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TECHNOLOGY OF OBTAINING LIQUID FEED WITH APPLICATION HYDRODYNAMIC EQUIPMENT

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The technology of obtaining liquid fodder and hydrodynamic equipment have been developed, which will allow the production of fodder that has undergone cavitation disinfection, which can be used in the conditions of livestock complexes.

Key words: *liquid feed, humates, cavitation dispersion, suspension.*

Introduction. The successful implementation of the program to provide food to the population depends entirely on the level of development of all branches of agricultural production. In the field of animal husbandry, a special place is occupied by the preservation and qualitative indicators of the productivity of healthy adult livestock. Among the factors that determine the formation of a highly productive herd, the creation of a strong fodder base is in the first place [1].

Problem. Existing technologies often have the following disadvantages: - lack of grinding and dispersing of grain, which prevents more complete assimilation of nutrients contained in grain;

- insufficient bactericidal effect on the components of the prepared feed and the lack of fight against mycotoxins, some of which pass into meat and other products, such as milk and eggs, which are especially exposed to the accumulation of mycotoxins, and others, enhancing the effect of each other, cause the effect of toxic synergism.

Analysis of recent research and publications.

The well-known technological line for the preparation of fodder "Тухенко - Аргус" [2], which includes a sequentially connected and technologically connected reloading device, a conveyor, a magnetic column, a working container, a shredder for cyclic processing of raw materials.

The purpose of the research: substantiation of the use of potassium and sodium humates as feed additives, development based on experimental and theoretical research of hydrodynamic equipment for obtaining such feeds.

Research results. Preparation of highly digestible, high-quality fodder that has undergone cavitation disinfection for fattening pigs and young animals is a very urgent task.To animals with such a stomach, in order to preserve the best functions of the gastrointestinal tract, part of the feed should be given in its original or almost unprocessed form, and the smaller part should preferably be cavitationally crushed, disintegrated and convert part of the contained fiber into starch and possibly into sugars.

The development of a method of cavitation preparation of liquid fodder and installation for its use in the conditions of livestock farms makes it possible to produce fodder from vegetable raw materials with the addition of humates of potassium and sodium to coarse and juicy fodder; cereals and legumes and grain processing waste (crushed grain, weed seeds, etc.), (straw, hay, silage, haylage) and grain processing waste (husks, chaff, meal, cake, etc.).

The installation is based on a hydrodynamic disperser, which will convert the energy of fluid movement into thermal energy. The scheme of operation of the hydrodynamic disperser is shown in fig. 3.2. The mode of creating ultrasonic oscillations necessary for the operation of the installation can be created during the movement of liquid between the nozzle 2 and the obstacle 3, made according to a special profile. (Fig. 1).

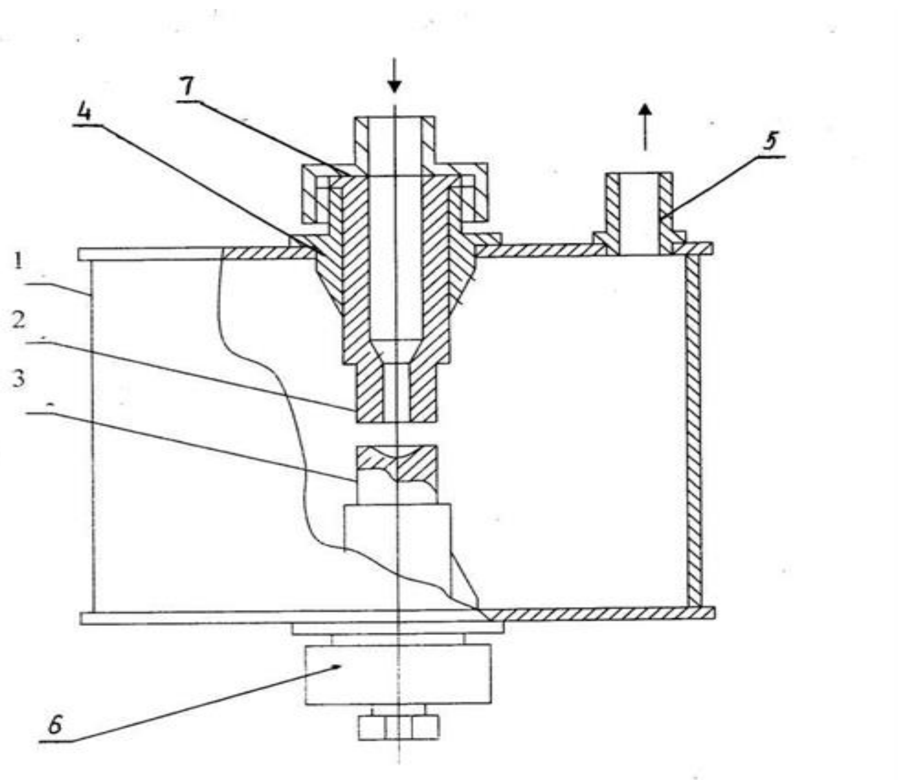

Fig. 1. Structural diagram of the hydrodynamic disperser.

The constructive optimal size of the corner corresponds

$$\alpha = arctgD - d / 2L_1 \tag{1}$$

The optimal mode of generating oscillations is observed when

the diameter of the hole on the end of the reflector is equal to two diameters of the liquid jet at the end of the nozzle, and the angle of exit of the reflected jet from the obstacle is within 35-50º.

Optimization of work is achieved by matching the depth of the hole in its diametrical section with the speed of the end of the jet in the same section [3].

$$И_к = U \frac{5{,}1 Lg\,\mathrm{Re} - 0{,}5 + 1 / CLnГL - Г / Г^2}{5{,}1 Lg\,\mathrm{Re} - 0{,}5 - 3 / 2C} \tag{2}$$

where U is the average velocity of liquid exit from the nozzle, m/s;
Re - Reynolds criterion; C is const.
The hole profile that repeats the jet profile will be optimal.

Zstr = Zopt (3)

$$Z_{cmp} = (5.11\mathrm{Re} - 0.5 + 1/CLn\Gamma_0 \Gamma / \Gamma_0)/(5.11g\,\mathrm{Re} - 0.5) \quad (4)$$

where Zстр is a dimensionless velocity equal to the ratio of the velocity at any distance Γг from the axis (0=<Γ< Γ¬0) to the velocity on the nozzle axis.

$$\mathrm{Re} = VPd/n \quad (5)$$

where P is density; n — viscosity;
Dimensionless depth of the hole profile, equal to the ratio of the depth at any distance from the axis (0=<Γ < Γo) to the maximum depth of the hole.

$$Z_{onm} = Xr/Xo \quad (6)$$

$$X_0 = \frac{1}{tg(180^0 \alpha_{omp})} \left[\begin{array}{l} \dfrac{Z_1\ Z_2 Z_3}{(Z_1 Z_2)(Z_1 Z_3) Z_1} + \dfrac{Z_2 Z_1 Z_3}{(Z_2 + Z_1)(Z_2 - Z_3) Z_2} \\ + \dfrac{Z_3 Z_1 Z_3}{(Z_3 - Z_1)(Z_3 Z_2) Z_3} + \dfrac{Z_4 (Z_1 Z_2 + Z_1 Z_3 + Z_2 Z_3}{(Z_3 - Z_1)(Z_4 + Z_2)(Z_4 - Z_3)} \end{array} \right]$$

(7)

The hole profile is defined as a curve passing through a set of points (Γг,Xг).
The resulting shape of the hole is close in shape to a paraboloid of rotation (Fig. 1). Received empirical formulas for determining the frequency:

$$f = 6V^{-1/3} \quad (8)$$

where V is the volume of the cavern (taking into account the dimensions of the jet).

(9)

$$f = 3{,}3d^{-1}$$

where d is the diameter of the nozzle, mm.
Obstacle surfaces, for the occurrence of ultrasonic vibrations, can be structurally made concave, or in some cases flat.
The speed of any jet element is determined by the ratio:
In the developed method of obtaining fodder with the addition of humates of potassium and sodium (released from peat), intensive cavitation dispersion occurs with the addition of hydroxides and carbonates of sodium and potassium and subsequent cavitation dispersion of the mixture until the temperature of the mixture, which thickens, increases.

The total content of nutrients to a certain extent depends on the quality of peat (9 should be at least 20%) and the ash content should not exceed 30%. In the case of a shortage of individual microelements in the initial compositions, it is necessary to replenish them from other sources. We offer hydrodynamic equipment for the processes of obtaining fodder with additives (Fig. 2.) works in the following way.

Peat (brown coal) after being crushed to a size of 0-10 mm, by weight dozatop 1, is fed to the belt conveyor, and then to the mixer 2. to obtain a stable process, water and alkali are added to the mixer.

The mixture that comes from the mixer to the dispenser 3 (of the described design) is subjected to intensive dispersion, heating, etc. After heating, the huminates are fed into the container. Hydroxides of these substances are also added to the mixer to obtain humates. After that, the obtained suspension is dispersed until humates are released (thickening of the initial mass.) The mass obtained in this way is moved to container 4, dosed and moved to mixer 5.

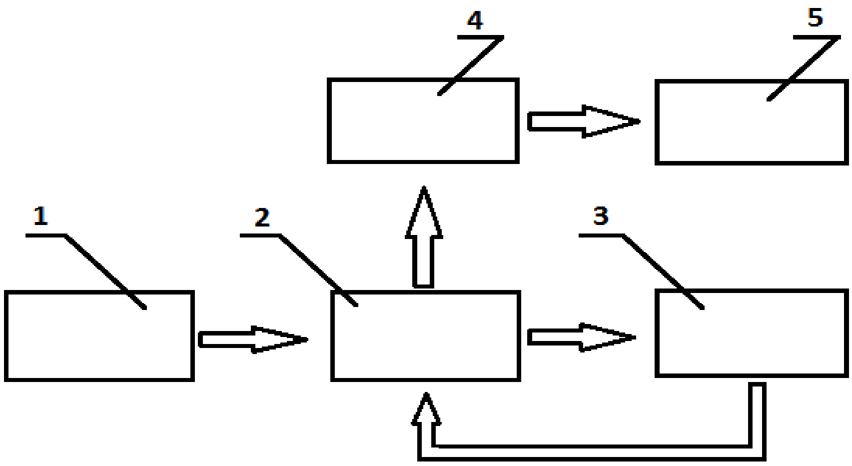

Fig. 2. Scheme of obtaining liquid feed using gyrodynamic equipment [4,6].

In terms of its effectiveness, the drug HELAFIT successfully competes with synthetic drugs, and in some indicators it has an advantage due to its natural origin and multifaceted effect on the animal's body.

The equipment for this method of feed preparation can partially be manufactured in the conditions of the existing workshops of farms.

Conclusions. The feasibility of using acoustic cavitation for technological processes of agricultural production has been established. A feed preparation facility has been developed, which contains a hydrodynamic disperser that will convert the energy of liquid motion into thermal energy. The described technology makes it possible to produce fodder from vegetable raw materials with the addition of humates to fodder; cereals and legumes and grain processing waste, grain processing waste (husks, chaff, meal, cake, etc.).

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ТЕХНОЛОГІЯ ОТРИМАННЯ РІДКИХ КОРМІВ З ЗАСТОСУВАННЯМ ГІДРОДИНАМІЧНОГО ОБЛАДНАННЯ

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Розроблено технологію отримання рідких кормів та гідродинамічне обладнання , що дозволить виготовляти корма що пройшли кавітаційне знезаражування, які можуть бути використані в умовах тваринницьких комплексів.

Ключові слова: *рідкі корма, гумати, кавітаційне диспергування, суспензія.*