

Morphological Indicators of The Efficacy of Phytopreparations Derived From Plants in The Treatment of Animals

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Abstract: This article examines the efficacy of phytopreparations derived from plants in the treatment of animals, with particular emphasis on their application in internal non-infectious diseases and obstetric and gynecological conditions. The significance of morphological and morphometric indicators in evaluating the therapeutic effects of phytopreparations is analyzed. In addition, structural changes observed in internal organs and reproductive organs during treatment, as well as their relationship with clinical therapeutic efficacy, are summarized.

Keywords: Phytopreparations, Medicinal Plants, Animals, Morphology, Morphometry, Internal Non-Infectious Diseases, Obstetrics, Reproductive System

Introduction

Nowadays, there is a growing interest in the use of natural remedies, particularly phytopreparations derived from medicinal plants, for the treatment and prevention of animal diseases in veterinary practice. Biologically active compounds present in plants can affect various physiological systems of the body and may exhibit anti-inflammatory, antioxidant, immunomodulatory, and metabolic properties [1]. Therefore, phytopreparations are considered promising therapeutic agents for the treatment of internal non-infectious diseases, metabolic disorders, and certain changes in the functioning of the reproductive system in animals.

The prolonged and uncontrolled use of chemical pharmaceutical agents may lead to adverse effects in the body, the development of drug resistance, and the persistence of drug residues in animal-derived products. In this regard, the scientific evaluation of the therapeutic efficacy and safety of preparations based on biologically active plant components is of considerable importance [2].

The assessment of the effects of phytopreparations on the animal body is directly associated with several veterinary disciplines. In the field of Internal Non-Infectious Diseases, pathological changes occurring in internal organs as a result of diseases and their dynamics during treatment are evaluated. In Veterinary Obstetrics and Gynecology, the functional state of reproductive organs, their morphometric parameters, and animal fertility are studied. Pathological Anatomy contributes to the identification of structural changes in organs and tissues, while Pharmacology provides an understanding of the mechanisms by which phytopreparations affect the body. Clinical Diagnostics

enables the comparison of clinical parameters before and after treatment, whereas Physiology facilitates the assessment of the functional response of the body to phytopreparations [3].

Therefore, the efficacy of phytopreparations can be comprehensively evaluated through an integrated assessment of clinical, morphological, morphometric, and reproductive indicators [4].

Research Objective

The main objective of this study is to summarize the therapeutic effects of phytopreparations derived from plants on animals based on scientific literature and data obtained from veterinary practice, to analyze their effects on clinical, morphological, and morphometric parameters, and to evaluate their potential applications in internal non-infectious diseases, obstetric, and gynecological conditions [5].

The study also aims to investigate the effects of biologically active compounds contained in phytopreparations, including flavonoids, phenolic compounds, terpenoids, saponins, alkaloids, essential oils, and other components, on biological processes in the animal body. Their anti-inflammatory, antioxidant, immunomodulatory, metabolic, and regenerative properties are considered from a veterinary perspective. Particular attention is given to the comprehensive assessment of morphological and morphometric changes in internal organs and reproductive system organs, in addition to clinical signs, in determining the efficacy of phytopreparations [6].

Research Tasks

To achieve the stated objective, the following tasks were undertaken:

- 1. Analysis of phytopreparations used in veterinary practice.** To summarize available scientific information on medicinal plants and phytopreparations derived from them that are used for the treatment and prevention of various diseases in animals, and to analyze their fields of application, pharmaceutical forms, and therapeutic purposes.
- 2. Investigation of biologically active compounds contained in phytopreparations.** To identify the major components responsible for the biological activity of medicinal plants and analyze their mechanisms of action in the animal body. Particular attention is paid to compounds exhibiting antioxidant, anti-inflammatory, immunomodulatory, metabolic, and regenerative effects.
- 3. Evaluation of the potential use of phytopreparations in internal non-infectious diseases.** To investigate the therapeutic potential of phytopreparations in selected diseases associated with the digestive, respiratory, cardiovascular, hepatic, and renal systems, as well as metabolic disorders. During treatment, the general clinical condition and physiological parameters of animals, together with the structural condition of organs affected by disease, are evaluated [7].
- 4. Analysis of the effects of phytopreparations in obstetric and gynecological conditions.** To investigate the effects of phytopreparations on the reproductive system of female animals and analyze changes in the functional and morphological condition of the ovaries, uterus, and other reproductive organs. In addition, the relationship between certain biologically active plant compounds and reproductive processes, fertilization, and fertility parameters is evaluated.
- 5. Comparison of morphological parameters before and after treatment.** To identify morphological changes occurring in the animal body before the administration of phytopreparations and after treatment. Treatment efficacy is evaluated by comparing the external appearance, shape, color, consistency, weight, and other macroscopic characteristics of internal organs [8].
- 6. Evaluation of morphometric parameters of reproductive organs.** To investigate the weight, length, width, volume, and, where necessary, other morphometric parameters of reproductive organs such as the ovaries and uterus. The obtained parameters are analyzed in relation to the physiological condition and reproductive activity of the animals.
- 7. Comprehensive evaluation of the clinical, morphological, and functional efficacy of phytopreparations.** To determine the overall therapeutic effects of phytopreparations by comparing data related to the general clinical condition of animals, the morphology of internal organs, morphometric parameters, and reproductive activity.
- 8. Evaluation of the safety and prospects for the use of phytopreparations.** To analyze potential adverse effects, duration of administration, dosage considerations, and safety aspects of phytopreparations based on available scientific evidence. The promising areas for their application in veterinary practice are also identified.

9. **Development of scientific conclusions based on the obtained data.** To summarize the efficacy of phytopreparations in the treatment of animal diseases based on clinical, morphological, morphometric, and reproductive parameters and to identify relevant directions for future scientific research [9].

Methodology

This study was conducted as a narrative literature-based review of phytopreparations used in veterinary medicine. The analysis focused on scientific publications included in the reference list and on the clinical, morphological, morphometric, and reproductive indicators described in the reviewed veterinary literature. Information was grouped according to the principal biologically active compounds of medicinal plants, their proposed mechanisms of action, their application in internal non-infectious diseases, and their possible effects on the reproductive system. Particular attention was given to macroscopic and morphometric parameters of internal and reproductive organs, including organ weight, length, width, volume, structural condition, follicular development, and reproductive outcomes. The evidence was synthesized qualitatively by comparing reported therapeutic, morphological, and functional effects and by identifying common patterns, limitations, and areas requiring further controlled investigation.

Results and Discussion

General Concept of Phytopreparations

Phytopreparations are natural products obtained from medicinal plants or their parts and rich in biologically active compounds. In veterinary practice, they are used for the treatment and prevention of various animal diseases, as well as for supporting physiological functions of the body [10]. They may be prepared from the roots, stems, leaves, flowers, fruits, seeds, or other parts of plants. The biological efficacy of phytopreparations depends on the concentration and ratio of active compounds, the plant species, and the method of preparation.

In veterinary pharmacology, phytopreparations are administered in various forms, including extracts, infusions, decoctions, powders, oils, tinctures, capsules, and tablets. The choice of pharmaceutical form depends on the properties of the active compounds, animal species, course of the disease, and intended purpose of administration. Biologically active compounds present in plant extracts may influence various physiological and biochemical processes in the animal body.

The major components responsible for the biological activity of phytopreparations include *flavonoids, alkaloids, terpenoids, saponins, phenolic compounds, essential oils, and phytoestrogens*. Flavonoids and other polyphenolic compounds are often characterized by antioxidant properties. Essential oils consist predominantly of various terpenoid components and represent an important source of biological activity. Saponins and phenolic compounds may also influence various biological processes in the animal body [11].

Of particular interest are phytoestrogens, which are plant-derived compounds that may exhibit estrogen-like biological activity. Therefore, preparations derived from plants containing phytoestrogens have attracted considerable interest in studies concerning reproductive system function, hormonal balance, and fertility in animals.

Mechanisms of Action of Phytopreparations in the Animal Body

The effects of phytopreparations on the animal body are multifaceted and cannot easily be explained by a single pharmacological mechanism [12]. Various biologically active compounds present in plants may simultaneously contribute to the reduction of oxidative stress, regulation of inflammatory processes, modulation of immune responses, support of metabolic processes, and tissue repair.

Certain phytocomponents may contribute to the reduction of inflammatory processes by modulating the activity of inflammatory mediators and cellular signaling pathways. This property provides a basis for investigating phytopreparations as components of comprehensive therapy for certain internal non-infectious diseases and inflammatory processes affecting the digestive and other body systems.

Reproductive Effects

The effects of phytopreparations on the reproductive system represent a promising area of modern veterinary research. Biologically active compounds derived from plants may influence processes associated with hormonal regulation, immune responses, and oxidative stress, thereby potentially affecting follicular development, oocyte maturation, and the condition of the endometrium.

Thus, the effects of phytopreparations can be considered as an interconnected system involving the following pathways: *antioxidant* → *anti-inflammatory* → *immunomodulatory* → *metabolic* → *regenerative* → *reproductive*

When functional changes are evaluated together with morphological and morphometric changes in organs and tissues, a more comprehensive assessment of the therapeutic efficacy of phytopreparations can be achieved [13].

Application of Phytopreparations in Internal Non-Infectious Diseases

Phytopreparations may be used as complementary natural agents in the comprehensive treatment of certain internal non-infectious diseases occurring in animals. Biologically active compounds contained in plants may have various effects on digestive processes, hepatic function, respiratory processes, and metabolism [14].

Gastritis, Enteritis, Dyspepsia, and Disorders of Intestinal Function

In conditions such as gastritis, enteritis, dyspepsia, and impaired intestinal function, certain plant components may help support digestion, reduce inflammatory processes, and normalize intestinal activity. Therefore, the potential use of phytopreparations as components of comprehensive treatment for such conditions is being investigated.

Phytopreparations may contribute to supporting certain metabolic processes in animals, reducing oxidative stress, and improving the general physiological condition of the organism. In particular, it is important to evaluate the effects of biologically active plant components on metabolic processes in conjunction with morphological and biochemical parameters.

Overall, the efficacy of phytopreparations in internal non-infectious diseases should preferably be determined not solely on the basis of clinical signs, but through a comprehensive assessment of laboratory, biochemical, and morphological parameters.

Significance of Phytopreparations in Obstetrics and Gynecology

The use of phytopreparations in veterinary obstetrics and gynecology represents an important area of research in terms of supporting the normal functioning of the reproductive system, improving the morphofunctional condition of reproductive organs, and maintaining fertility parameters in animals. Biologically active compounds present in plants, particularly phytoestrogens, flavonoids, and phenolic compounds, may influence reproductive system function through their effects on hormonal regulation, oxidative stress, and inflammatory processes [15].

In female animals, the assessment of the effects of phytopreparations primarily focuses on the morphofunctional condition of the **ovaries, uterus, cervix, oviducts, and endometrium**. In particular, follicular development and maturation in the ovaries, the structural condition of the uterine endometrium, and the morphometric parameters of reproductive organs are important indicators for assessing the reproductive potential of animals.

Morphometric Parameters of Reproductive Organs

The study of organ morphometric parameters is important for an objective assessment of the effects of phytopreparations on the reproductive system.

By comparing these parameters before and after treatment, the morphological effects of phytopreparations on reproductive organs can be assessed. Analyzing morphometric changes together with clinical and physiological parameters provides a more comprehensive understanding of the overall biological efficacy of the preparation.

Effects of Phytopreparations on Fertility Parameters

In assessing the effects of phytopreparations on the reproductive system, in addition to morphometric parameters, indicators such as sexual activity, manifestation of estrus, mating, fertilization, pregnancy, and production of offspring are also of considerable importance. The viability and general physiological condition of the offspring may also be considered additional criteria for evaluating reproductive efficacy.

The effects of biologically active compounds derived from plants on the reproductive system may be associated with their ability to modulate hormonal regulation, antioxidant defense, and inflammatory processes. Therefore, in studies of phytopreparations containing phytoestrogens, it is appropriate to evaluate not only the morphological and morphometric parameters of reproductive organs but also the actual reproductive outcomes of animals.

Evaluation of the Morphological Efficacy of Phytopreparations

Morphological and morphometric parameters are important scientific criteria for assessing the therapeutic effects of phytopreparations on the animal body. During treatment, observations of the structural condition of organs and tissues altered by disease may provide valuable information about the biological efficacy of a preparation. In this regard, macroscopic parameters of internal and reproductive organs, including their weight, length, width, volume, color, and consistency, as well as the presence of pathological changes, are evaluated.

For a more detailed morphological assessment, histological materials may be examined to evaluate the morphological condition of cells, overall tissue architecture, epithelial layer thickness, vascular condition, inflammatory infiltration, degenerative changes, and regenerative processes. These parameters make it possible to determine the extent to which structural changes caused by disease have been reduced or restored.

Comprehensive Evaluation of the Clinical and Morphological Efficacy of Phytopreparations

For a comprehensive assessment of the effects of phytopreparations on the animal body, it is important to evaluate clinical, laboratory, morphological, histological, and obstetric parameters in an integrated manner. Drawing conclusions about the efficacy of a preparation based on a single parameter may not fully reflect the complex functional and structural processes occurring in the organism. Therefore, during treatment, in addition to the general condition of the animal, appetite, body temperature, productivity, and other clinical signs, hematological and biochemical parameters should also be assessed.

Changes in clinical and laboratory parameters reflect the functional state of the organism, whereas morphological and morphometric examinations make it possible to determine how these functional changes are structurally manifested in organs and tissues. In this context, the weight, length, width, volume, color, and consistency of internal organs are evaluated, while histological examinations assess the structure of cells and tissues, epithelial condition, blood vessels, inflammatory processes, and regenerative changes. From the perspective of obstetrics and gynecology, the morphometric parameters of the ovaries and uterus, follicular development, fertilization, pregnancy, and offspring production are of particular importance.

Thus, the efficacy of phytopreparations can be assessed using the following sequence: *“phytopreparation → functional changes → morphological and morphometric changes → clinical outcome → reproductive efficacy.”*

Such a comprehensive approach contributes to integrating the effects of phytopreparations on the animal body from the perspective of various veterinary disciplines, objectively assessing treatment outcomes, and scientifically substantiating their potential applications in practical veterinary medicine.

Discussion

The results of assessing the efficacy of phytopreparations derived from plants in the treatment of animals indicate that they may exert multifaceted biological effects on the organism. Flavonoids, phenolic compounds, essential oils, saponins, alkaloids, and phytoestrogens contained in various medicinal plants may play important roles in reducing inflammatory processes, enhancing antioxidant defense, supporting metabolism, and regulating certain physiological processes. In this regard, the available data indicate that the therapeutic effects of phytopreparations should be evaluated not only on the basis of clinical signs but also in conjunction with morphological and morphometric changes in organs and tissues.

The effects of phytopreparations prepared from different plants may vary depending on their chemical composition and biologically active compounds. For example, plant preparations rich in flavonoids and phenolic compounds may predominantly exhibit antioxidant and anti-inflammatory effects. Preparations derived from plants containing essential oils may additionally influence the

functioning of the digestive and respiratory systems. Phytoestrogen-rich plant preparations are of particular interest because of their potential effects on reproductive system function, morphological processes in the ovaries and uterus, and reproductive parameters.

Among morphological parameters, organ weight, length, width, volume, and the structural condition of tissues may be considered sensitive indicators for assessing treatment efficacy. Particularly in the reproductive system, ovarian weight and dimensions, the degree of follicular development, and the morphometric condition of the uterine wall and endometrium are important as structural manifestations of functional changes occurring in the organism. Studying these parameters together with clinical and physiological outcomes allows a more detailed assessment of the mechanisms underlying the effects of phytopreparations.

From the perspective of internal non-infectious diseases, the efficacy of phytopreparations may be manifested in processes associated with digestion, liver function, respiration, and metabolism. Improvement in the clinical condition, together with a reduction in pathological changes in internal organs, restoration of tissue structure, and normalization of certain laboratory parameters, may indicate the comprehensive effects of a preparation. However, such outcomes should be interpreted with consideration of factors such as the type and stage of the disease, animal age, physiological condition, feeding conditions, and the dose of the administered preparation.

From the perspective of obstetrics and gynecology, the significance of phytopreparations is primarily associated with their potential to improve the morphological and functional condition of reproductive organs. Morphometric changes in the ovaries and uterus, follicular development, progression of the sexual cycle, fertilization, and pregnancy parameters are important criteria for evaluating reproductive efficacy. In particular, in studies involving phytoestrogen-containing plant preparations, it is important to analyze morphometric findings together with hormonal and reproductive parameters.

The main advantages of phytopreparations can be attributed to their natural origin, the diversity of biologically active compounds they contain, and their potential to exert multifaceted effects on the organism. At the same time, certain limitations should also be considered. The chemical composition of plant raw materials may vary depending on the plant species, growing conditions, harvesting methods, and storage conditions. Furthermore, standardization of preparations, determination of the precise concentrations of active compounds, and establishment of optimal doses and treatment durations remain important considerations.

Conclusion

Phytopreparations represent promising natural agents for the comprehensive treatment of certain internal non-infectious diseases in animals and for supporting reproductive processes. Their biological effects may be manifested through the reduction of inflammatory processes, regulation of metabolic processes, and improvement of the overall functional condition of the organism. In assessing the efficacy of phytopreparations, the study of morphological and morphometric changes, in addition to clinical parameters, is of particular importance. In particular, the morphometric parameters of the ovaries and uterus, together with the outcomes of fertilization, pregnancy, and offspring production, are important criteria for evaluating reproductive efficacy.

In future studies, it would be appropriate to conduct comprehensive investigations based on control groups, with standardized composition, dosage, and duration of administration of phytopreparations.

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