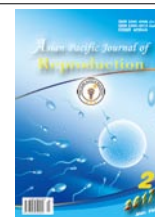


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Plants altering hormonal milieu: A review

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ABSTRACT

The aim of the present review article is to investigate the herbs which can alter the levels of hormones like Follicle stimulating hormone, Prolactin, Growth hormone, Insulin, Thyroxine, Estrogen, Progesterone, Testosterone, and Relaxin etc. Hormones are chemical signal agents produced by different endocrine glands for regulating our biological functions. The glands like pituitary, thyroid, adrenal, ovaries in women and testes in men all secrete a number of hormones with different actions. However, when these hormones are perfectly balanced then people become healthy and fit. But several factors like pathophysiological as well as biochemical changes, disease conditions, changes in the atmosphere, changes in the body, diet changes *etc.* may result in imbalance of various hormones that produce undesirable symptoms and disorders. As medicinal plants have their importance since ancient time, people have been using it in various ways as a source of medicine for regulation of hormonal imbalance. Moreover, it is observed that certain herbs have a balancing effect on hormones and have great impact on well-being of the people. So, considering these facts we expect that the article provides an overview on medicinal plants with potential of altering hormone level.

1. Introduction

There are two important systems in human beings, which control and maintain the homeostasis *i.e.* maintaining the internal environment in a balanced state. First and foremost important system is nervous system with the help of functioning cells called neurons. These neurons are characterized by their conductivity with the help of neurotransmitters *i.e.* chemical mediators. This nervous system is well organized and function efficiently in human beings. Second important system is also organized and efficiently function with other set of chemical messengers known as hormones.

Hormones are chemical messengers synthesised by the ductless glands and released in the blood and they execute their functions

at their target organs which are far away from the site of release. Hormones are chemically of two types: peptides and steroidal in nature. The major endocrine glands include the pineal gland, pituitary gland, pancreas, ovaries, testes, thyroid gland, parathyroid gland, and adrenal glands. A wide variety of these chemical substances are produced by endocrine cells, most of which are in glands. The peptide hormones are synthesized from the gene expression by the specific genes to express the final proteins and also the specific enzymes for the conversion of cholesterol into steroids in case of steroidal hormones. If these expression alter, there may be the chances of hormonal imbalance. In most of the

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case secretion of various hormones are defective which can be corrected by administration of hormones. If excessive production of hormones are there, that also leads to hyper functions which can be corrected by the corresponding antagonists.

In this review, the authors have covered various medicinal plants and their importance in altering the level of hormones. Hormones exhibit their action by medicating G-protein coupled, Tyrosine kinase and nucleic acid receptors. There are many hormones produced by the endocrine glands. Their primary functions are as follow.

1.1. Pituitary hormones

Most of the peptides are synthesized and released by master gland known as pituitary gland. This gland gets stimulus from hypothalamus whenever body requires such hormones by negative feedback mechanism. The anterior pituitary hormones are growth hormone (GH), Thyroid stimulating hormone (TSH), Adrenocorticotrophic hormone (ACTH), Follicle stimulating hormone (FSH) etc. The posterior pituitary hormones are oxytocin and vasopressin.

1.2. Steroid gland hormones

Steroidal hormones are synthesized in adrenal and gonads in both male and females. These steroids are synthesized by using cholesterol as a precursor with the help of enzymes. The major function of peptide hormones are to influence the metabolism and growth, but the steroidal hormones are influencing the fluid balance and development of secondary sexual characters of both male and females.

1.3. Pancreas hormones

The pancreas secretes hormones (insulin and glucagon) and digestive enzymes. The pancreas maintains the body blood glucose balance. However the diabetes is the most common disorder associated with the pancreas.

1.4. Adrenal gland hormones

The adrenal gland located at the anterior part of the kidneys, and covered with the connective tissue. The adrenal glands have very different function such as regulate metabolism, maintain blood pressure, and regulate sodium and potassium balance in the body. The adrenal hormones from adrenal cortex are Mineralocorticoids,

Glucocorticoids and sex hormones. The hormones from adrenal medulla is adrenaline.

1.5. Reproductive organs hormones

Testes secrete testosterone, which is responsible for the physical development and function of the male reproductive system. The ovaries in females secrete estrogen and progesterone. Estrogens are steroids. They are primarily responsible for broadening of the pelvis, development of breasts and further development of the uterus and vagina. Progesterone is also a steroid. Progesterone has important role in the menstrual cycle and pregnancy. The placenta becomes a major source of progesterone and it maintains pregnancy. However placenta release a large amount of corticotropin releasing hormone which stimulate pituitary glands[1].

2. Plant derived hormones

The hormones, which are made from plants, are known as phytohormones. There are number of plants that have estrogen and progesterone like substances. Plant derived hormones may enhance the action of present hormones by increasing concentration of one hormone, thereby diminishing the effect of another and mimic the action of various hormones and showing anabolic effect and androgenic effects. It was also noticed that the plant supplements containing plant derived hormones are safe[2].

3. Herbs for balancing hormones

The hormones play an important role in the body cell and affect our health in various dimension of the world's population. Nowadays trust on medicinal plant and depend on plant based diet for their existence can balance our hormones in various ways by using herbs. The most important thing is that the herbs have a less chance of adverse effect. Therefore, it can have a great impact on regulation of hormones. We have tried to look upon such herbs that could be more helpful for altering hormonal milieu.

3.1. Astragalus

The hormone balancing property of Astragalus helps in regulating blood pressure and blood sugar levels. In Mastalgia, women release more prolactin, and studies have shown that chasteberry extracts

reduce prolactin levels in blood[3].

3.2. *Ashwagandha (withenia somnifera)*

Ashwagandha reduce the stress hormones which disturb endocrine function and rapid premature aging[4].

3.3. *Maca root (lipidium meyenii)*

Maca root has plant hormones that discuss benefits to women such as relieving premenstrual syndrome and menopausal symptoms. It has been found that healthy men receiving *Lepidium meyenii* for a period of 4 mo and showed significant increase in seminal volume, sperm count, and sperm motility. However, Serum hormone levels such as LH, FSH, prolactin, estradiol, and testosterone were not affected in women[5,6].

3.4. *Saw palmetto (seranoa repens)*

The whole part of *Serenoa repens* has a balancing effect on the endocrine system and on both male and female reproductive system.

It is examined that hyperprolactinemia increases weight and induces hyperplasia in the lateral prostate (LP). Lipidosterolic extract of *Serenoa* significantly reduced LP growth and hyperplasia in sulphuride treated rats. In addition, lipidosterolic extract of *Serenoa repens* inhibited the androgenic as well as trophic effect of prolactin (PRL) in rat[7].

3.5. *Chasteberry (vitex agnus-castus)*

Vitex agnus castus extract acts on the pituitary gland and regulate hormones like estrogen, follicle stimulating hormone (FSH), luteinizing hormone, and prolactin[8]. The flavonoid constituents of *Vitex* has selective binding affinity for β estrogen receptor. Additionally, *in vitro* studies deliver extensive evidence of prolactin inhibition with the direct binding to D_2 receptor. However, *Vitex* extract does not modulate follicle stimulating hormone (FSH) or luteinizing hormone (LH) production in rat pituitary gland[9-11].

It is also reported that inhibition of FSH and stimulation of LH secretion affected the progesterone and estrogen hormone level. It is a significant decrease secretion by D_2 receptor antagonism. It is also noticed that *Vitex* extract has great impact on prolactin secretion and study also demonstrated high-dose *Vitex* inhibits secretion of prolactin in male rats and decreases milk production in lactating rats.

Moreover, menstrual cycle irregularities due to hyperprolactinemia,

corpus luteum insufficiency, and oligomenorrhea have been treated with *Vitex* extract. Furthermore, current experimental studies indicate that *Vitex* is widely used for the management of hyperprolactinemia. *Vitex* extract is able to moderate progesterone and menstrual cycle irregularities[12-18].

3.6. *Black cohosh (actaea racemosa)*

The ethanolic extracts of *C. racemosa* has estrogenic activity on primary pituitary cells. The ethanolic extract significantly reduced prolactin secretion of primary pituitary cell. For instance prolactin secretion by *C. racemosa* was reduced by the D_2 receptor antagonist haloperidol which showed the dopaminergic activity of *C. racemosa*[19].

The effect of *C. racemosa* on bone loss may be connected with its capacity to reduce prolactin levels through D_2 -receptor antagonism. However, high prolactin levels have been associated mainly due to associated hypogonadism[20].

3.7. *Cissampelos pareira*

The leaf extract of *Cissampelos pareira* showed altered LH, FSH, prolactin and estradiol secretion[21].

3.8. *Jatropha gossypifolia*

Jatropha gossypifolia extract altered the LH, FSH, prolactin and estradiol secretion[22].

3.9. *Mimosa pudica*

Methanolic extract of *Mimosa pudica* significantly increase in the duration of the diestrous. The extract also changed gonadotropin release and estradiol secretion[23].

3.10. *Butea monosperma*

Alcoholic extract of *Butea monosperma* has reported to possess antiestrogenic effect[24,25]. The alcoholic extract of *Butea monosperma* has anti-ovulatory and anti-implantation activities. However, the active constituent of *Butea monosperma* is butin which exhibited estrogenic activity[26-29]. Butin also exhibits male contraceptive properties. *Butea monosperma* seed extract has antifertility effect. Methanolic extracts of *Butea monosperma*

exhibited uterotrophic and uterine peroxidase activities and antifertility effect[30-31].

3.11. *Nigella sativa*

The oral administration of *Nigella sativa* seeds extract at 2 g/kg daily showed significant anti-fertility activity[32,33]. *Nigella sativa* oil (1mL/kg BW/day) administered orally for 30 d significantly increase Luteinizing hormone (LH) and this effect may be due to the effect of oil on hypothalamus[34,35]. The aqueous extract (0.5 g/kg) and ethanolic extracts of *Nigella sativa* (1 g/kg) increased milk production significantly.

3.12. *Acacia nilotica*

Acacia nilotica extract showed that it stimulates synthesis and release of prolactin (PRL) significantly. Moreover, the aqueous extract of *Acacia nilotica* may stimulate milk production and PRL release[36].

3.13. *Black cohosh*

Black cohosh contains triterpene glycosides which contributes to improvement of estrogenic symptoms.

Black cohosh has also decreased hot flashes, increased blood flow, and improved hormone related depression[37].

3.14. *Don quai*

Don quai influences the estrogen receptor to improve estrogen activity[38,39]. It also increases vaginal lubrication. Chaste tea has been used to treat premenstrual syndrome, menstrual irregularities, and hyperprolactinemia[40]. The herb has an affinity for D₁ and D₂ dopamine receptors and thus may interact with dopamine agonists and antagonists[41].

Plants have formed the basis for the treatment of diseases in traditional medicine systems for thousands of years, and continue to play a major role in the primary health care of about 80% of the world's population. However, the prospect of current article is to review the changes in hormone level by medicinal plants. We have discussed numbers of medical plants and their importance that how they can alter the level of hormones such as Follicle stimulating hormone, Prolactin, Growth hormone, Insulin, Thyroxin, Estrogen, Progesterone, Testosterone, and Relaxin etc. The present review would thus be beneficial for the researcher working in the field of endocrinology.

Conflict of interest statement

The authors declare that they have no conflict of interest.

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