

Name: Abu Hasnath Md. Golam Sarwar
Supervisor: Dr. Sonu Chand Thakur
Co-Supervisor: Dr. Beena Khillare, Dr. Fareeda Athar
Centre: Centre for Interdisciplinary Research in Basic Sciences
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ABSTRACT

The most perplexing problem being faced by the world today is the alarming growth rate of population. Overpopulation continues to be a significant contributor to environmental degradation and human suffering worldwide.

Apart from means of controlling population growth rates, contraceptive agents help to improve the health conditions of woman and men of reproductive age. They also reduce the risk of maternal morbidity and mortality by protecting women from giving birth at a very young age.

Family planning has been promoted through several methods of contraception. But due to serious adverse effects produced by synthetic steroidal contraceptives, attention has now been given to indigenous plants for possible contraceptive effects. Though steroidal contraceptives are highly effective means of birth control some women discontinue their use because of bothersome side effects such as acne hirsutism and weight gain. In addition oral contraceptives adversely affect thrombolysis, carbohydrate metabolism and lipid profiles.

The plant kingdom contains numerous bioactive substances that may affect the regulation of reproduction. Many herbs have been used to reduce fertility with little or no scientific evidence supporting this claim. Though a lot of research work has been done in the field, but a meaningful and systematic research study is yet to come to reach the goal and find a breakthrough.

In our present study we investigated the antifertility efficacy and toxicity of three plants, *Piper longum* and *Ensete superbum* in female rats and *Achyranthes aspera* in male rats.

Experiments were designed to explore the antifertility efficacy of fruits of *Piper longum* hexane fraction (PLHF). Mature female rats were orally administered with two different doses (150 and 250 mg/kg) for thirty days. PLHF treatment prolonged the length of estrous cycle and there was drastic reduction in the number of implantation sites. A marked suppression in the ovarian cytokines, cyclooxygenase-2 and nitric oxide level was observed. Furthermore, production of reactive oxygen species was also significantly reduced. Histopathology of the uterus revealed degeneration of uterine glands and endometrial epithelial cells. The graffian follicle in the ovary showed lack of cumulus oocyte complex. The serum levels of LH, FSH and estradiol were altered.

To evaluate the antifertility efficacy of ethanolic extract of seeds of *Ensete superbum* (EES) various reproductive parameters like effect on estrous cycle, implantation, hormone levels, histology of the reproductive organs, serum marker enzymes, ovarian enzymic and nonenzymic antioxidant levels were investigated in female rats. EES was administered to rats in two different doses (100 and 200 mg/kg) for 30 days. EES administration prolonged the length of the estrous cycle. Histopathological changes were

noticed in the reproductive organs of the rat. Ovary showed decline in the population of the developing follicles. There was reduction in the number and size of the uterine glands in the uterus. A significant decrease in the level of FSH, LH and estradiol was observed. Activities of ovarian antioxidant enzymes like catalase, superoxide dismutase, glutathione peroxidase, glutathione reductase and glutathione S-transferase were significantly lowered.

Therefore, collectively analyzing all the above observations it can be concluded that *Piper longum* hexane fraction and *Ensete superbum* ethanolic extract disturbed normal progression of reproductive senescence and induces infertility via gonadotropin insufficiency, modulation of inflammatory mediators and prevention of antioxidant enzymes.

Achyranthes aspera hydroethanolic extract was evaluated for male antifertility activity and spermicidal activity. Male rats were exposed to *Achyranthes aspera* hydroethanolic extract at doses of 100 and 200 mg/kg for 60 days. Histology of testis and accessory reproductive organs, serum testosterone level as well as the antioxidant enzyme levels in testis, prostate and seminal vesicle were analyzed. Treatment with higher dose of *Achyranthes aspera* hydroethanolic extract affected histology of reproductive organs of rats. Histological studies have revealed that *Achyranthes aspera* hydroethanolic extract caused degeneration of Leydig cells, spermatogenic disruption and shrinkage of seminiferous tubules in the testis. Seminal vesicle and prostate secretions were blocked and comparatively less population of spermatozoa were not seen in the lumen of epididymis. The serum testosterone level reduced significantly. When the treated males were mated with normal cyclic females, the fertility rate was declined and implantation sites in female rats were drastically reduced. The level of antioxidant enzymes like catalase, superoxide dismutase, glutathione peroxidase, glutathione reductase and glutathione S-transferase were significantly lowered. So it can be concluded that infertility in male rats could be due to impairment of reproductive performance as indicated by reproductive tract lesions, reduction in the level of testosterone and decrement in the levels of antioxidant enzymes which play an important role in scavenging free radicals frequently produced in semen.

We also studied spermicidal activity of this plant and found that hydroethanolic extract of the roots of *A. aspera* possess significant spermicidal activity *in vitro* by affecting the integrity of plasma membrane and can be used as a potent spermicide.

Toxicity studies of all the extracts showed very minimal or no toxicity which could be figured in the histological sections of liver and kidney, two very important organs of biotransformation and elimination of exogenous and endogenous toxic materials. This was also proved by minimal or no significant changes in the level of serum aspartate transaminase, alanine transaminase and creatinine which are the markers of liver and kidney health.

Further efforts should be made to identify and isolate the compounds present in the plant extracts that are exclusively responsible for fertility regulation in both males and females. As the whole world is running after safe and easily accessible contraceptive drugs with high efficacy and low toxicity, our study could help in imparting knowledge regarding potent antifertility agents for future research and drug development.