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IMPACT OF PHYTOESTROGENS ON ENDOCRINE GLANDS OF ALBINO RATS II. ADRENAL

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ABSTRACT
It is clearly proved that the *oxalis corniculata* has steroidogenic activity and this natural chemical can be safely used as it does not alters the functioning of organs which is proved by its action on one of the endocrine organ - adrenal gland, which functions normally in the extract treated female albino rats.

INTRODUCTION

Phytoestrogens are naturally occurring phytochemicals found in plants and plant products. These is structurally and functionally similar to 17b oestradiol or synthetic oestrogens. (Burton and Wells, 2002) Even a low dose phytoestrogen diet can induce developmental and maturational abnormalities in both laboratory animals and domestic livestock and can affect human health too. (Fredrick *et al.,* 1981; Schinckel, 1948) Among their widespread clinical effects dietary phytoestrogens is purported to reduce the risk of cancer have antioxidant and free radical scavenger activity, reduce serum cholesterol induce cell differentiation and inhibit angiogenesis in human. (Sharangouda and Patil, 2006 and Cline and Hughes, 1998) Phytoestrogens can be present in the herbs used for treatment for many diseases (unconventionally), in the diet in legumes, grains, nuts, fruits and other fiber rich foods (Humfrey, 1998 and Wilcox *et al.,* 1990).

One of the suspected sources of phytoestrogen is *Oxalis corniculata* (Sharangouda and Patil, 2006).

The role of adrenal gland in the metabolism and homeostasis of mammals has been investigated for over a century. Mammalian adrenal gland is unique among vertebrates in that the steroidogenic and chromaffin cells are clearly separated as cortex and medulla respectively. The response of these two regions under the influence of phytoestrogen helps us to know more about the safer use of these natural chemicals (Sturgis,1959, 1964).

The paper deals with the impact of estrogenic activity of ethanolic extract of the whole plant of Oxalis corniculata on the adrenal glands of Wister strain albino rats on the basis of the histologcal studies.

MATERIALS AND METHODS

The whole plant of *Oxalis corniculata* was shed dried and powdered after identification and authentication. Green gummy ethanol extracts were prepared with help of soxhlet apparatus and stored at 6ºC in refrigerator.

Colony bred Wister strain immature female, 30 days old, weighing 35 - 40g were used. The animals were subjected to bilateral ovariectomy by dorsolateral approach under light anaesthesia and semi-sterile condition and divided into two groups I and II Each group having 6 animals.

Group I: Control, received 0.2mL Tween - 80(1%) for 7days.

Group II: Treated, received 200mg ethanol extract of seeds of *O. corniculata* /kg body weight in 0.2mL Tween - 80(1%) orally for 7days.

Twenty four hours after the final treatment rats were sacrificed by decapitation. At necropsy the uteri and adrenal glands were dissected out, freed from externous fat and connective tissues. Uteri and adrenal were fixed in alcoholic bouins for 24 hrs. These tissues were transfered to 70% alcohol and after giving two changes of 70% the tissues were dehydrated and cleared in xylol and embedded in pararffin wax (58-59æ%).

The prepared blocks were sectioned at 3μ and 5μ respectively and stained with eosin and haemotoxylin.

RESULTS

Measurment of the weight of adrenal glands in control and treated rat show no significant difference. The weight of right and left adrenal glands differs too, the left one being heavier than the right one.

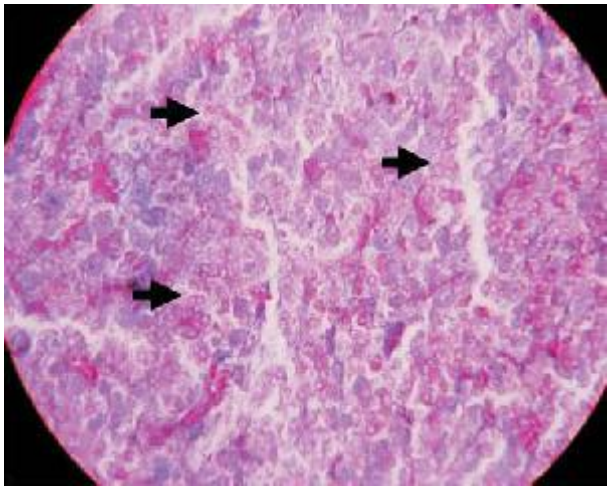

Figure1: Adrenal gland of control rat stained with hematoxyline and eosin x 100

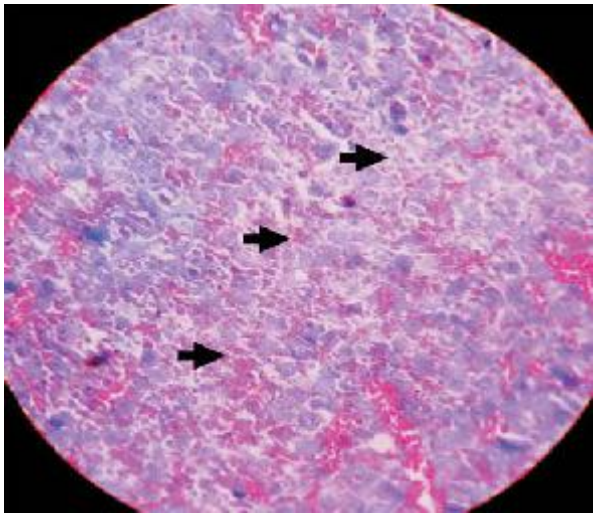

Figure 2: Zona glomerulosa (ZG) and zona fasciculata (ZF) of control rat stained with hematoxyline and eosin x 450

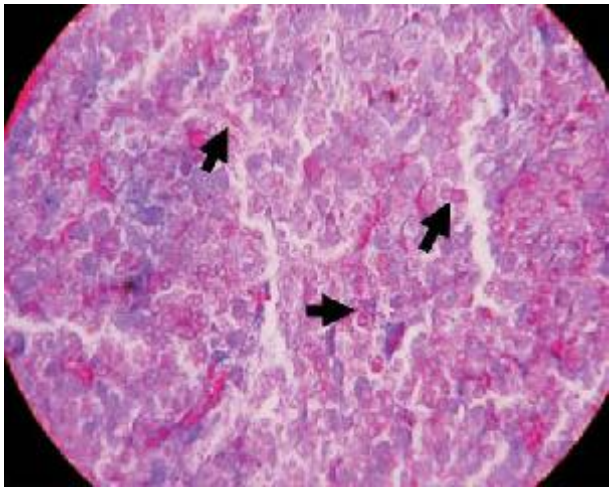

Figure 3: Zona fasciculate (ZF) and zona reticularis (ZR) of control rat stained with hematoxline and eosin x 450

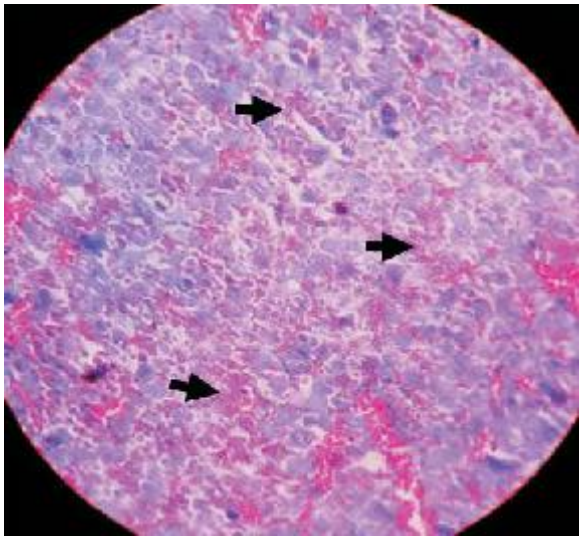

Figure 4: Medulla (M) of control rat stained with hematoxyline and eosin x 450

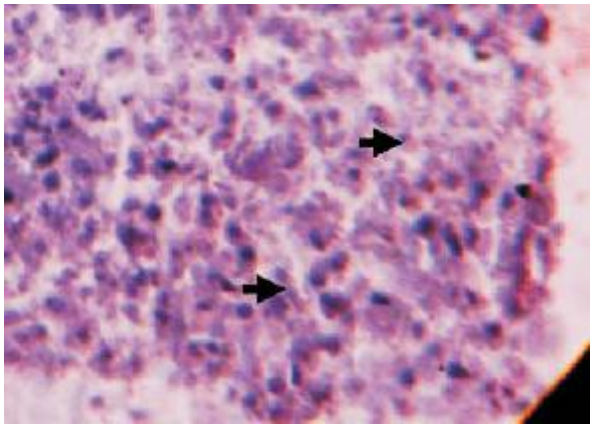

Figure 5: Adrenal gland of experimental rat stained with hematoxyline and eosin x 450

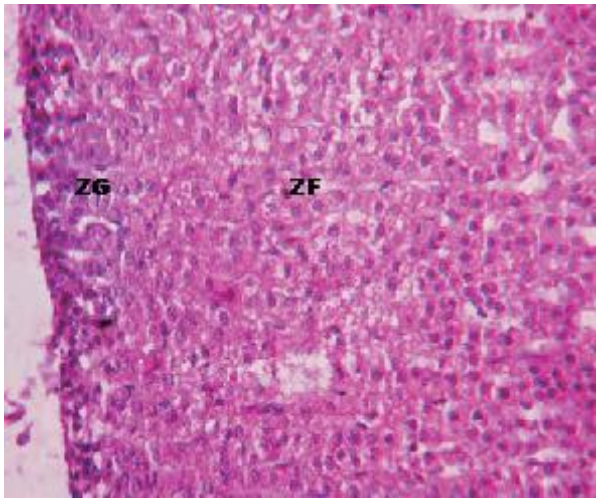

Figure 6: Zona glomerulosa (ZG) and zona fasciculata (ZF) of experimental rat stained with hematoxyline and eosin x 450

Histological observations show that the adrenal gland is well differentiated into two zones, cortex and medulla in the albino

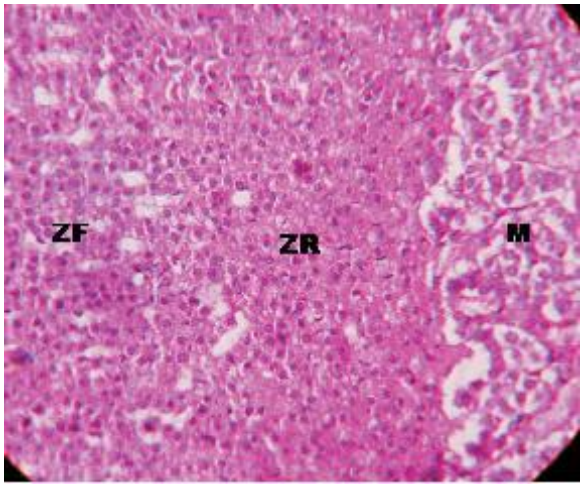

Figure 7: Zona reticularis (ZR) and medulla (M) of experimental rat stained with hematoxyline and eosin x 450

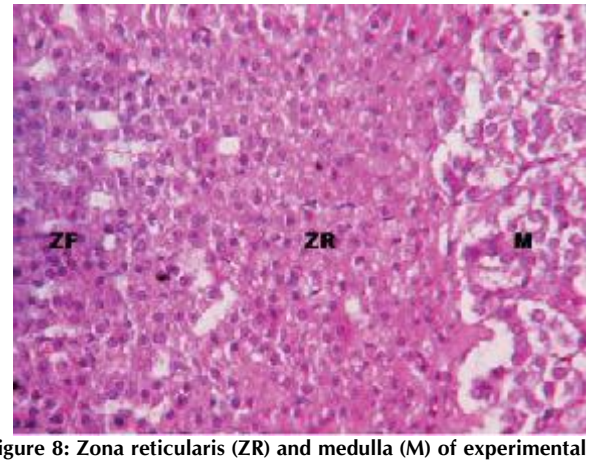

Figure 8: Zona reticularis (ZR) and medulla (M) of experimental rat stained with hematoxyline and eosin x 450

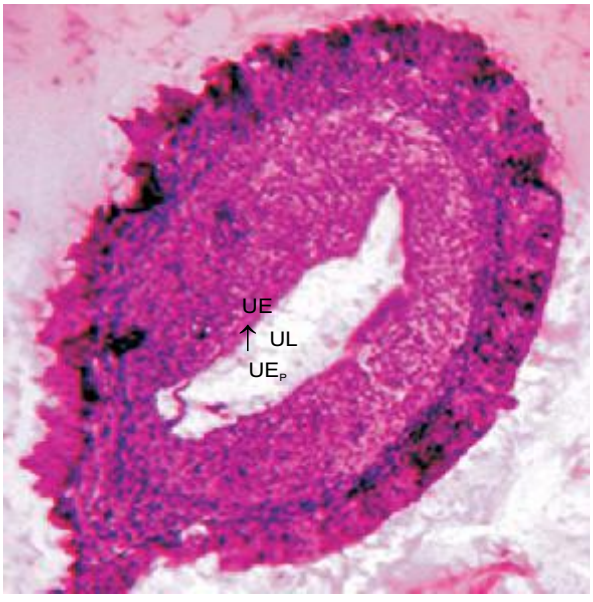

Figure 9: Uterus of control stained with hematoxyline and eosin x 450. Ul: Uterine Lumen, UEp: Uterine Epithelium, UE: Uterine Endometrium

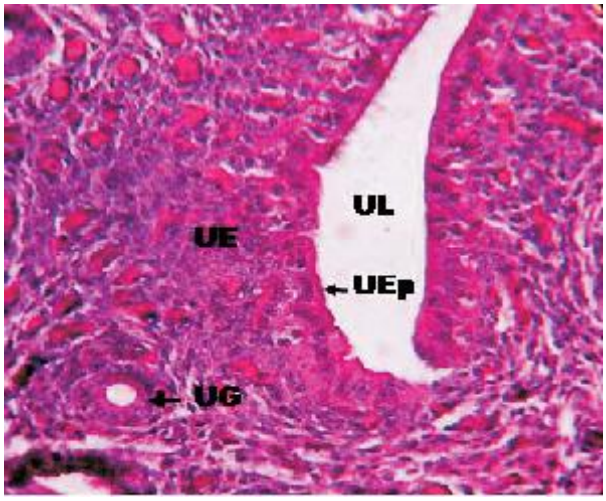

Figure 10: Uterus of experimental rat showing well developed uterine glands, stained with hematoxyline and eosin x 450. ul : uterine Lumen, UEp: Uterine Epithelium, UE : Uterine Endometrium, UG : Uterine Gland

rat. Histological structure of these two zones is presented separately in control and extract treated rat. (Fig. 1 and 5)

Adrenal cortex: The cortex is histologically further demarcated into three distinct zones namely, zona glomerulosa, zona fasciculate and zona reticularis, each with a distinct pattern of cellular arrangened and function.

Zona glomerulosa is smallest of 3 zones. In control rats this zone consists of small spherical cells that are compactly arranged and appear acinus like group of cells in sections. There are mainly 7-8 cells in a group, with darkly staining cytoplasm and small compact nucleus. In extract treated rat cells of this zone show more or less similar picture, albeit cells are a little more compactly arranged and show vacuolation (Fig. 2, 6).

Zona glomerulosa imperceptibly merges with zona fasciculata which is the widest zone consisting large polyhedral or cuboidal cells arranged in cords that are usually one to two cells thick, arranged in a radial manner running towards the center of the gland. Each cell has deeply staining cytoplasm with vesicular nuclei and flake like chromatin material. Blood spaces are observed in between the cells of zona fasciculate (Fig. 3).

In extract treated rats number of cells in the cords appear greater as cell division can be occasionally seen in the cells.These cells appear spongy due to the presence of lipid droplets and have vesicular nuclei (Fig. 6 and 7).

Zona reticularis is present immediately below the zona fasciculate and is adjacent to medulla. It has anastomosing cords of cells with varying degrees of shape and size. Each cell has intensely eosinophilic cytoplasm with a large vesicular nucleus and prominent vacuoles (Fig. 3).

In extract treated rats cells are smaller and greater in number than control group. Cytoplasm is intensely eosinophilic and vacuolated, nucleus is comparatively small (Fig. 7).

Medulla: The medulla is completely surrounded by cortex which is almost of similar width as that of medulla. It consists

of cells arranged in small group, or short cords surrounded by blood capillaries. These cells are polymorphic epitheloid cells with a clear vesicular nuclei and minute cytoplasmic granules. Identification of two different types of chromaffin cells is not possible as the fixative and regular staining technique are not sufficient for this purpose (Fig. 4).

In extract treated rats the cells show scanty cytoplasm and vesicular nucleus (Fig. 7and 8).

Observations shows insignificant difference in the weight of adrenal gland in control and extract treated rat. This is well in consonance with stress experienced by the animal undergoing extract treatment. Presence of vacuoles in the cells of zona glomerulosa, zona fasciculate and zona reticularis of extract treated rats show that the adrenal cortex is active (Shetty *et al.,* 1984). Medullary cells of extract treated rats show scanty cytoplasm mostprobably due to degranulation (Seraphim, 2002) .

All these suggest that the adrenal gland is fully active and is helping to cope the stress, as the uteri of immature female rats are undergoing developmental changes due to oestrogenic extract treatment in them. This is proved by stained sections of the uteri of the experimental rats which shows well developed uterine glands (Fig. 9 and 10). The present finding is supported by the works of Sharangouda and patil, 2006; Bhargava, 1984.

CONCLUSION

Thus it is clearly proved that the *oxalis corniculata* has steroidogenic activity and this natural chemical can be safely used as it does not alters the functioning of organs which is proved by its action on one of the endocrine organ-adrenal gland, which functions normally in the extract treated female albino rats.

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