

**A Comparative Study on the Effect  
of *Coriandrum sativum*, *Nigella sativa*,  
and *Calendula officinalis* on the Testis of Rat**

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**Summary:**

**Background:**

*Coriandrum sativum*, *Nigella sativa*, and *Calendula officinalis* are commonly used herbs in traditional medicine. Their effects on the testis of rat have been studied and compared in the present work since there is a lack of knowledge on this matter.

**Methods:**

Dried ripe fruits of *Coriandrum sativum*, *Nigella sativa* seeds, and *Calendula officinalis* flowers were individually administered for 14 days for each group of 30 experimental rats. Each herb was suspended in distilled water and administered to the rat through the orogastric tube. Distilled water was administered to 30 control rats in the same way for the same period. Histological, hormonal, and morphometric studies were carried out.

**Results:**

*Coriandrum sativum* gave controversial results. There was insignificant increase in testicular weight and diameter of seminiferous tubules and insignificant decrease in diameter of Leydig cells, with significant decrease in LH level in the serum and insignificant change of FSH and testosterone, and highly significant decrease in the sperm count. Both *Nigella sativa* and *Calendula officinalis* showed positive effects with highly significant increase in the sperm count.

**Conclusions:**

From these findings, it can be concluded that *Coriandrum sativum* inhibits the spermatogenic process in contrast to *Nigella sativa* and *Calendula officinalis* which activate the spermatogenic process.

**Keywords:** *Coriandrum sativum*, *Nigella sativa*, *Calendula officinalis*, testis.

*Fac Med Baghdad*  
*2008; Vol. 50, No. 1*  
*Received Dec. 2006*  
*Accepted Aug. 2007*

**Introduction:**

*Coriandrum sativum*, *Nigella sativa*, and *Calendula officinalis* are well-known herbs, have been used by different societies as folk medicine. Coriander is used for dyspeptic complaints, loss of appetite and complaints of upper abdomen (1). It is also used as carminative, diuretic, antispasmodic, and emmenagogue (1, 2). Coriander volatile compounds have antibacterial activity against *Salmonella choleraesuis* at any growth stage (3). Coriander plays protective role against the

deleterious effects in lipid metabolism in experimental colon cancer (4). Additionally, coriander is antidiabetic (5, 6) and it has antiadhesive properties on the adhesion of *Helicobacter pylori* to human stomach tissue (7).

*Nigella sativa* is used as emmenagogue, galactagogue (2), and has antidiabetic activity (8, 9, 10). It also has anti-inflammatory, analgesic and antipyretic activity (11, 12, 13) and has diuretic and hypotensive effects (9, 14, 15). It can protect chemically induced hepatocarcinogenesis (16,7) and can inhibit

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colon carcinogenesis of rats (18). It activates the spermatogenic process in the male rat (19).

Traditionally, *Calendula officinalis* has been used to treat gastric and duodenal ulcers, amenorrhea, dysmenorrheal and epistaxis; crural ulcers, varicose veins, hemorrhoids, anal eczema, proctitis, lymphadenoma, inflamed cutaneous lesions and conjunctivitis (20). The crude extract of *Calendula officinalis* flowers contains both spasmolytic and spasmogenic constituents (21). The organic extract of flowers from *Calendula officinalis* possesses anti-HIV properties of therapeutic interest (22). It also has anti-inflammatory and anti-tumor activity (23, 24). It activates the spermatogenic process in the male rat (25).

In the present work a comparative study has been carried out to throw the light on the effect of *Coriandrum sativum*, *Nigella sativa*, and *Calendula officinalis* on the testis of rat since literature shows no knowledge on this matter collectively.

#### **Materials and Methods:**

A total of 120 healthy male Norway Albino rats (*Rattus Norvegicus*) were used in this study. Their average weight between 175-220 gm. They were isolated in a relatively controlled environment at a temperature of about 25°C; and given free access to tap water and ordinary rat's pellet diet. They were housed in wire-meshed stainless steel cages. The light/dark cycle was kept (12 hr/12 hr). They were divided into four groups each consisting of 30 rats. The First group was given the ground dried ripe fruits of *Coriandrum sativum* in a dose of 0.05gm/100gm body weight / day (26) for 14 days. Each dose was suspended in 4 ml of distilled water. The second group was given the ground seeds powder of *Nigella sativa* in a dose of 0.2gm/100gm body weight/day (27) for 14 days. Each dose was suspended in 4 ml of distilled water. The third group was given the ground dried flowers of *Calendula officinalis* in a dose of 0.01gm/125gm body weight/day (20) for 14 days. Each dose was suspended in 4 ml of distilled water. All these herbs were administered to the animals through an oro-gastric tube. The fourth group (control group) received only 4 ml of distilled water through the oro-gastric tube daily for 14 days. The body weight of each animal was

recorded at the beginning and at the end of the experiment.

Via cardiac puncture, blood samples were collected from the living anaesthetized animals, both control and experimental. Each blood sample was centrifuged at 3000 rpm for 15 minutes. The supernatant plasma was removed for hormonal assay of testosterone, FSH, and LH, using the Enzyme Linked Fluorescent Assay technique. Then the assay was completed by VIDAS apparatus.

The testes of each animal were removed under open ether anesthesia. The left testis of each animal was immediately weighed by sensitive electronic balance. They were then immediately fixed in Bouin's solution together with the epididymides, for 24 hours. After fixation they were dehydrated by passing through ascending grades of ethanol, then cleared by xylene and finally embedded in paraffin wax. 5um thick sections were stained by hematoxylin and eosin stain (H &E). Morphometry was carried out to study the diameter of both seminiferous tubules and Leydig cells. The measurements were performed on at least 20 round seminiferous tubules for each testis with an eyepiece micrometer, at X400 magnification. Then the mean diameter of seminiferous tubules was calculated for each animal. Regarding Leydig cells, 20 interstitial spaces of each testis were randomly studied, and the diameter of each cell was measured using the same eyepiece mentioned above, at X400 magnification (28). The right testis was used for sperm count. Each testis was put in a watch glass that contains normal saline, and then minced into small tiny pieces with microsurgical scissors until it became homogenized solution that contains the spermatozoal suspension. Using small pipette, a drop of spermatozoal suspension was placed on a slide and covered with cover slip. The concentration of spermatozoa was calculated from the mean number of spermatozoa in ten microscopic fields under magnification of X400. The number was multiplied by a factor of one million (29).

The means and standard deviations were recorded and analyzed by using the computer facility of SPSS 10.0 (Statistical Packages for Social Sciences version 10.0). Results were presented in simple measures of mean  $\pm$  S.D. (standard deviation). Results between two

groups were analyzed using student's t-test (30).

#### Results:

There was no significant difference in body weight between control and experimental groups. The mean of testicular weight of all experimental animals was higher than the control one. However, there was significant increase of testicular weight in *Nigella sativa* treated group but there was no significant increase in *Calendula officinalis* and *Coriandrum sativum*-treated groups (Fig.1).

The sperm count was significantly increased in both *Nigella sativa* and *Calendula officinalis*-treated groups. However, there was a significant decrease in sperm count in *Coriandrum sativum*-treated group (Fig.2). There was significant increase of FSH level in both *Nigella sativa* and *Calendula officinalis*-treated groups. However, there was no significant change in *Coriandrum sativum*-treated group (Fig.3). There was significant increase of LH level in both *Nigella sativa* and *Calendula officinalis*-treated groups. However, there was a significant decrease in LH level in *Coriandrum sativum*-treated group (Fig.3). Testosterone hormone was significantly increased in both *Nigella sativa* and *Calendula officinalis*-treated groups. However, there was no significant change in *Coriandrum sativum* treated-group (Fig.3). A significant increase in the diameter of Leydig cell was detected in *Nigella sativa*-treated group only. Both *Calendula officinalis* and *Coriandrum sativum*-treated groups showed no significant change (Fig.4).

A significant increase in the diameter of seminiferous tubule was seen in both *Nigella sativa* and *Calendula officinalis*-treated groups. However, *Coriandrum sativum*-treated group showed no significant increase in the diameter of the seminiferous tubule (Fig.5).

#### Discussion:

Sterol content of *Coriandrum sativum* was estimated to be at a high level. The most predominant components were stigmasterol and  $\beta$ -sitosterol (31). Also the sterols of *Nigella sativa* and *Calendula officinalis* include stigmasterol and  $\beta$ -sitosterol (32, 33, 34). These components have a steroidal action (35).

Several hormones play essential roles in spermatogenesis such as testosterone, FSH, LH, and estrogens (36). The result obtained by Sriraman et al [2004] (37) provided evidence for a definite role for FSH in regulation of spermatogenesis, also confirming the role of LH in spermatogenesis via testosterone. Both *Nigella sativa* and *Calendula officinalis* cause significant increase of these hormones, thus explains the significant increase of the sperm count in these two groups. However, *Coriandrum sativum* caused significant decrease in LH and insignificant changes in testosterone and FSH. Thus, there was significant decrease in the sperm count. Testosterone and estradiol have direct effect on FSH secretion. It has been proposed that alterations in the testosterone/estradiol ratio might account for selective elevations in plasma FSH levels under some circumstances (38).

The secretion of LH is controlled by the negative-feedback action of gonadal steroids on the hypothalamus and the pituitary. Both testosterone and estradiol can affect this inhibition (38). The significant increase of testosterone level in both *Nigella sativa* and *Calendula officinalis*-treated groups is due to significant increase of LH level in these groups. However, there was no significant change in testosterone level in *Coriandrum sativum*-treated group, although there was significant decrease in LH level. This is because the rat Leydig cells have a large number of excess or spare LH receptors. Thus, maximal testosterone biosynthesis occurs with doses of LH that result in only 10% of maximal cAMP production (38). Leydig cell is under the control of pituitary LH which was significantly increased in diameter in *Nigella sativa*-treated group. Although LH was significantly increased in *Calendula officinalis*-treated group, the increase in diameter of Leydig cell was not significant. The decrease of Leydig cell diameter in *Coriandrum sativum*-treated group was due to the significant decrease in LH.

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