

FRAGILITY OF GRANULED COMBINED FEEDS

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The compound feed industry produces compound feed by combining different ingredients (types of raw materials) in different combinations and proportions. This determines the name "combi feed". Compound feeds are composed in such a way that the disadvantages of some ingredients (low protein content, lack of vitamins, etc.) are compensated by the advantages of other ingredients. The main purpose of compound feed is to produce compound feed that meets the nutritional needs of livestock, domestic animals and poultry and ensures their growth, development and safety. The role of compound feed has increased with the development of industrial agriculture. The demand for compound feed on industrial livestock and poultry farms has increased significantly. Compound feed becomes a connecting link between nature and animals. Animals are kept in cages or stables and are deprived of contact with wild nature, so they receive all the nutrients necessary for growth and development with food. There are different types of compound feed, including loose, granulated and briquetted, characterized by such quality indicators as fragility.

Key words: *compound feed, fragility, granulation, index, moisture.*

PROBLEM

The quality and nutrition of feed must meet established standards, and the content of vitamins and amino acids must meet certain criteria. Feeds are produced in the form of loose products, pellets and briquettes, and the quality of the feed deteriorates as the fragility of the pellets increases [1,2,5].

ANALYSIS OF THE LATEST RESEARCH

Compound feed is a mixture of different feeds, pre-cleaned, crushed and separated according to a scientifically calculated recipe to ensure the most efficient use of nutrients by animals. Compound feed plays a very important role in the rational feeding of livestock and poultry. The nutritional value of feed is calculated in feed units, exchangeable energy, crude fiber and minerals, and also takes into account the ratio of energy to protein, glycoprotein, other nutrients, amino acids, vitamins and minerals [3,5,8]. The nutritional value of animal feed is achieved by balancing the nutrient content of the feed according to the criteria of energy, dry matter, protein, amino acids, vitamins and minerals. Such fodder ensures a normal physiological state of the animal body, increases productivity and reduces the cost of agricultural fodder per unit of production. The products are intended for different species and age groups of animals, as well as for pond animals and fish. Granulation ensures high feed productivity, improves taste, facilitates storage and transportation, and prevents losses in the form of dust and powder [5,7,10]. Pelleting preserves the nutritional balance of the feed, especially in terms of vitamins and minerals. Combined fodder is produced with fine, medium and coarse grinding. The degree of grinding is determined by the residue on the sieve:

- Finely dispersed feed - 2 mm in diameter, less than 5%;
- feed of medium grinding - 3 mm in diameter, no more than 12%, with holes of 5 mm; and
- Coarse grinding of feed - up to 35% for a diameter of 3 mm and up to 5% for the remaining 5 mm.

RESEARCH RESULTS

According to regulatory requirements, the quality of pelleted feed is evaluated by several indicators, including organic, mechanical and physical. It is allowed to increase the diameter of the granules by 1.0 mm, and the length of the granules should be equal to the diameter. Granulated feed must meet the requirements of national standards and other regulatory and technical documents for each type of livestock, poultry, fish and animal feed. In order to meet the above requirements, we conducted research to determine the optimal level of binders, which significantly affect the fragility of the feed, and the final moisture content of the product after the production of granulated feed. We suggested using natural corn extract as a binding agent [6,9,10]. Quality analysis was performed according to standard methods. High-quality pellets do not

crumble much. To determine the friability, 1 kg of granules are placed in a drum rotating at an average speed (25 revolutions per minute). The amount of fine crumbs before and after passing the batch through the drum is compared. The criteria for weakness varies from animal to animal. In general, for high-quality pelleted feed, this indicator should not exceed 22%. For wear analysis, 2-3 kg of granulated feed is taken. First, the granules are sieved for 1 minute on a sieve with holes of 0.8 diameter of the granule to remove small particles. Then, two 250 g weights are separated from the obtained sample and placed in the hopper of the device. The granules are scraped for 5 min and weighed on the same sieve. The difference between the initial and final mass of the granules is expressed as a percentage and is the flowability of the granules (K, %):

$$K = 250 - (a/250) 100 \quad (1)$$

where 250 is the initial mass of granules, g;
a is the final mass of granules, g.

The crushing value of the granules is determined as the arithmetic mean of two repeated tests. To determine the degree of swelling, 25 g of the suspension is taken, placed in a measuring cylinder with a volume of 500 cm³ and the volume occupied by the granules is measured. Then the granules are filled with water at 10(C) so that the level above the granules is 130 cm³, and the time for which the granules lose their shape is measured. The granules swell for at least 10 minutes. The swelling of granules takes into account the time from the moment of filling the cylinder with water to the moment of deformation of the granules. Samples with different concentrations of moisture and binder were examined and a graph was constructed that shows that 13.5% moisture and 4.5% binder best meets the given conditions.

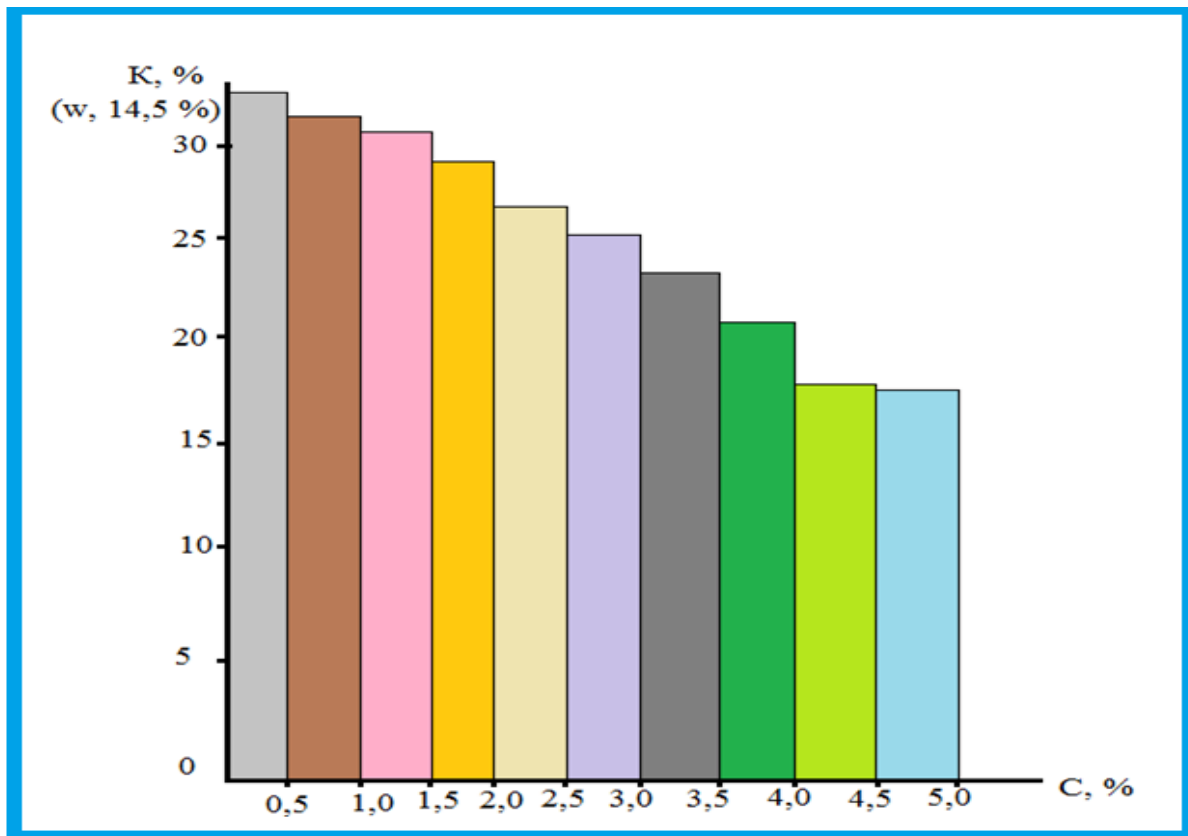


Fig. 1. Dependence of fragility of granules on binder concentration and moisture content, 14.5%.

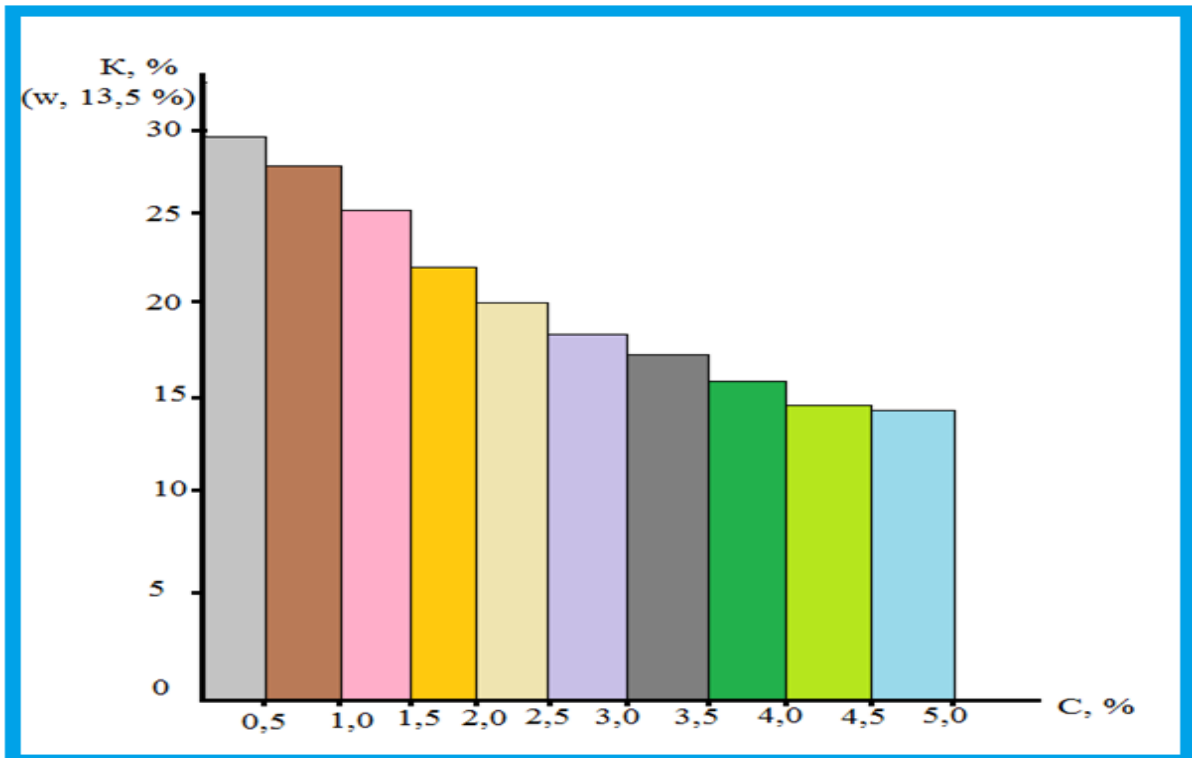


Fig. 2. Dependence of granule fragility on binder concentration and moisture content, 13.5%

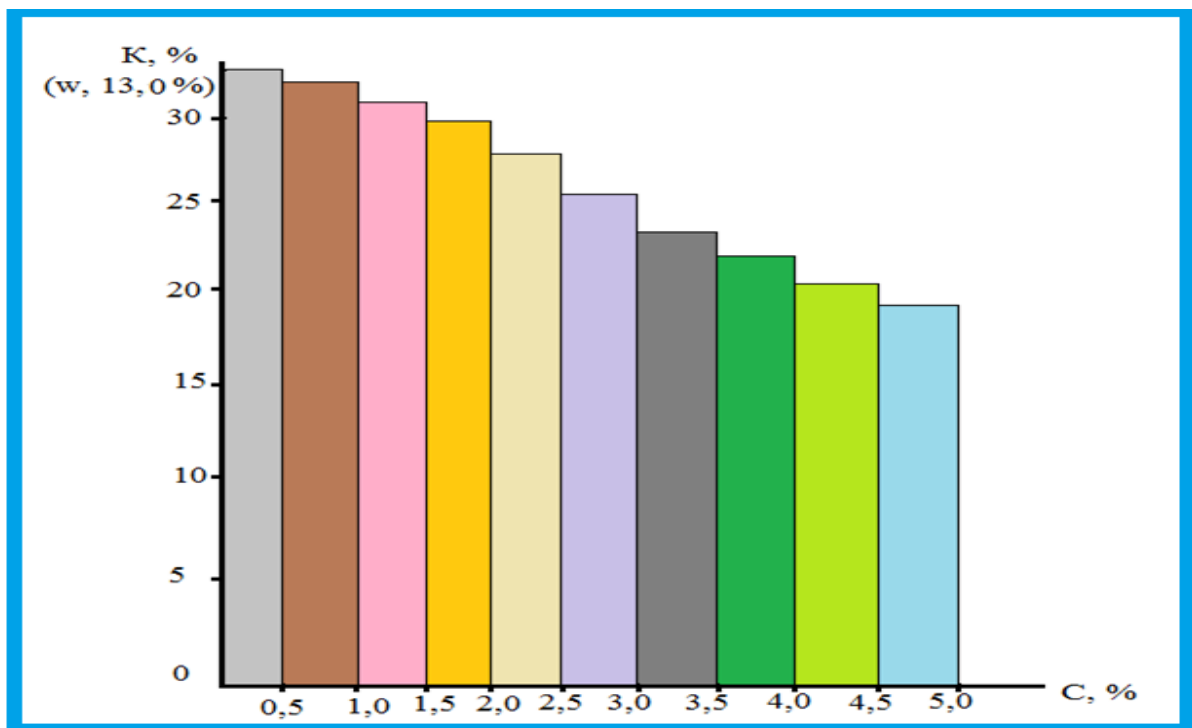


Fig. 3. Dependence of granule fragility on binder concentration and moisture content, -13.0%

CONCLUSIONS

Studies have shown that the fragility of granules is affected by humidity, while the recommended optimal moisture content is 13.5%, and the amount of binder is 4.5% of the total weight of the product.

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КРИХКІСТЬ ГРАНУЛЬОВАНИХ КОМБІКОРМІВ

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Комбікормова промисловість виробляє комбікорми, поєднуючи різні інгредієнти (види сировини) в різних комбінаціях і пропорціях. Це і визначає назву "комбікорм". Комбікорми складаються таким чином, що недоліки одних інгредієнтів (низький вміст білка, нестача вітамінів тощо) компенсуються перевагами інших інгредієнтів. Основною метою комбікормів є виробництво комбікормів, які задовольняють потреби худоби, домашніх тварин і птиці в поживних речовинах і забезпечують їхній ріст, розвиток і безпеку. Роль комбікормів зросла з розвитком промислового сільського господарства. Попит на комбікорми на промислових тваринницьких і птахівничих фермах значно зріс. Комбікорми стають сполучною ланкою між природою і тваринами. Тварини утримуються в клітках або стайнях і позбавлені контакту з дикою природою, тому всі поживні речовини, необхідні для росту і розвитку, вони отримують з кормом. Існують різні види комбікормів, в тому числі розсипні, гранульовані та брикетовані, що характеризуються такими показниками якості, як крихкість.

Ключові слова: *комбікорм, крихкість, гранулювання, показник, вологість.*