Effect of Olea europaea Extract on Male Rats’ Reproductive Parameters

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Abstract

Objective: Phytoestrogens plant compounds with biologic-estrogenic activity, structurally similar to 17-β estradiol, are first converted to heterocyclic compounds similar to estrogens in structure and then conjugated in the liver. Olive (Olea europaea), from the oleaceae family, is known as a phytoestrogen plant compound since it contains lignans and phenolic compounds. The aim of the present study was to evaluate the effect of O. europaea extract on male rats’ reproductive parameters.

Materials and Methods: In this experimental study, 40 male Wistar rats with the average weight of 200-250 g and age of 8-10 weeks, divided into 5 groups. Group 1, which called control group, received no treatment. Group 2 received normal saline and Groups 3-5 received extract at a dose of 50, 100 and 200 mg/kg/day of the olive leaves extract (1 cc), respectively. Before the administration of the first gavage and 24 h after that of the last one (i.e., in the 49th day), all the rats were weighed, and blood samples were taken from their tail vein. The blood samples were then centrifuged at 1500 rpm for 20 min, then serum was separated and stored at −80 ºC for the measurement of estradiol and testosterone, using immunoassay technique.

Results: The results show a significant decrease in testosterone and estradiol level among the five groups, which is dependent on the concentration of the extract; the decrease in testosterone and estradiol is positively correlated to the concentration of the extract.

Conclusion: In conclusion, olive leaves extract significantly decreased fertility parameters in the male adult rat dose-dependently.

Keywords: Estradiol, Olive Leaves Extract, Rats, Testosterone

Introduction

Phytoestrogens plant compounds with biologic-estrogenic activity, structurally similar to 17-β estradiol, are first converted to heterocyclic compounds similar to estrogens in structure and then conjugated in the liver (1). Phytoestrogens are categorized into three major classes: Isoflavones, lignans, and coumestans (2). These plants are vastly available in food sources such as soybean, flax seed, fennel and Actinidia chinensis (3). Epidemiological studies show that food sources containing phytoestrogens cause lower risk of cardiovascular diseases and also prostate and breast cancers (4).

Australian pastures developed a widespread infertility in the 1940s. A particular type of clover (Trifolium species), rich in formononetin, is included in the sheep grazing, which in the rumen during the process of fermentation will be changed to daidzein (5). Other studies claim that the phytoestrogens present in a type of summer
grass reduced the reproduction rate of sparrows and deer in California; these studies also report that young mice fed by their mothers suffered from infertility problems because they were exposed to high amounts of phytoestrogens (6). It was also observed that soy bean caused infertility in Cincinnati’s panthers, a problem solved by finding the statistical differences among their means. P < 0.05 is considered to be statistically significant.

Results
Oral administration of various concentrations of olive leaves extract resulted in significant decrease of male genital system hormones (Table 1).

As shown in table 1, it has been revealed that olive leaves extract caused significant decrease in serum levels of estradiol and testosterone dose dependently. It means that, extract at a dose of 200 mg/kg caused more decrease in serum levels of these hormones.

Discussion
Phytoestrogens are plant compounds with structures and functions similar to those of 17-β estradiol, which produce effects like those by estrogen. The olive, as it contains phenol compounds, is one of the natural plants rich in phytoestrogens, and belongs among the Lignans (15). The plant can highly decrease menopausal syndrome in women (16). It also decreases the occurrence of colorectal, prostate, and breast cancers (4). The findings of the present study show that olive decreases the levels of reproductive indicators such as, testosterone and estradiol in male rats.

The results also show a significant decrease in testosterone and estradiol level among the five groups, which is dependent on the concentration of the extract; the decrease in testosterone and estradiol is positively correlated to the concentration of the extract. Studies by Weber et al. (17) and Roberts et al. (18) on the effects of phytoestrogens on testosterone support these results. McGarvey et al. found that the LH level in rats decreases as a result of exposure to genistein (19). According to their study, it is possible that phytoestrogen has an inhibitory effect on the enzyme 17 β-hydroxy steroid hydrogenase human type 5; therefore, the synthesis of testosterone in adrenal cortex reduced.

### Table 1. The effect of olive leaves extract on estradiol and testosterone serum levels

<table>
<thead>
<tr>
<th>Parameter group</th>
<th>Estradiol (pg/ml)</th>
<th>Testosterone (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>12.03 ± 1.02</td>
<td>2.68 ± 0.14</td>
</tr>
<tr>
<td>Positive control</td>
<td>11.82 ± 0.96</td>
<td>2.60 ± 0.10</td>
</tr>
<tr>
<td>Extract 50 mg/kg</td>
<td>9.63 ± 0.67</td>
<td>1.89 ± 0.06</td>
</tr>
<tr>
<td>Extract 100 mg/kg</td>
<td>8.57 ± 0.70</td>
<td>1.53 ± 0.11</td>
</tr>
<tr>
<td>Extract 200 mg/kg</td>
<td>7.48 ± 0.86</td>
<td>1.07 ± 0.09</td>
</tr>
</tbody>
</table>
Studies by Weber et al. (17) and Glazier and Boman (20) have also shown that phytoestrogens produce no significant decrease in estradiol levels, and a study by Dehghani and Panahi about the effect of A. chinensis on male rats’ spermatogenesis showed an increase in estradiol (21).

It should also be noted that A. chinensis belongs to genisteins while olive is from lignan group, which can justify the discrepancy of the results of different experiments as a result of the different types of phytoestrogen under study and the differences in the concentrations employed.

With regard to the explained results, there is this possibility that the different effects of phytoestrogens on the male productive system is due to estrogenic and anti-estrogenic effects, as phytoestrogens function through estrogen receptors, which have both agonistic and antagonistic properties. Depending on the type of phytoestrogen and the location, the effects can differ. For example, isoflavones are very weak agonists which bind to estrogen receptors less than estradiol does (22).

When estradiol levels are low in the body and binding is therefore less competitive, isoflavones show stronger agonistic effects. On the other hand, the anti-estrogenic effects of isoflavones are co-dependent on relative concentrations of endogenous phytoestrogens and estrogens, and it is quite possible that when estrogen is high, phytoestrogens make estradiol receptors unavailable to estradiol.

Phytoestrogens produce various physiological effects in both the human body and animal models. Their effects on the male reproductive system depend on the type of the phytoestrogen, concentration and the model under study (11).

Conclusion
Olive leaves extract significantly decreased fertility parameters in the male adult rat dose-dependently. However, it is needed more study about the mechanism by which olive leaves extract create its anti-fertility effects on human being which are still unknown. Nevertheless, considering our findings in this animal model, it is recommended that the olive leaves extract maybe used in the future as a contraceptive in males.

Ethical issues
The local ethics committee approved the study.

Conflict of interests
We declare that we have no conflict of interests.

Acknowledgments
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References
16. Carrion Y, Ntinou M, Badal E. Olea europaea L. in

the North Mediterranean Basin during the Pleniglacial and the Early Middle Holocene. Quaternary Science Reviews 2010; 29: 952-68.


