

INTENSITY OF EVAPORATION OF MOISTURE AND THE INFLUENCE OF THE UNIFORMITY OF FLOOR COMBINED FEED DURING ITS STORAGE

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The development of effective rations that ensure the highest efficiency of feeding animals determines the main task of industrial compound feed production. The main direction of the further development of feed industry enterprises is related to the solution of urgent problems of improving equipment and technology, increasing the level of fodder use of raw materials, improving quality, increasing output and expanding the range of finished products prepared for long-term storage. Increasing the productivity of animal husbandry is based on the use of compound feed balanced in terms of nutrients, vitamin, mineral, amino acid composition, the content of antibiotics, antioxidants and other biologically active substances that meet scientific zootechnical requirements. The development of effective rations that ensure the highest efficiency of feeding animals determines the main task of industrial compound feed production.

Key words: *compound feed, mixture, structure, storage, air.*

Formulation of the problem. The growing nomenclature and quantitative differences of biologically active substances in the preparation of optimal rations must be weighed in a reasonable manner and with the necessary data that take into account the age of the animals and their industrial use. Therefore, there is a problem of determining the storage conditions and the effect of external factors that act during the storage of the obtained homogeneous mixtures of compound feeds of different recipes [1,2].

Analysis of recent research and publications. Understanding the dependence of sorption and adsorption during storage of compound feed can become determining factors affecting the quality of compound feed during its storage. The uniformity of the distribution of compound feed components, which are contained in small amounts (vitamins, trace elements, antibiotics, etc.), significantly affects the feed quality of compound feed and the duration of storage. It has been proven that the lack and uneven distribution of phosphorus and calcium delays the development of the bone system and the growth of the animal. Research has established that a deficiency in the diet of certain vitamins or a group of them leads to a significant disruption of the metabolism in the animal's body, causing vitamin deficiency.

Uneven distribution of chemically pure salts and trace elements leads to inactivation of vitamins. Where the direct contact of salts of microelements and vitamins is reduced, indicators of the quality of feed, namely its completeness, are significantly improved. The main ones are frictional properties, with certain external coefficients and internal friction, granulometric composition, porosity, bulk density, density, hygroscopicity, thermal conductivity, gas permeability of air into the particles of the mixture and the volumes between them. Research has established additives that must be within the required limits and that significantly affect the homogeneity of the mixture. The particle sizes of compound feed components should be determined by the amount of feed, which is especially important for biologically active components.

Physical properties [4,5], as well as the effect of air oxygen, which is often a catalyst for processes occurring in the volumes of stored products, have a significant impact on the duration and quality changes during storage of compound feed produced according to different recipes. The porosity of the mixture of components of combined feed affects a group of indicators, the most important of which are the volumetric weight and duration of storage. The volumetric mass in the state of free filling γ_0 (g/l) depends on the stacking of the particles of the loose material and tends to decrease during grinding. Other things being equal, the higher the sparability value, the lower the volume mass and vice versa. Cracking is an indicator, the value of which depends on the arrangement of particles, geometric dimensions and surface characteristics, it is known that the presence of air in compound feed with different cracking is an interdependent indicator. With an increase in the moisture content of the particles of mixed fodder, the porosity increases, which leads to a decrease in bulk mass and an increase in the angle of natural slope [2,3].

Presenting main material. The processing of the obtained results of the performed research during the storage of loose compound feed, carried out based on the review of the works carried out in laboratory and production conditions, made it possible to obtain empirical dependencies describing the change of the main parameters that affect the storage process. If the volume of particles of loose material is taken as a unit, then the porosity C_m will be determined by the ratio of the volume of partial spaces E to the total volume of the mixture $1 + E$:

$$C_m = E/(1 + E) 100\% \quad (1)$$

As the sparability value increases, the volumetric mass becomes smaller and vice versa. At the particle density ρ , the volume mass of the mixture is determined by the expression:

$$\gamma = \rho / (1 + \delta) \quad (2)$$

Since the rate of air exchange in the space between the particles has a significant influence on the duration of storage of compound feed, then at the height h_c , the aerodynamic resistance can be determined by the following expression:

$$H = hc (acvb + bc v2b) \quad (3)$$

where v_b is the speed of air movement in the space between the particles;
 ac, bc - coefficients, the values of which are determined by the sparability.

When storing loose materials with active ventilation, a significant effect of porosity on the intensity of moisture evaporation $I B$ into the environment is known, which is determined by the size of the active surface to moisture transfer F_{m2} , the difference in pressure of saturated water vapor and ambient vapor Δp , the value of barometric pressure $H\delta$, the coefficient K_v , depending on the speed of air filtration, determined by the amount of porosity, and is expressed by the dependence:

$$I B = F K v \Delta p 760 / H \delta \quad (4)$$

Conclusions. The effect of pore size on the intensity of moisture evaporation during storage of loose compound fodder was established. It was established and confirmed that the significant influence on the intensity of moisture evaporation on the environment is determined by the size of the active surface before moisture release. As the sparability value increases, the volumetric mass becomes smaller and vice versa.

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ІНТЕНСИВНІСТЬ ВИПАРОВУВАННЯ ВОЛОГИ ТА ВПЛИВ ОДНОРІДНОСТІ СИПКОГО КОМБІКОРМУ ПРИ ЙОГО ЗБЕРІГАННІ

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Розробка ефективних раціонів, що забезпечують найвищу результативність годування тварин, визначає головне завдання промислового комбікормового виробництва. Основний напрям подальшого розвитку підприємств комбікормової промисловості пов'язано з вирішенням актуальних задач удосконалення техніки й технології, підвищення рівня кормового використання сировини, поліпшення якості, збільшення виходу й розширення асортименту готової продукції, підготовленої до тривалого зберігання.

Підвищення продуктивності тваринництва засноване на використанні комбікормів, збалансованих за живильними речовинами, вітамінному, мінеральному, амінокислотному складі, змісту антибіотиків, антиоксидантів і інших біологічно активних речовин, що задовольняють науковим зоотехнічним вимогам. Розробка ефективних раціонів, що забезпечують найвищу результативність годування тварин, визначає головне завдання промислового комбікормового виробництва.

Ключові слова: комбікорм, суміш, структура, зберігання, повітря.