Int.J.Curr.Microbiol.App.Sci (2022) *11*(05): 225-229

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 11 Number 05 (2022)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2022.1105.026

Immunostimulatory Properties of Plant Extracts in the Immunoprophylaxis of Avian Infectious Bronchitis

Emma Agayeva[1], Sayyara Ibadullayeva[2*], Rustem Gasimov[1], Vidadi Narimanov[1] and Nuri Movsumova[2]

[1]*Azerbaijan Medical University, Baku, Azerbaijan*
[2]*Institute of Botany, Azerbaijan National Academy of Sciences, Azerbaijan*
**Corresponding author*

Keywords

Plant extract, *Rosa canina* L., immunostimulant

Article Info

Received:
08 April 2022
Accepted:
28 April 2022
Available Online:
10 May 2022

A B S T R A C T

A plant extract from rose hips (*Rosa canina* L.) has been studied. Its immunostimulating properties were determined and the optimal dose was established, equal to 1.5 mg/kg, as well as its effect on the biochemical and hematological parameters of the blood. The tension of immunity after vaccination in combination with a plant extract was established.

Introduction

Poultry farming is the leading livestock sector, accounting for 89% of the total meat production. The main reason hindering the development of poultry farming in our country are infectious diseases of viral and bacterial etiology.

Immunological prophylaxis of viral diseases is the most reliable means among all anti-epizootic control measures.

The effectiveness of specific prevention depends on the immunogenicity of vaccines, on features of the pathogenesis of the disease, the degree of the body's immune response to vaccination, the antigenic stability of the pathogen itself, and the characteristics of the epizootic process (Aris, 2005; Kaukhova, 2006).

Currently, live vaccines are used for the specific prevention of viral diseases, including avian infectious bronchitis related to coronaviruses, but inactivated drugs are increasingly being used as they are safer.

Live vaccines create intense and long-term immunity, but they also have disadvantages due to often post-vaccination allergic complications, increased reactogenicity, reversion, attenuated strains, in particular when strains with multiple serotypes are attenuated. A major obstacle in the use of live vaccines against viral diseases is the direct introduction into the natural environment of live,

and attenuated pathogens, which are included in the natural process of evolution, as well as the involvement of previously unknown viruses in the epidemic process (Vorobiev, 2002). As a result, the antigenic structure of viruses changes, new variants of pathogens appear and outbreaks of diseases occur.

As a result of the natural evolution of pathogens of influenza, coronaviruses, African swine fever viruses, bluetongue, under the influence of the immune system of recovered animals and humans, antigenic multiplicity of virus strains arose.

Scientists agreed that live vaccines should be prepared from genetically pure and stable strains of the virus (Kniga o vaccinatsii, 2021).

Inactivated biological products have a significant advantage over live ones, especially when immunized with vaccines against zoonotic infections - influenza, rabies, coronavirus infection (Saytar *et al.*, 2021).

The advantage of inactivated vaccines is the absence of contamination, harmlessness, antigenic stability and safety, standardization and stability during long-term storage, as well as the simplicity of the technology for the production of biological products.

The safest are deposited vaccines with adjuvants.

Currently, the arsenal of inactivated vaccines with a positive result includes vaccines against influenza in humans and animals, against foot-and-mouth disease, IBR in cattle, sheep and goat pox. Inactivated vaccines against respiratory diseases can be used in association and complex, since there is no interference between their antigens.

In the conditions of industrial poultry farming, the technogenic and microbiological load on the bird's body increases significantly.

The variability of viruses and bacteria, the rapid development of resistance to antibiotics, technological stress, intensive feeding force specialists to use drugs, immunostimulants, adaptogens.

Currently, there is a huge trend towards the use of medicinal plants (Maksyutina *et al.*, 1985; Maniak, 2004). Medicinal plants, unlike synthetic drugs, are not rejected by the body's immune system, are well tolerated, and there are no complications with long-term use.

Herbal preparations are used in the form of infusions, decoctions, extracts. Extracts - concentrates provide the maximum yield of biologically active substances, are convenient and stable in storage and use (Alvarado 2003).

However, the literature data presented on the immunostimulatory properties of medicinal plants are of a screening nature.

Based on the above mentioned, the development and use of immunostimulatory herbal preparations in order to increase the immunological reactivity of chickens vaccinated against infectious bronchitis is an urgent task of our time.

Materials and Methods

The object of the study was broiler chickens ROS308. Extract of rosehip plant – *Rosa canina* L., was used as an immunostimulant.

Plants were collected in Shahbuz district of Nakhichevan Autonomous Republic, Azerbaijan. The plant material was dried, and the moisture content of the dried material was determined according to the method described in the SP (State Pharmacopoeia, 1989).

The experiments were carried out in poultry farms (Shabran district - in the farm "saba", Ujar district - in the farm "marjan").

Birds were immunized with live and inactivated vaccines. Live vaccines have been used for broilers

and primary vaccination of breeding birds and layers in combination with Newcastle disease vaccine and separately with Cebak I Bird vaccine. Inactivated oil-emulsion vaccines were used at the beginning of the laying period in breeding birds and layers - Nobilis IB.

Vaccines were preliminarily tested for sterility, harmlessness, and immunogenicity in accordance with regulatory and technical documentation.

The birds were divided into groups, kept separately and vaccinated with live and inactivated vaccines.

In the first group, the vaccine was administered together with herbal preparation by aerosol spraying, and later on the 7^{th} day by drinking, an immunostimulant was added with drinking water.

The second group was vaccinated without immunostimulants.

After immunization, the birds were subjected to clinical examination (the mucous membranes and feather cover of birds were examined).

Birds of experimental and control groups were infected after 21 days.

The strains included in the vaccines were chosen in such a way that they fully represented the antigenic spectrum of isolates isolated in Azerbaijan.

We used the Massachusetts strain, as the most frequently and stably isolated in IB in Azerbaijan.

The largest part of the isolates (about 53%) belonged to the Massachusetts serotype, strain 793B was isolated in 40% of cases.

Live vaccines were used intratracheally, instilled into the eyes or through the nasal passages, and the spray method and the drinking water method were also used. Immunological studies included the determination of the bactericidal activity of blood serum by photocalorimetric method.

Results and Discussion

From ancient times in Azerbaijan, people kept poultry in their backyards and used their eggs, meat and fur products. National selection and genetic work has been carried out in keeping and feeding birds. Thus, disease-resistant local bird species have been obtained in accordance with various environmental conditions. These bird species also make up the national gene pool of Azerbaijan.

In addition to certain national attributes, medicinal plants have been widely used and are still used in the treatment of poultry diseases. The false fruits and flowers of the *Rosa canina* L. plant are used medicinally. Infusion of the root cleanses the body of all stones and salts, is used to weaken and destroy malaria plasmodium. Fruits and seeds are a valuable drug against tapeworms, expelling stones from the urinary tract, diuretic, rheumatism and podagra (Ibadullayeva, 2020). The plant is one of the main components in the composition of immunorestorative drugs (Kakhramanova *et al.*, 2017)

In this regard, an extract obtained from *Rosa canina* species has been studied as an immunorestorative agent. The optimal dose of a herbal preparation consisting of a dry extract of *Rosa canina* and its effect on biochemical and hematological blood parameters, as well as indicators of adaptive immunity in chickens vaccinated against infectious bronchitis, were determined in groups of broiler chickens, formed by 50 heads each, according to the principle of analogues.

Chickens of the 1^{st} group were injected with the herbal preparation Rosa L by aerosol spraying in combination with Cebak I Bird vaccine at a dose of 2 mg/kg. Chickens of the 2nd group were vaccinated without an immunostimulant. To determine the optimal dose of the plant extract, the drug was administered by drinking with water at doses of 1.5 mg/kg (group II), 1 mg/kg (group III), 0.5 mg/kg (group IV). The fifth group of chickens served as control.

Cebak I Bird – a live attenuated vaccine from strain 1/96 belonging to the IB 793B group (available in bottles of 1000, 2500, 5000 doses).

The packaging was used in 1000 doses. Immunity was formed 3 weeks after vaccination and persisted for 6 weeks after application.

The intensity of post-vaccination immunity was determined on days 10 and 45 after vaccination.

As a result of the study, a significant decrease in erythrocytes was found in all groups, except for the control (by 15% - in group I, by 12% - in II, by 10% - III and by 5% - IV) and monocytes (in I - by 2.5%, in II - by 1.5%, in III - by 3.5%, in IV - by 2.7%).

An increase in leukocytes and lymphocytes was noted in all experimental groups. In chickens of the 1st group, the number of T-lymphocytes was 7.5±1.0, in the 2nd group – 8.9±0.25, in the 3rd group – 10.0±0.60 and in the fourth – 5.3± 0.72.

The highest number of T-lymphocytes was noted in the second group at a dose of plant extract of 1.5 mg/kg – 8.8±0.25.

When determining the intensity of immunity after vaccination in combination with a plant extract, the maximum increase in antibody titer in the second group by 9% was found in comparison with other groups and with control.

Thus, the optimal dose of plant extract of the *Rosa* L., equal to 1.5 mg/kg, was determined, as well as proven immunostimulatory properties in the immunoprophylaxis of avian infectious bronchitis (Dantal Ash, 2015.).

Thus, the most pronounced effectiveness of vaccination was noted in the 2nd group in comparison with other groups, which allows us to recommend the use of this plant extract in combination with vaccines to increase post-vaccination immunity to IB.

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How to cite this article:

Emma Agayeva, Sayyara Ibadullayeva, Rustem Gasimov, Vidadi Narimanov and Nuri Movsumova. 2022. Immunostimulatory Properties of Plant Extracts in the Immunoprophylaxis of Avian Infectious Bronchitis. *Int.J.Curr.Microbiol.App.Sci.* 11(05): 225-229. doi: https://doi.org/10.20546/ijcmas.2022.1105.026