

UDK: 577.15:591.1

THE EFFECTS OF PHYTOESTROGEN COMPOUNDS ON ANIMALS

Eshmatov Gayrat Khurramovich

Scientific Supervisor: PhD in Veterinary Sciences, Associate Professor

Xasanboy Yashnarbek o'g'li Qamchibekov

Independent Researcher

Samarkand State University Of Veterinary
Medicine, Animal Husbandry And Biotechnology

Abstract. This article analyzes the effects of phytoestrogen compounds found in plants on animals. Phytoestrogens are structurally similar to estrogen hormones in animals and can interact with estrogen receptors. They may affect the reproductive, immune, metabolic, and antioxidant systems of the body. The effects of phytoestrogens depend on their type and concentration, as well as on the animal species, age, and duration of exposure. At moderate levels, some phytoestrogens may have beneficial effects on animal growth, immune status, and metabolic processes. However, when consumed in high amounts or over prolonged periods, they may cause adverse effects such as reproductive disorders, reduced fertility, and early embryonic loss.

Keywords: phytoestrogen, animals, estrogen, reproductive system, genistein, daidzein, coumestrol, immunity, livestock.

Introduction. Ensuring animal health, productivity, and high reproductive performance is one of the most important objectives in livestock production. Biologically active substances present in feed, including phytoestrogens, can have a significant influence on the animal organism.

Phytoestrogens are naturally occurring phenolic compounds found in certain plants, particularly leguminous forage crops and soybeans. Due to their molecular similarity to 17β -estradiol, they can bind to estrogen receptors and alter hormonal processes.

Therefore, studying the effects of phytoestrogens on animals is of considerable scientific and practical importance for veterinary medicine, animal science, and livestock production.

General Information on Phytoestrogens. Phytoestrogens are biologically active compounds produced as part of the secondary metabolism of plants and possess estrogen-like properties. The major groups of phytoestrogens include isoflavones, lignans, and coumestans. Genistein, daidzein, formononetin, biochanin A, and coumestrol are among the most extensively studied compounds.

These substances are found in alfalfa, clover, other leguminous plants, and soybean products. After entering the animal organism, some phytoestrogens undergo metabolism under the influence of microorganisms in the rumen of ruminants. For example, daidzein can be metabolized into equol, while formononetin can be converted into other metabolites.

Mechanisms of Action of Phytoestrogens in Animals. The primary mechanism of action of phytoestrogens is their interaction with estrogen receptors. They can interact with estrogen receptor

Multidisciplinary research and Innovation (SICMRI 2026)

alpha ($ER\alpha$) and estrogen receptor beta ($ER\beta$) and, depending on the tissue and dose, may act as either estrogen agonists or antagonists.

The biological effects of phytoestrogens depend on the following factors:

- animal species and breed;
- age and physiological status of the animal;
- type of phytoestrogen;
- amount present in the diet;
- duration of consumption;
- general health and nutritional status of the animal.

Therefore, it is not appropriate to classify the effects of phytoestrogens simply as either “beneficial” or “harmful.” The same compound may produce beneficial effects at low concentrations but adverse effects at high concentrations.

Effects on the Reproductive System. One of the most important effects of phytoestrogens is their influence on the reproductive system of animals. In particular, prolonged consumption of high levels of phytoestrogens may affect the estrous cycle, ovarian function, hormonal balance, and pregnancy.

Sheep are considered to be among the animal species that are particularly sensitive to phytoestrogens. Long-term grazing on estrogenic legume pastures has, in some cases, been associated with disturbances in the estrous cycle and reduced fertility. Although cattle are generally less sensitive than sheep, high or prolonged exposure may adversely affect ovarian function, expression of estrus, and conception rates.

In male animals, high levels of phytoestrogens may also affect spermatogenesis and reproductive hormone activity. Therefore, controlling phytoestrogen levels in the diets of breeding males is important.

Beneficial and Adverse Effects of Phytoestrogens. The effects of phytoestrogens vary depending on the dose and the physiological conditions of the animal.

Beneficial effects

- supporting antioxidant activity;
- influencing immune system function;
- promoting growth and body weight gain under certain conditions;
- stimulating protein metabolism;
- providing anti-inflammatory and other biological protective effects in some phytoestrogens.

Adverse effects

- disruption of the reproductive cycle;
- weak or silent estrus;
- reduced conception rates;
- disruption of progesterone activity;
- early embryonic loss;
- reduced sperm quality and reproductive performance.

The biological effects of isoflavones such as genistein and daidzein are also concentration-dependent. In addition to binding to estrogen receptors, genistein can affect certain enzymes, including tyrosine kinase signaling pathways.

Multidisciplinary research and Innovation (SICMRI 2026)

Effects of Phytoestrogens on the Immune System. In addition to their hormonal effects, phytoestrogens may influence immune system activity. Some phytoestrogens possess antioxidant and anti-inflammatory properties.

They may participate in reducing oxidative stress and protecting cells from the harmful effects of free radicals. However, these effects depend on the type and concentration of the compound.

Antioxidant Properties of Phytoestrogens. Genistein and several other isoflavones possess antioxidant properties. They may help reduce oxidative stress processes in the body.

This property may be relevant to the regulation of oxidative processes associated with stress, disease, high productivity, or nutritional imbalance in animals.

Importance of Phytoestrogens in Livestock Production. Plants containing phytoestrogens are important feed resources in livestock production. Although leguminous forages have high nutritional value, their phytoestrogen content should also be taken into consideration.

In particular, uncontrolled feeding of phytoestrogen-rich feeds is not advisable in breeding animals, pregnant cows, sheep, and herds in which high reproductive performance is required. Balancing the diet and controlling phytoestrogen levels can help reduce reproductive risks.

At the same time, not all mechanisms of action of phytoestrogens have been fully elucidated. Since their effects vary depending on animal species, dose, and physiological status, further research is needed to determine specific doses and safe levels of exposure.

Practical Recommendations. In livestock farms, it is not always necessary to completely exclude phytoestrogen-rich feeds from the diet. The key considerations are maintaining a balanced ration and preventing excessive intake of phytoestrogens.

Particular attention should be paid to the following factors in farms where reproductive problems are observed:

- determining the botanical composition of feed and forage;
- controlling the proportion of leguminous plants in the diet;
- regularly recording reproductive performance indicators;
- monitoring disturbances in the estrous cycle;
- providing special nutritional management for breeding animals;
- conducting laboratory analysis of phytoestrogen levels in feed when necessary.

Conclusion. Phytoestrogens are naturally occurring compounds found in plants that can exert estrogen-like biological effects in animals. They influence the reproductive, immune, metabolic, and antioxidant systems of animals.

The effects of phytoestrogens depend on their chemical structure, concentration, animal species, age, physiological status, and duration of exposure. At moderate levels, some phytoestrogens may possess beneficial biological properties; however, when consumed in high amounts or over prolonged periods, they may potentially have adverse effects on reproductive function.

Therefore, when using phytoestrogen-containing feeds in livestock production, it is important to maintain a balanced ration, monitor feed composition, and regularly assess the reproductive status of animals.

REFERENCES

1. Anderson J. J. B., Anthony M. S., Messina M., Garner S. C. Phytoestrogens and their biological effects. *Journal of Nutrition*.
2. Reed K. F. M. et al. Phytoestrogens: A review of their impacts on reproductive physiology and other effects upon grazing livestock. *Animals*. 2022;12(19):2709.
3. Morales-Ramirez M. et al. Effects of phytoestrogens on the reproductive physiology of productive species: review. *Revista Mexicana de Ciencias Pecuarias*. 2022;13:803–829.
4. The role of genistein in mammalian reproduction. *International Journal of Molecular Sciences*. 2023.
5. Effect of diets containing phytoestrogen on livestock production: nutrient utilization, carcass traits, lactational performance, and reproductive function — a review. *Molecules*. 2026.