

# The Effect of Phytoestrogen Substances on the Morphometry of Reproductive Organs in Increasing the Fertility of Rabbits

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**Annotation:** This article examines the effect of phytoestrogen substances on the morphological and morphometric changes in the reproductive organs of rabbits. During the experiment, differences between the group treated with phytoestrogens and the control group were analyzed. The results showed that phytoestrogen substances positively influence the size, weight, and functional activity of the reproductive organs. This study contributes to determining the potential use of phytoestrogens to improve the reproductive performance of rabbits.

**Keywords:** Phytoestrogen, rabbit, reproductive organs, morphometry, fertility, ovary, testis, uterus, vascular network, reproduction, hormonal balance, *Ferula asafetida*, *Ferula narthex*, *Ferula foetida*.

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**Introduction.** Nowadays, rabbit breeding is an important industry for meat, wool, and laboratory research. The rapid and healthy reproduction of rabbits contributes to increased production efficiency. However, several factors, including nutrition and hormonal balance, affect their reproductive capacity.

Phytoestrogens are natural compounds found in plants that have been shown to positively affect the reproductive system of animals. Using phytoestrogens instead of synthetic hormones is safer and more environmentally friendly.

Therefore, studying the effects of phytoestrogens on increasing rabbit fertility is of great importance. This research is beneficial not only for improving the efficiency of rabbit farming but also for enhancing animal health.

Some species of the *Ferula* plant that are rich in phytoestrogens include:

1. ***Ferula asafetida* (asafoetida):** This plant is rich in phytoestrogens and is often used as a medicinal herb. Its roots and resin contain biologically active compounds that help modulate estrogen levels. One of its key active components, asafetida, exhibits estrogen-like effects and aids in regulating hormonal balance.
2. ***Ferula narthex*:** This plant is also considered rich in phytoestrogens. Its roots and stems are used in treating various conditions, including reproductive system disorders. It contains several compounds with phytoestrogenic properties that support the female reproductive system.
3. ***Ferula foetida*:** This plant contains phytoestrogens, and its extract is sometimes used for promoting women's health by enhancing estrogenic activity.

**Research Objective.** The objective of this study is to recommend the use of phytoestrogen substances to enhance the fertility and physiological maturation period of rabbits by examining morphometric changes in their reproductive organs.

**Research Tasks.** To achieve this objective, the following tasks were defined:

Determine the growth rate of reproductive organs in rabbits during the postembryonic period.

Study the physiological norms of changes in body weight and linear parameters of female rabbits from 1 to 8 months of age.

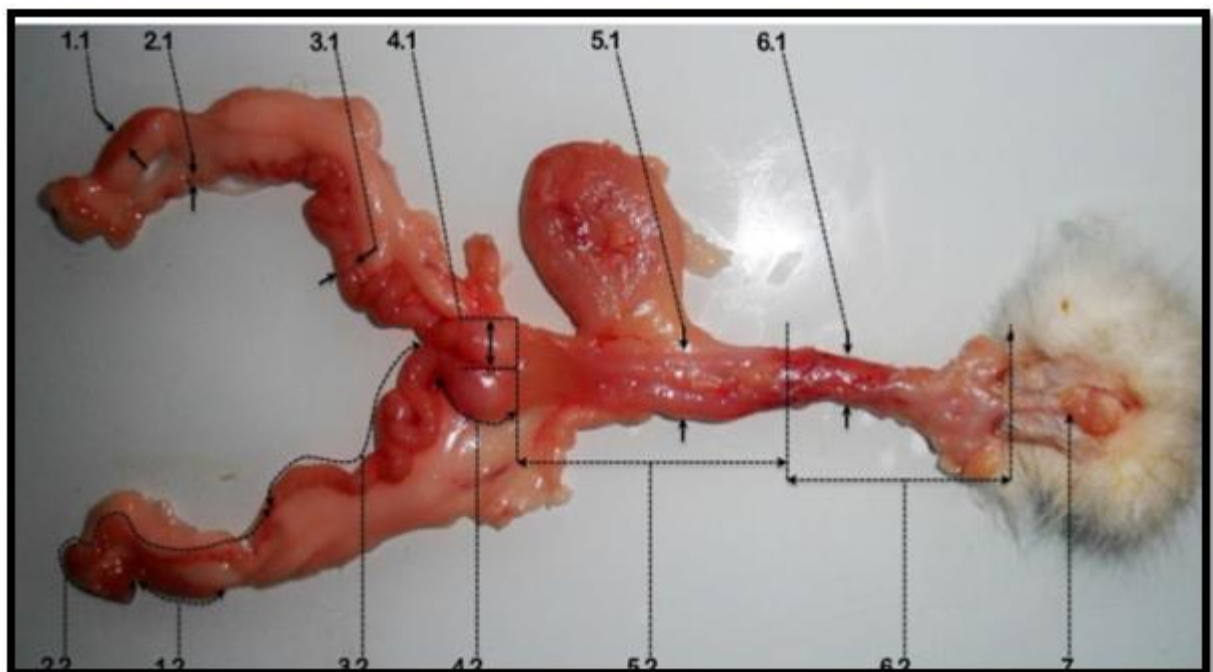
Analyze age-related changes in ovarian weight and the morphometric parameters of the ovaries in female rabbits.



**Research Object and Methods.** For the study, 24 clinically healthy rabbits were selected, and their postnatal development was examined from 1 to 8 months of age.

In our research, a morphometric analysis of the reproductive system organs of rabbits was conducted. Parameters such as ovarian and uterine length, as well as the linear dimensions of these organs, were evaluated. Additionally, factors like body weight and overall body length were also taken into account.

**Research Results.** During the study, animals from each age group were measured, and the morphometric measurements of the linear cross-sections of the reproductive system organs were examined.



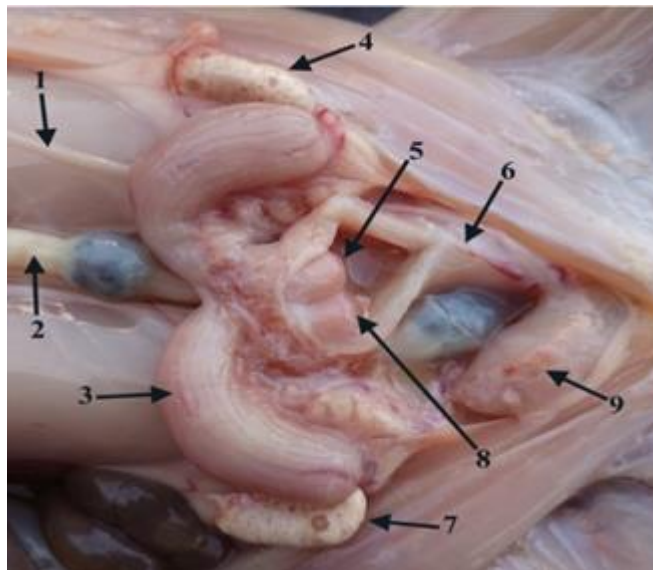
**Figure 1.** Morphometric Analysis of the Rabbit's Sexual Organs (3 months): 1 – Ovaries: 1.1 – Ovary width, 1.2 – Ovary length; 2 – Oviducts: 2.1 – Uterine width, 2.2 – Uterine length; 3 – Uterine horns: 3.1 – Uterine width, 3.2 – Uterine length; 4 – Uterine cervix: 4.1 – Cervix width, 4.2 – Cervix length; 5 – Vagina: 5.1 – Vagina width, 5.2 – Vagina length; 6 – Vaginal vestibule: 6.1 – Vestibule width, 6.2 – Vestibule length and vagina; 7 – Labia externa.

**Ovarian weight and morphometric parameters of the ovaries in female rabbits,  $m \pm m$** 

Age of the animal	Ovary weight, g	Morphological parameters of the ovaries, mm		
		Ovary length, mm	Ovary width, mm	Ovary Thickness, mm
10 daily	0,012 $\pm$ 0,002	5,59 $\pm$ 0,17	2,19 $\pm$ 0,22	1,01 $\pm$ 0,08
1 monthly	0,021 $\pm$ 0,002	7,17 $\pm$ 0,40	2,25 $\pm$ 0,17	1,13 $\pm$ 0,07
2 monthly	0,029 $\pm$ 0,002	10,45 $\pm$ 0,84	2,57 $\pm$ 0,12	1,37 $\pm$ 0,09
3 monthly	0,119 $\pm$ 0,013	15,82 $\pm$ 0,89	4,28 $\pm$ 0,32	2,42 $\pm$ 0,15
4 monthly	0,187 $\pm$ 0,010	17,28 $\pm$ 0,73	5,06 $\pm$ 0,45	3,22 $\pm$ 0,23
5 monthly	0,201 $\pm$ 0,004	18,47 $\pm$ 0,56	5,27 $\pm$ 0,23	3,28 $\pm$ 0,17
6 monthly	0,214 $\pm$ 0,003	18,97 $\pm$ 0,67	5,66 $\pm$ 0,11	3,59 $\pm$ 0,31
7 monthly	0,226 $\pm$ 0,009	19,13 $\pm$ 0,40	6,36 $\pm$ 0,06	4,02 $\pm$ 0,26
8 monthly	0,237 $\pm$ 0,008	19,25 $\pm$ 0,42	6,63 $\pm$ 0,04	4,38 $\pm$ 0,08

As seen from the table data, during the period from 10 days to 2 months, the ovarian weight was 0.017 grams. From 2 months to 4 months, the ovarian weight increased by 0.158 grams, which means the ovarian weight increased on average by 6.44 times during this period.

During the period from 4 months to 8 months, the increase in ovarian weight was on average 0.05 grams, meaning that during this period, the ovarian weight increased by an average of 1.27 times. The increase in ovarian weight was mainly observed during the period from 10 days to 4 months, as determined in the experiments.



The length of the ovaries showed intensive growth with increasing age, as follows: From the 10-day period to 3 months, the ovary length increased by 10.23 mm, which corresponds to a 2.83-fold increase. In the following months, a decrease in this parameter was observed. On average, from 3 to 5 months, the length increased by 2.65 mm, which represents a 1.17-fold increase in ovarian length. From 5 to 8 months, the increase was only 0.78 mm, indicating a slowdown in growth during this period.

When the ovary width was monitored, it was observed that from 10 days to 8 months, the width increased, with an average growth of 3.03 times. During this period, the ovary width increased by 4.44 mm, as observed in the experiments. The main period of rapid growth corresponds to the period from 2 months to 3 months.

## CONCLUSION

The development of reproductive organs and sexual maturity in rabbits is related to the increase in body weight and length; however, this does not necessarily indicate that the rabbits are ready to reproduce. Age-related morphofunctional changes are characterized by the increase in ovarian weight, length, and width.

Phytoestrogens, particularly from *Ferula* plants, help regulate the hormonal balance in rabbits and stimulate the healthy development of the ovaries.

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