for possible contraception. Since ancient times, mankind has been using plants and plant parts as a means for reducing fertility.

## MATERIALS AND METHODS

In the present study, literatures have been reviewed on medicinal plants of North Eastern India and Bangladesh. The reports concerning the common medicinal plants of North Eastern India and Bangladesh attributed with contraceptive property were collected. The published reports on efficacy of tested antifertility property on different animal model were also recorded by literature survey.

## RESULTS AND DISCUSSION

After extensive literature survey, some common medicinal plants are noted which are found in both North East India and Bangladesh and are having antifertility efficacy.

### Plants found in both the North Eastern India and Bangladesh which are having contraceptive efficacy:

North East India being widely rich in biodiversity belongs to different climatic conditions varying from tropical, subtropical, temperate and alpine zones which are adorned with major occurrence of medicinal plants. The different states of North East India fall into different hill zones like Eastern Himalaya 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 and Garo, Jaintiya and Khasi hills occupying the state of Meghalaya. The biodiversity distribution extends to neighbouring countries like China, Myanmar and Bangladesh and to some extent the vegetation of India and Bangladesh are similar.

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. In different regions of India and Bangladesh, tribal people are using plant based medicines till today. These days natural herbal contraception has become one of the focus 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 sufferings. Because of better cultural acceptability, better compatibility with the human body, lesser side effects and effectiveness of many traditional medicines 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 populations rely on traditional medicines for primary health care, most of which involve the use of plant extracts (Sandhya et al., 2005).

### Some of the common medicinal plants found in both North East India and Bangladesh which are attributed with contraceptive property are as follows:

1. **China rose:** The plant *Hibiscus rosa sinensis* is commonly known as Joba in Bangla and Jasum in Hindi. Flower paste is taken by the women on the days of menstruation for contraception and stem bark paste taken continuously for five days cause abortion by Bhumija tribe of Baleswar, Orissa (Goswami et al., 2011). Anti-implantation, uterotropic, antispermatic and antiandrogenic activities were observed by the extracts of flowers (Reddy et al., 1997). In Bangladesh, the plant is 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).
2. **Prickly Chaff Flower:** Scientific name of Prickly Chaff Flower plant is *Achyranthes aspera*. It is commonly known as Apang in Bangla and Apamarga in Hindi. It belongs to the family Amaranthaceae. It is an annual herb that grows throughout India (Srivastav et al., 2011). *A. aspera* is reported for its contraceptive property in Assam and Arunachal Pradesh (Tiwari et al., 1979). It has been attributed with spermicidal activity (Paul et al., 2006), abortifacient (Shibeshi, et al., 2006) and contraceptive (Wadhwa et al., 1986). 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).
3. **Neem:** *Azadirachta indica* is commonly known as Neem in Bangla as well as in Hindi. *Azadirachta indica* is reported for its use as contraceptive by the Bagada community of Tamil Nadu (Sathyavathi et al., 2007). The extract of *Azadirachta indica* acts as powerful spermicide and was found to significantly inhibit spermatogenesis (Upadhyay et al., 1993), decrease sperm motility (Khillare and Shrivastav, 2003). Intraperitoneal injections of the steroidal extract at a dose of 100 mg/kg body weight, twice a week for 10 weeks resulted in impaired spermiogenesis, increased the number of headless spermatozoa and significantly decreased ( $p < 0.01$ ) motility of cauda spermatozoa, leading to a decline in the fertility index in male Wistar rats and feeding of a 0.8% (w/v) aqueous neem leaf extract in drinking water for 7 weeks decreased serum testosterone (Parshad et al., 1997). The estrous cycle of rats was disrupted by the administration of alcoholic extract of neem flower and also caused a partial block in ovulation (Gbotolorun et al., 2008). Thus, neem is attributed with both male (Deshpande et al., 1980) and female antifertility activity.
4. **Rosary pea:** Scientific name of Rosary pea is *Abrus precatorius*, which is known as Kunch in Bangla and Gunja in Hindi. Seed of *Abrus precatorius* is used for contraception in Baleswar, Orissa (Goswami et al., 2011). This plant also possess abortifacient efficacy (Meena and Rao, 2010). A study on contraceptive and toxicological effects of methanolic extract (70%) of the seeds of *Abrus precatorius* on body and organ weights, cauda epididymal biochemical indices, toxicological profile and fertility rate in adult male mice showed contraceptive effect at higher dose and reversibility was observed after 90 days (Bhatt et al., 2007). A dose related reduction in testicular sperm count and the motility were observed and showed that *Abrus precatorius* has effect on male reproduction affecting the male reproductive system by Morey and Khandagle in 2011. Crude mixture of *A. precatorius* seed has a negative impact on male reproductive functions and it might have antifertility property for male rats (Talukder, et al., 2011).
5. **Acacia:** Scientific name of Acacia is *Albizia lebbek* and it is called Shiris in Bangla and Siris in Hindi. A survey work in Western Ghat of Maharashtra revealed the use of *Albizia lebbek* as antifertility agent (Pokarkar et al., 2010). *Albizia lebbek* extract tested in male rats and it has been found that the fertility is reduced by 100% (Gupta et al., 2005). The extract of pod of *A. lebbek* shows reduction in sperm motility and count (Chaudhary et al., 2007).
6. **Stephania:** This plant is also known as Velvet-Leaf Pareira and scientific name is *Stephania hernandifolia* which is called Malabuta in Bangla and Aknadi in Hindi. In Northeast India, roots are used for treatment of fever, diarrhoea, dyspepsia and urinary diseases. It has also been observed that the weights of accessory reproductive organs, number of different generation of germ cells at stage VII of seminiferous epithelial cycle and STD were reduced significantly only after 28 days of treatment in rats and significant decrease in sperm motility is observed (Paul et al., 2009). In West Bengal state of India, the folk women use the crude aqueous extract of *Stephania hernandifolia* leaves for the prevention of pregnancy. This is also established by feeding aqueous fraction of methanol extract to male Wistar rats at a dose of 200mg/ml per 100g body weight per day for 28 days. In the treated rats, the weight of the sex organs, the testicular key androgenic enzymes activities, the plasma level of testosterone, the number of different germ cells at stage VII of seminiferous epithelial cell cycle and the seminiferous tubular diameter in comparison to the controls were significantly decreased (Jana et al., 2003).
7. **Periwinkle:** The plant periwinkle (*Catharanthus roseus*) is commonly known as Nayantara in Bangla and Sadabahar in Hindi. It is a renowned medicinal plant, belonging to the family Apocynaceae and is a rich source of alkaloids, which are distributed in all parts of the plant and an important drug. The plant is having male antifertility property (Mathur and Chaudan, 1985). The antifertility efficacy of the plant has also been tested in house cricket by Shah and Mohamed in 1996 and found that there is reduction in egg production and hatchability.
8. **Andrographis or Indian Echinacea:** *Andrographis paniculata* is known as Kalmegh or Chirota in Bangla and Kirayat in Hindi. Dry powder of leaves showed antispermatic and antiandrogenic activity in rat model (Akbarsha et al., 1990). Root extract fraction of *A. paniculata* shows alteration in the levels of hormones and changes noted in the histology of ovary and uterus of experimental rats (Krishnamoorthy et al., 2013).
9. **Belliric Myrobalan:** The plant *Terminalia bellirica* is known as Bohera in Bangla and Behra in Hindi. This plant possesses spermicidal activity (Pokharkar et al., 2010). Adult male rats, treated with bark extracts of *T. bellirica* resulted in significant decrease in weight of accessory reproductive ducts, protein and epididymal sperm count associated with increase in total cholesterol content. These changes may be due to non-availability of androgens in *T. bellirica* barks extracts treated rats (Patil et al., 2010). Benzene and ethanolic extracts of bark exhibit a strong

antiimplantation activity at the dose level of 25mg/100g body weight in female albino rats (Vishwanatha et. al., 2009)

10. **Pergularia:** The plant *Pergularia daemia* is known as Chagalbati in Bangla and Utaran in Hindi. Sadik and co-workers (2001) from Bangladesh reported that the ethanol extract of *Pergularia daemia* and its steroidal fractions are responsible for antifertility activity. Both the ethanol extract and the steroidal fractions of *Pergularia daemia* showed significant antifertility activity in the preimplantation stage in female mice. This

extract also showed late abortifacient activity. This perennial twining herb has a folkloric reputation as an antifertility agent and has been documented for antifertility properties (Nama and Joseph, 2010). Petroleum ether, benzene and ethanol extracts of *Pergularia daemia* leaves when administered intraperitoneally at the dose level of 100 and 200mg/kg body weight to male albino rats for 30 days, resulted shows decrease in the number of spermatogonia, spermatocytes and spermatids in testis along with sperm count in caudal epididymis (Londonkar et al., 2009). The plant also exhibits antiurolithiatic activity (Vyas et. al., 2011).



**Figure 1** Medicinal plants found in both North East India and Bangladesh which are attributed with contraceptive property [a. China rose (*Hibiscus rosa sinensis*) b. Prickly Chaff Flower (*Achyranthes aspera*) c. Neem (*Azadirachta indica*) d. Rosary pea (*Abrus precatorius*) e. Acacia (*Albizia lebbek*) f. Stephania (*Stephania hernandifolia*) g. Periwinkle (*Catharanthus roseus*) h. Andrographis (*Andrographis paniculata*) i. Belliric Myrobalan (*Terminalia bellirica*) j. Pergularia (*Pergularia daemia*)]

## CONCLUSION

This study was focused on the uncontrolled population growth rate of India and Bangladesh, and the percentage of use of birth control methods in both the countries. It has been noted that the commercial birth control methods are not very popular among the rural and ethnic communities of North East India and Bangladesh. This failure is resultant of various factors faced by the people of both the countries. 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 few such plants has been carried out which are attributed with contraceptive values. The plants included in this paper are traditionally used by some of the ethnic and tribal communities of both the North East India and Bangladesh for antifertility properties with a view to control the excessive population growth apart from many other medicinal properties and some are tested experimentally using animal model.

**Acknowledgement:** We wish to thank our companions, helpers, guides. We would like to thank the anonymous reviewers who gave valuable input into the review and their constructive comments. We are grateful to everyone that helped us to find the literature used in this review.

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