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Potential Health Effects of Grape Seed Extract on Female Albino Rats Fecundity (Article Review)

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ABSTRACT

Background: *There are many plant extracts and seeds with proven efficacy in the life sciences, some curative, some inhibitory, and some enhance, each with its own specific function and niche. In this study, we have compiled some sources from scientific websites concerned with life sciences and medical research across multiple scientific databases, including PubMed, Scopus, Web of Science, and Google Scholar We have clarified the impact of grape seed activity on the fertility of albino mice, along with related events and details.* ***Aim of study****: The study's focus is on demonstrating the effect of grape seed activity on the fertility of albino female mice.* ***Introduction****: Since the beginning of human civilization, medicinal plants have always remained a part and parcel of human, society to combat and treat different diseases.* ***Materials and Methods****: This review article was conducted based on a structured literature search and data synthesis Approach in accordance with established academic standards for narrative and semi-systematic reviews.* ***Result****: Our research indicated to the effect of alcoholic extract of grape seeds on the extent of improvement in the efficiency of the functioning of the ovaries and uterus in female albino rats.* ***Conclusion****: We have concluded the effect of the alcoholic extract of grape seeds on the extent of improvement in the efficiency of the functioning of the ovaries and uterus in female albino rats. The results showed that there is a noticeable improvement in appearance and histology on the organs of the female reproductive system.*

Keywords: Medicinal Plants, Grape Seed, Reproductive System, Folliculogenesis, Uterus.

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1.1 INTRODUCTION

Since the beginning of human civilization, medicinal plants have always remained a part and parcel of human society to combat and treat different diseases. In particular, society needs to combat and treat different diseases. In particular, in the Indian systems of medicine, Rigveda, Charak Samhita and Sushruta Samhita, such descriptions have been documented. According to estimates of the World Health Organization, nearly 75% of the world's population currently uses herbs and other traditional medicines to treat diseases of different natures [1]. Nevertheless, currently, medical as well as pharmaceutical research is being carried out towards the characterization and development of plant-derived natural components to treat various human ailments [2]. The grape belongs to the berry family as it is found attached to the stem. Many berries make up a cluster or bunch of grapes [3]. The fruit of the grape is one of the most palatably edible foods, having many established nutritional

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and medicinal properties for consumers. The grape is a good source of water (*82%), carbohydrates (12–18%), proteins (0.5 0.6%), and fat (0.3–0.4%). Additionally, the grape contains significant amounts of potassium (0.1–0.2%), vitamin C (0.01–0.02%), and vitamin A (0.001–0.0015%) and also has a small amount of calcium (0.01–0.02%) and phosphorus (0.08–0.01%) [2,3]. Grapes are also a major source of other nutrients like boron, [4] a possible substance for bone health. The essential parts of the berry include skin, pulp, and seeds. In mammals, female reproductive capacity is negatively correlated with age, and the female reproductive system is more rapid to show overt signs of physiologic aging another body systems [5]. Female reproductive aging is known to trigger a series of molecular alterations that could cause aneuploidy, miscarriages, birth defects, and infertility [6,7]. Ovarian aging is thought to be dominated by a gradual decrease in both the quantity and the quality of the oocytes residing within the follicles with increasing age [8,9].

These decreases lead to the decline in the duration of ovarian functions. Similar to mammals, the poultry also undergoes age-related decline in fecundity. Fast decline appears in the egg production of the laying hens after 480 days of age due to ovarian aging, thereby leading to reduced egg production and commercial value of the laying hens. Hence, it is necessary to explore the mechanisms of the deterioration of the laying performance and its counter measures during the aging process. One of the major factors that cause ovarian aging is oxidative stress [10]. The oxidative stress induced by accumulated reactive oxygen species (ROS) levels is indicated to be one of the dominant mechanisms underlying ovarian aging [11,12] . In the living organisms, physiological levels of ROS are appreciated to maintain the normal conditions such as signal transduction and redox regulation, while high levels of ROS could induce oxidative damage [13]. In the normal cells, there is a complex antioxidant defense system which could scavenge ROS and maintain the redox state of diverse cells. The antioxidant defense system consists of antioxidant enzymes such as superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GSH-Px), and glutathione S- S-transferase (GSH-ST) and biological antioxidants such as glutathione (GSH) and vitamins C and E [14]. However, the balance between ROS generation and scavenging would be disrupted due to decreasing levels of the antioxidants during the aging process, then causing oxidative stress. Therefore, the balance between the antioxidants and oxidants.

1.2 Normal Female Reproductive System Tract Histology

The paired ovaries of the rat are grape-like structures that vary in gross appearance and size, depending on the stage of the oestrous cycle. The subgross anatomy of the rodent ovary. Covering its surface is a single layer of modified peritoneal mesothelium, the ovarian surface epithelium (OSE), which is continuous with the broad ligament (mesovarium) that supports the ovary. The OSE of a single ovary can range from squamous to cuboidal, columnar or pseudostratified columnar in type; this regional variation in OSE morphology accompanies the cyclical changes that occur within the underlying ovarian parenchyma during the oestrous cycle. The ovarian stroma forms the body of the ovary and is composed of spindle-shaped, fibroblast-like cells and delicate collagen fibers admixed with ground substance. The stroma directly beneath the OSE is dense and fibrous – it forms a narrow and variably distinct zone termed the tunica albuginea. The ovarian stroma beneath the tunica albuginea is divided into a peripheral cortex and central medulla. although the latter is not always visible in histological sections of ovary. In sexually mature rats the cortex contains numerous follicles at various stages of development. **Five stages of follicular maturation (folliculogenesis) are described:**

i. Primordial follicle – This represents the earliest stage of follicular development.

Primordial follicles form during early foetal development and are typically located within the peripheral cortex, just beneath the tunica albuginea. Each primordial follicle consists of a primary oocyte surrounded by a simple squamous follicular epithelium. Envelopment of the primary oocyte by follicular cells arrests development of the germ cell at the first meiotic division. During each oestrous cycle a cohort of “resting” primordial follicles starts to develop into primary follicles; this process occurs occur independently of hormonal stimulation up until the formation of early tertiary follicles.

ii Primary follicle – The squamous follicular cells surrounding the primordial follicle differentiate into a single layer of columnar cells, resulting in the formation of a primary follicle.

iii Secondary follicle – Proliferation of the columnar cell monolayer results in the formation of a multilayered zone of granulose cells, the zone granulose, around them . This is accompanied by the development of a thick glycoprotein and acid proteoglycan coat, the zone pellucid, between the oocyte and the zone granulosa . As the secondary follicle continues to grow, multiple fluid. filled spaces form within the zone granulosa – this stage is termed a vesicular follicle. Ovarian stromal cells surrounding the developing follicle become arranged into concentric layers and form the theca follicular, or theca. This layer is separated from the zone granulosa by a basement membrane.

iv. Tertiary follicle – The cystic spaces within the zone granulosa coalesce and form a large central cavity, the follicular antrum. This cavity is filled with fluid, the liquor follicular, and surrounded by the zone granulosa. The primary oocyte is eccentrically positioned within the tertiary follicle and resides within a mound of granulosa cells, called the cumulus oophorus, that protrudes into the antrum. The granulosa cells immediately surrounding the oocyte are termed the corona radiate.

v. Preovulatory (Graafian) follicle – A small number of tertiary follicles enter a preovulatory stage and undergo further morphological changes. The follicular antrum continues to enlarge causing attenuation of the surrounding zone granulosa. Degeneration of the granulosa cells of the cumulus oophorus occurs; this causes the primary oocyte to detach from the zona granulosa and float freely within the follicular antrum . The primary oocyte completes the first meiotic division just prior to ovulation and forms the secondary oocyte.

1.3 Uterus

The bicornuate uterus is poorly developed at birth, consisting of a simple tube lined by low cuboidal epithelium embedded in undifferentiated mesenchyme stroma. At PND 21, the uterus is only 1.0 mm in diameter and grossly appears like a mucus thread. By PND 28, inflammatory cells first appear within the endometrial stroma; vacuolation of epithelial cells can be observed; and the diameter of the uterus is 1.25 mm. By PND 36, inflammatory cells are routinely found in the uterine stroma in response to hormonal influence associated with the onset of puberty. The uterus is mature by PND 42, with a well-developed muscular is that is composed of a thick inner circular layer, an intervening layer of smooth muscle containing large blood vessels, and a thinner outer longitudinal layer. The diameter of the uterus is approximately 1.75 mm by this time.

2. MATERIALS AND METHODS

This review article was conducted based on a structured literature search and data synthesis Approach in accordance with established academic standards for narrative and semi-systematic reviews. Search Strategy and Data Sources an extensive literature search was performed across multiple scientific databases, including PubMed, Scopus, Web of Science, and Google Scholar.

The search covered studies published between January 2000 and July 2025. In most studies, groups of albino mice were taken, and after collecting data from several sources, the groups were selected as follows: (Most research has moved towards this division, which is what we adopted in this study (Fifteen adult healthy female rats of Wistar strain weighing 300-350 g and 12-14 weeks old were housed in separated plastic cages and kept in controlled environment of 22-25 °C. Commercial food (pellets) and tap water were provided to animals libitum, 50% humidity and 12hrs /12 hrs light/dark cycle. Rats were adapted to the environment for one week prior to the start of experiment. The animals were randomly distributed into three equal groups (3 mice each. As follow: Group 1: (negative Control): rats were fed on the basal diet and water Group 2: given Grape seed extract accumulative dose of (250 mg/kg b.wt) Group 3: given Grape seed extract accumulative dose of (400 mg/kg b.wt).

3. RESULT AND DISCUSSION

Our research indicated to the effect of alcoholic extract of grape seeds on the extent of improvement in the efficiency of the functioning of the ovaries and uteruses in female albino rats. The results showed that there is a noticeable improvement, appearance and histology, on the organs of the female reproductive system, as it was observed that the number of ovarian follicles increased at various stages in the treated group. At the concentration of 250 mg/kg of body weight, the intermediate and developing ovarian follicles and the follicles of GSE were in greater numbers than in the control group, and there were higher numbers in the last concentration of 400 mg/kg of body weight. The results also showed a noticeable phenotypic and histological improvement in the wombs of the groups treated with the two concentrations of 250 and 400. mg / per kg of body weight, as the number of uterine glands in the uterine epithelium increased and the various layers of the uterus improved. The reason for the improvement in the efficiency of ovaries and wombs treated with alcoholic extract of grape seeds is due to the presence of Phytochemicals are compounds produced by plants that can affect human health if consumed [15] They are found in many common fruits, vegetables, beans, and grains that are commonly included in most diets. There are various types of phytochemicals such as carotenoids, sulfides, and polyphenols [16]. Carotenoids are found in many vegetables and fruits such as carrots, yams, and cantaloupe. They are viewed as anti-cancer agents due to Vitamin A, retinoids, and antioxidants. Allyl sulfides, found in garlic and onions, are thought to strengthen the body‟s immune system. The last type of phytochemical, polyphenols, includes a large subgroup known as flavonoids. Flavonoids are chemicals derived from fruits, vegetables, and grains that may prevent cancer and heart disease. Flavonoids can act as antioxidants which rid the body of harmful molecules such as „free radicals‟ through the consumption of plant products like grapes and eggplant [17].

Additionally, isoflavonoids are a specific type of flavonoid found in red clover, garbanzo beans, and other plant products and are suspected to imitate the actions of estrogen [18]. There is no substantial evidence supporting the benefits of phytochemicals, but they are being researched further. In this research, the effect of giving an alcoholic grape extract was revealed to test its effect on improving the fertility of female white rats for a period of 28 days by oral dose. The results showed a significant improvement in the phenotypic shape of the ovaries and uterus treated with two concentrations of the alcoholic extract of grapes (250, 400 mg/kg bw.) , compared with the control group. on the other hand we did not find a similar study looking at the role of grapes and its active compounds in the function of the female reproductive system. We provided only two studies conducted on chickens, and the treatment gave positive results in improving the quality of eggs, their number and the density of the egg yolk, compared with control groups. [19] In previous studies Pastrana Bonilla et al. 2003 indicated that the major polyphenols in GSE were gallic acid, syringic acid vanillin, coumaric acid, and quercetin. Furthermore [20]. demonstrated that grapefruit contains several nutrient elements, including minerals, vitamins, edible fibers, carbohydrates, and phytochemicals however polyphenols are considered the most important phytochemicals which have health- promoting benefits and possess several biological activities . The major phenolic compounds include flavanols, anthocyanins, stilbenes (resveratrol), phenolicacids, and flavonols [21].

Flavonoids are mainly found in stems and seeds and principally contain (-)-epicatechin, (+)-catechins, and procyanidin polymers. Moreover, white grape is rich in flavan-3-ols and red grape is rich in anthocyanins [22]. Resveratrol that found in grape seed also named as 3,5,4?-trihydroxy-trans-stilbene, is a plant derived polyphenol which was first isolated in 1940 from the roots of white hellebore (Veratrum grandiflorum O. Loes), then in 1960 from the roots of Polygonum cuspidatum and is now detected in around 70 species of plants including grapes. Resveratrol is reported to have beneficial effects in various diseases like cancer, diabetes, inflammation, heart diseases etc [23].

Its efficacy for PCOS is also well documented. A clinical trial was conducted by Mansour et al. 2021.on 78 patients receiving 1000 mg of the drug for period of three months to check the effect of resveratrol for PCOS. The result showed increased mensuration rate (76.47% vs. 51.61%; $p = 0.03$) and reduced hair loss (32.10% vs. 68.00%; $p = 0.009$) was observed while the level of lipid, insulin and androgens remains unchanged after the treatment [24]. The in vivo study performed by Rencber et al., on DHEA-induced PCOS rats also revealed the efficacy of the drug for PCOS [25]. The rats were treated with resveratrol (20 mg/kg/day), metformin (300 mg/kg/day) and their combination[26]. A decrease in the levels of testosterone, LH, LH/FSH, TNF-apha and tissue AMH level was noted with all the treatment groups with more marked effect in resveratrol treatment group [27]. Grape seed is a nutraceutical that belongs to the bioflavonoid family. It is composed of chains of procyanidins that are found in a wide variety of beverages [28].

CONCLUSION

We have concluded the effect of the alcoholic extract of grape seeds on the extent of improvement in the efficiency of the functioning of the ovaries and uterus in female albino rats. The results showed that there is a noticeable improvement in appearance and histology on the organs of the female reproductive system.

Recommendations

We recommend that a more extensive and comprehensive study be conducted, whether international or regional, to create a comprehensive survey picture of this phenomenon.

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Conflicts of interest

There are no conflicts of interest.

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