Effects of Coriandrum Sativum on the Spermatogenesis of Rat Testis: Histological and Morphometrical Studies

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ABSTRACT:

BACKGROUND:

Coriandrum Sativum is a native of Mediterranean region and is grown in North Africa, central Europe, and Asia as culinary herb and medicament. In addition to the other health-supporting reputation, coriander has hypoglycemic, hypolipidemic, and aphrodisiac effects.

OBJECTIVE:

To study the effect of *Coriandrum Sativum* on process of spermatogenesis.

MATERIALS AND METHODS:

Coriandrum sativum was given daily to mature male rats in a dose of 50mg/ 100g body weight for 14 days. 10% formalin fixed paraffin-embedded tissue sections were performed for histological and morphometrical studies.

RESULTS:

Histological study showed wider seminiferous tubules & increased spermatocytes population with an increased sperm density in the lumen of the tubules. Morphometrically, the diameters & thickness of the germinal epithelia of the seminiferous tubules were significantly increased in coriander treated rats than that of the control group.

CONCLUSION:

Coriandrum sativum appeared to be stimulant to the process of spermatogenesis.

KEY WORDS: rat testis, *Coriandrum sativum*, spermatogenesis.

INTRODUCTION:

Coriandrum Sativum is a native of the Mediterranean region and is grown in North Africa, central Europe, and Asia as culinary herb and medicament. Its English name is coriander and it is referred to as Chinese parsley and Japanese parsley [(1)]. Coriander essential oil composed mainly of volatile and fixed oil. The volatile oil is represented by the linalool, coriandrol, and the hydrocarbones pinene and terpinene and a small amount of borneol and geraniol. The fixed oil is represented by the unsaponifiable compounds and the insoluble fatty acids like palmitic, petroselinic, linoleic, and oleic acids. In addition coriander essential oil contains traces of protein, sugar, iron, phosphorous, calcium, and albuminoid materials [(2).] I[illegible]n coriander volatile oil is rich in beneficia[illegible]trients and the seeds have a health-supporting reputation that is high on the list of the healing spices and has been used as antispasmodic, carminative, stimulant, cytotoxic, lipolytic, fungicidal, and disorder of the stomach. Coriander also possesses antibacterial, antimutagenic activity, and insecticidal [(3)]. Also coriander has hypoglycemic, hypolipidemic, and aphrodisiac effects [(2).]

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MATERIALS AND METHODS:

Twenty four adult (8-12 weeks of age), sexually mature, Norway Albino male rats were used in this study. These animals were housed individually in separate cages in the animal house of Baghdad medical school under normal diurnal lighting conditions, kept at a relatively controlled temperature of about 25°C, and have free access to tap water and food (ordinary pellet diet). The sample was divided into two groups randomly, each composed of twelve rats. The first group served as a control group and the second one was the experimental group. The control group received no herbal treatment while the experimental group received coriandrum sativum as an oral herbal

suspension. A dry ripe seed of coriandrum sativum was crushed in a coffee grinder, and the obtained powder was suspended in distilled water to make herbal suspension. Four grams of coriandrum sativum was suspended in fifty milliliter distilled water and given to the animal in a dose of 50 mg /100 g body weights as an oral single daily dose for fourteen days [4]. The herbal suspension was delivered slowly to the experimental rats using a 5.0 ml graded pipette tube. At the end of the experiment a median scrotal incision was made to separate and remove the entire testes. The obtained samples were fixed in 10% neutral buffered formalin, a longitudinal slit was made in the capsule to facilitate the penetration of the fixative inside the testis for better fixation , for 20-24 hours at room temperature and processed for routine paraffin-wax embedding and sectioned serially at 5.0 µm thickness using electric microtome [5]. Morphometry done to study means & standard deviations of the diameters & thickness of germinal epithelia in 25.0 rounded seminiferous tubules/ five tissue sections by using an eyepiece micrometer, at 400X magnification power [6] & and the differences between these variables in both groups.

Histological study was conducted to study the general arrangement of the tissue structure in the control group and the differences in the thickness of the germinal epithelium, diameter of the seminiferous tubules and the density of the sperms in the lumen of seminiferous tubules. Testicular sections of control rats stained with H. & E. revealed normal testicular tissue histology (fig. 2). The seminiferous tubules, separated by the interstitial tissue, are lined by a single layer of cuboidal cells, spermatogonia, followed by the primary spermatocytes. The sperms appeared with the heads anchored in the germinal epithelium and the tail floating in the lumen of the seminiferous tubules. Testicular sections of coriander treated rats stained with H. & E. showed wider seminiferous tubules than those of the control group with an increased germinal epithelium thickness (fig. 3). The primary spermatocytes population was increased with an increased sperm density in the lumen of the tubules. Morphometrical study reveals that the diameters & thickness of the germinal epithelia of the seminiferous tubules were significantly increased (p-value < 0.0005 for both) in the coriander treated rats than that of the control group (table 1).

RESULTS:

Table 1: Shows the differences between the diameter and thickness of the germinal epithelia of seminiferous tubules in control and experimental groups.

	Control		Experimental		P-value
	Mean (µm)	SD	Mean (µm)	SD	
Diameter	77.2	1.104	89.1	0.6	0.0005
Thickness of germinal epi.	22.3	0.4	33.02	0.8	

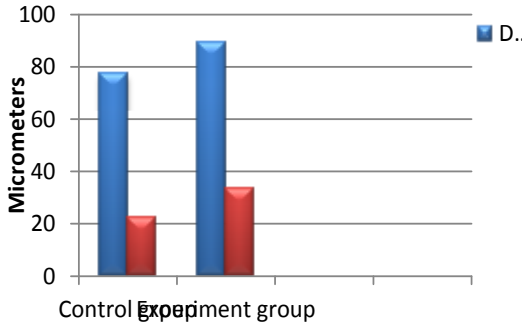

Figure 1: The mean values of the diameters and thickness of the germinal epithelia among the control and experimental groups.

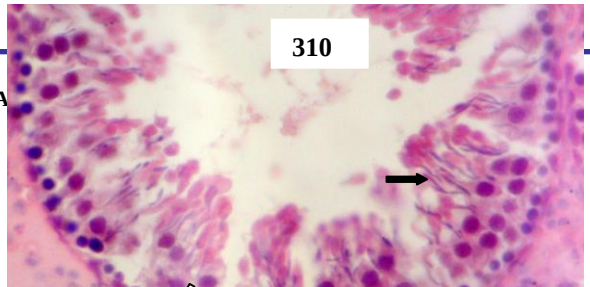

Figure 2: Shows normal histology of control rat testis; white arrow refers to spermatogonia, narrow black arrow refers to the interstitial tissue and wide black arrow refers to the sperms within the lumen of seminiferous tubule (magnification X 400, H. and E.).

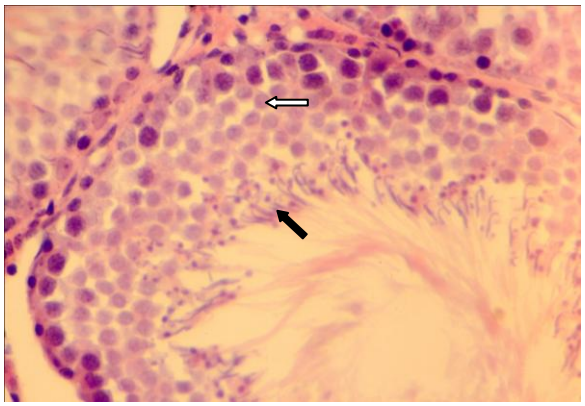

Figure 3: Shows increment in the diameter, thickness of the germinal epithelium and density of the sperms within the seminiferous tubules of coriandrum sativum treated rats, white arrow refers to primary spermatocytes and wide black arrow refers to the sperms within the lumen of seminiferous tubule (magnification X 400, H. and E.).

DISCUSSION:

The rats were chosen to be between eight to twelve weeks of age (i.e. age of the peak activity of Leydig cells). According to Shan & his colleagues, Leydig cells of 90 days old rat produce testosterone 150 times greater than that at 21 days of age and 5 times greater than that at 35 days of age as the activities of androgen metabolizing enzymes were minimal and there would be continuous increase in the levels of testosterone biosynthetic enzymes [7]. In addition, Inano H. and Tamaoki B. I. in their work reported that immature Leydig cells divided and differentiated to form the adult population of Leydig cells which are capable to produce testosterone at the time of the 56 postnatal days (age of 2 months) [8]. Chen H. and his colleagues mentioned that the steroidogenic capacity of Leydig cells is reduced with aging and by the age of 20 months to 50% [9]. In the present study these finding had been taken into consideration in order to have samples with the most active Leydig cells and to reduce the variation among the groups. The diameters and thickness of the germinal epithelia of the seminiferous tubules of coriander treated rats were greatly increased in comparison to the control group. In addition there were increments in the spermatocytes population with high density of sperms in the lumen of seminiferous tubules. Thus coriandrum sativum appeared to have stimulant effect to the process of spermatogenesis. This is coincided with the previous literatures which reported that coriandrum sativum had an aphrodisiac effect (2 and 3). In the ancient Egyptian, Indian and Chinese medicine, coriandrum sativum is a well known aphrodisiac

agent & It is regarded as one of the world's oldest spices, cultivated in Egypt 3,500 years ago and found in the tomb of Tutankhamun, built in 1350 B.C [10]**)**. The Chinese used the herb in love potions believing it provided immortality. The book of The Arabian nights tells a tale of a merchant who had been childless for 40 years and he was cured by a concoction that included coriander. That book is over 1000 years old so the history of coriander as an aphrodisiac dates back far into history [11].

The aphrodisiac effect of *Coriandrum sativum* might be due to its high content of vitamin A whereas Coriander provides 6748 IU of vitamin - A per 100 g, about 225% of recommended daily intake [12]. Vitamin "A" was found to pushes undifferentiated spermatogonia into the differentiation pathway and, eventually, meiotic prophase. Retinoic acid (RA), which is a vitamin "A" derivative, binds to two families of intracellular receptors termed RA receptors (RARs) & retinoid X receptors (RXRs) resulting in induction of STRA8 (stimulated by retinoic acid gene 8 protein) that control meiotic initiation of "A" spermatogonia [13]. However; this result differs from Ja'afer F.M., 2004 results which found the coriandrum sativum as inhibiting substance for the process of spermatogenesis. Ja'afer F.M. reported that Coriandrum sativum caused significant decrease in the sperm density inside the seminiferous tubules and LH level in the blood [4]. In addition there was no significant difference in the diameter of the seminiferous tubules and in the testosterone hormone and FSH levels in the blood. Since the testosterone hormone and FSH level and the diameter of the seminiferous tubules remained unchanged and the sperm density inside the seminiferous tubules does not reflect the real number of the sperms because of the wavy nature of the process of spermatogenesis. Therefore, this finding should not be taken into consideration unless a more precise way of sperm count is used.

CONCLUSION:

Coriandrum sativum appeared to be stimulant to the process of spermatogenesis since the increments in the diameters of the seminiferous tubules and thickness of their germinal epithelia in the coriander treated rats were highly significant.

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