HISTOLOGICAL AND HISTOCHEMICAL STUDIES ON THE EFFECT OF GINSENG ON THE ADRENAL AND THYROID GLANDS OF THE MALE ALBINO RAT.

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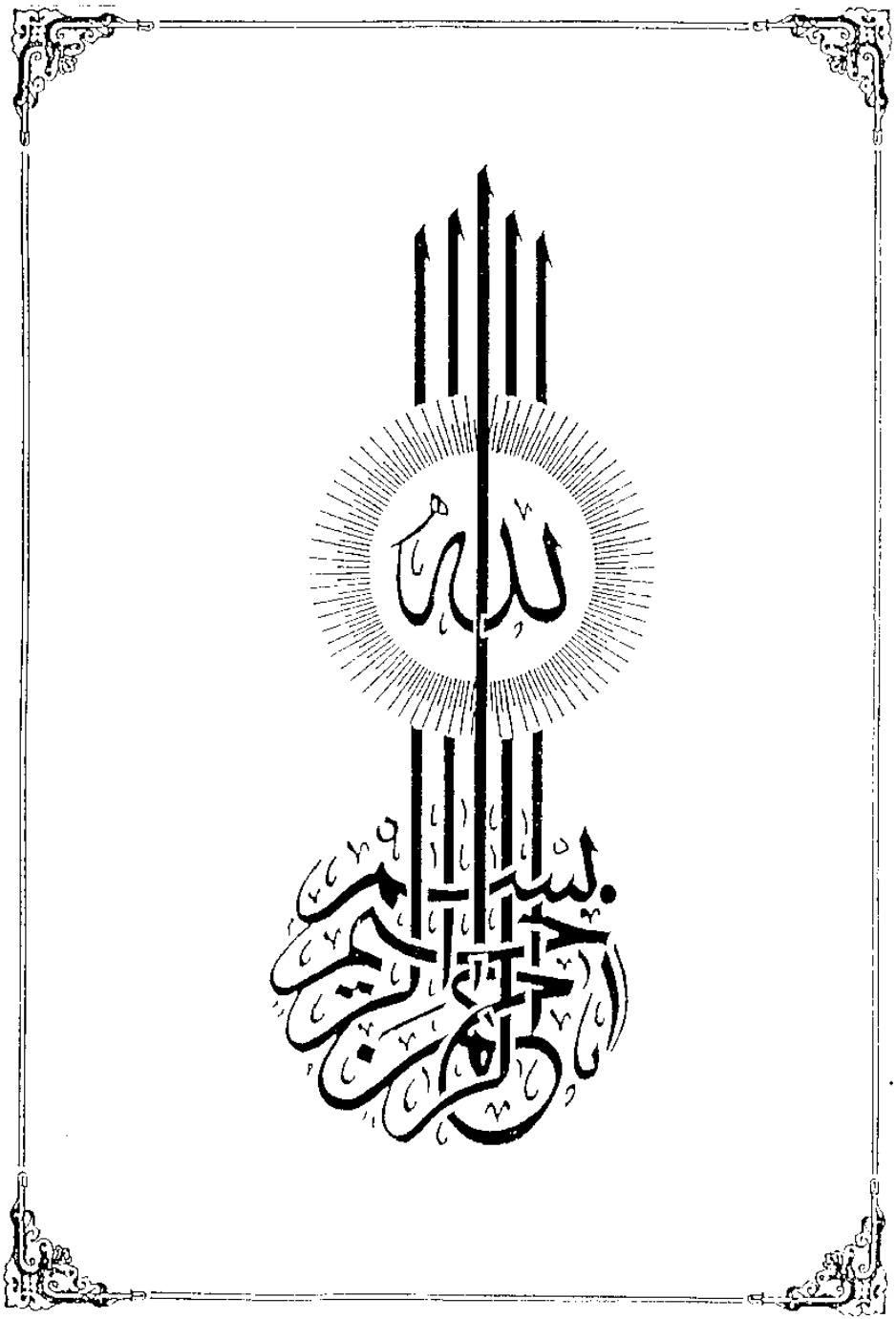

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INTRODUCTION AND AIM OF THE WORK

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INTRODUCTION AND AIM OF THE WORK

Ginseng is one of the medicinal plants that possesses a wide range of pharmacological and therapeutic action ***(Liu and Xiao, 1992)***. It belongs to the "Arliaceae" family ***(Brekhman and Dardymov, 1969).*** The active ingredient was isolated and contained a mixture of several saponin glycosides termed ginsenosides ***(Martindale, 1982).*** Twenty-eight ginsenosides and some minor constituents were extracted and isolated from the root, root stalk, stems, leaves, flowers and flower-buds ***(Liu and Xiao, 1992).***

Ginseng acts on the central nervous system, cardiovascular system and affects endocrine secretion. It also promotes immune function and metabolism. Ginseng has an anti-stress and anti-aging activities ***(Liu and Xiao, 1992). Bittles, Fulder, Grant, and Nicholls (1979)*** reported that ginseng increased long term resistance to stress and disease. ***Singh, Agarwal, and Gupta (1984)*** reported that ginseng inhibited stress-induced peptic ulcer. ***Ramarao and Bhargava (1990)*** suggested

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that ginseng extract at high doses produced analgesia and hypothermia in rats by a non-opiate mechanism.

Ginseng is classified as an adaptogen which means a mild acting, non-toxic drug with non-specific stimulation as well as improving body resistance and revitalizing the homeostasis ***(Sprecher, 1987).*** The group of adaptogens has involved utilization of substances of natural origin, rather than chemical synthesis of new compounds ***(Brekhman, and Dardymov, 1969).***

Ginseng stimulates the pituitary-adrenocortical system ***(Hiai, Yokoyama, Oura, and Yano, 1979).*** Also, ginseng therapy restored the adrenal and thyroid functions inhibited by dexamethasone ***(Lin, Wu, Tsai, Leu, Jeang, and Hseih, 1995).*** As most of the available references have dealt with the pharmacological action of ginseng rather than on its histological effect, the present study is suggested aiming to detect the histological and the histochemical changes induced by ginseng on the adrenal and thyroid glands of the male albino rat.

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REVIEW OF LITERATURE

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REVIEW OF LITERATURE

Petkov, and Staneva (1963) demonstrated that oral administration of an extract from the roots of Panax ginseng increased urinary corticosteroid, decreased adrenal ascorbic acid and cholesterol, and decreased eosinophils of peripheral blood in rats.

Brekhman and Dardymov (1969) mentioned that Panax ginseng had been known more than 4000 years ago and it occupied a particular place among the tonic remedies. They reported that ginseng was proved to improve atrophy of both thyroid and adrenals. They also concluded that the antialarm action of ginseng was due to root extractions that was manifested by a particular anabolic action on the adrenals with a loss of cholesterol and ascorbic acid. They added that Panax ginseng had adaptogenic effects by their capacity to increase the organism's resistance to various adverse factors of a physical nature (cooling, overheating, and ultraviolet or ionizing radiations), of a chemical nature (various toxins, narcotic, hormonal and anti-cancerous), and of a biological nature (foreign sera, bacteria, transplanted tumours, etc.).

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Bittles et. al., (1979) investigated the effect of continuous administration of ginseng on the lifespan of mice and their behavioural responses to stress. They found that ginseng administration did not significantly alter the lifespan but it caused an exaggeration of the behavioural responses to mild stress. They stated that stress was controlled by the adrenal glands through secretion of adrenaline and glucocoticoid suggesting an effect of ginseng on the adrenal cortex and the stress response. They suggested that the reported prophylactic effect of ginseng against stress and disease might therefore be due to the amplification of endocrine responses.

Hiai, Sasaki, and Oura (1979) found that a single intraperitoneal administration of ginseng saponin to intact rats induced an increase of adrenal cortex cyclic AMP and of plasma corticosteroid. They also found that ginseng saponin administered to hypophysectomized rats could not increase adrenal cyclic AMP, whereas exogenous ACTH could. They concluded that ginseng saponin probably induced secretion of ACTH from the anterior pituitary gland.

Hiai, Yokoyama, and Oura (1979) concluded that oral or intraperitoneal administration of

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ginseng saponin increased plasma corticosterone in unanesthetized, phenobarbitol-anasthetized or alloxan-diabetes rats. They stated that ginseng was associated with stimulation of pituitary-adrenocortical system.

Hiai et. al., (1979) studied the effects of preparations of saponin mixture and isolated ginsenosides, extracted from the root of Panax ginseng, on plasma corticotropin (ACTH) and corticosterone concentrations in rats by radio-immunoassay and competitive protein binding method. Intraperitoneal administration of ginseng induced a significant increase in plasma ACTH and corticosterone 30, 60, 90 minutes after the treatment. They found that ginseng-induced increase in plasma corticosterone was suppressed by pretreatment with dexamethasone. Thus they suggested that ginseng acted on the hypothalamus and/ or hypophysis primarily, and stimulated ACTH secretion which resulted in increased synthesis of corticosterone in the adrenal cortex.

Fulder (1981) studied the hypothalamic-pituitary control of stress by ginseng. In his experiment, mice were given ginseng throughout

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their lifespan. He found that, at intervals, the behavioural responses of mice to mild stress were exaggerated compared to the controls without ginseng. He also found that corticosteroid binding to certain brain regions was increased in adrenalectomized rats given ginseng saponin compared to saline treated controls. He suggested that this effect was due to an increase in hypothalamic-pituitary-adrenal sensitivity caused by ginseng.

Owen (1981) mentioned that ginseng antistress actions were greatly reduced by adrenalectomy. He added that ginseng exerted antistress actions after removal of the pituitary gland, but ACTH must still be given.

Banerjee, and Izquierdo (1982) studied the antistress and antifatigue properties of a chinese ginseng preparation on swiss albino mice, exposed to various experimental models of stress. They reported that ginseng treatment provided good protection against electroshock stress compared to the untreated mice. Ginseng provided a significant protection to the treated mice against exposure to heat. In fatigue stress of forced swim test, ginseng treatment

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provided effective adaptation to fatigue and increased endurance in both male and female mice.

Martindale (1982) mentioned that ginseng contained a mixture of several saponin glycosides termed ginsenosides. The main ones were based on the aglycones oleanolic acid, (20S)-protopanaxadiol, and (20S)-protopanaxtriol. The sugars; glucose, rhamnose, arabinose, and xylose were present in varying amounts. He also mentioned that ginseng was used in chinese medicine in the People's Republic of China for weakness after vomiting of blood, for menorrhagia, and for vomiting. It was also used with other herbal remedies for rectocele fever, gasping, excessive sweating and thirst.

Hess, Parent, Cox, Stevens, and Becci (1982) reported that ginseng was used to maintain homeostasis under stressful situations. They added that the pharmacological activity of ginseng apparently helped the body to adapt to various conditions of stress by correcting adrenal and thyroid dysfunction.

Pearce, Zois, Wynne, and Funder (1982) examined the binding of saponin from Panax ginseng to chemical steroid receptors in vitro. It showed

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demonstrable affinity for progestin, mineralocorticoid and glucocorticoid receptors. Highest affinity binding was to glucocorticoid receptors. They suggested that such interactions might explain the reported glucocorticoid-like effect of ginseng in vivo.

Filaretov, Bogdanova, Mitiushov, Podvigina, and Srailova (1986) denoted that intraperitoneal injection of Panax ginseng to rats produced a rise in plasma corticosterone one hour after injection. They found that immobilization-induced rise in plasma corticosterone was increased by 7 days pretreatment with ginseng. They concluded that the adaptation effect of Panax ginseng was probably achieved through the pituitray-adrenocortical system.

Sprecher (1987) mentioned that ginsenosides played an important role in the catecholamine synthesis of catecholaminergic neurons of the brain, in the ganglion and in the chromaffin cells of the adrenal medulla, as well as in the formation of nerve fibers and in the functioning of the sympathetic nerve endings. He also mentioned that a significant release of ACTH by rat pituitary cell cultures was detected after doses of ginsenosides.

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