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Microbiological Appraisal of Feed Meal of Animal Origin, Produced by Drying and Grinding Installation

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The article reviews the question of microbiological appraisal of feeding meal of animal origin produced by the patented drying-grinding installation (DGI). A comparison of the microbiological characteristics of feed meal, produced using vacuum boiler and new DGI. The research revealed that the total number of microbes in 1 g. of flour produced by DGI in 2 times less than the established requirements and 1,8 times less as compared to flour, produced using vacuum boiler. Improving the quality of feed meal by using DGI associated with the duration of drying and grinding of raw materials due to the uniformity of high-temperature fields and the humidity device that reduces energy costs.

Key words: Microbiological evaluation of feed meal of animal origin, High-temperature drying.

Feed meal of animal origin is one of the complete components of feed stuff. In increase of feed meal production, the use of all kinds of non-edible materials, wastes and condemned products of the meat processing enterprises and households are of special importance[1]. Dry feeds of animal origin fill the deficiency of the protein substances in vegetal feeds and enhance their accessibility[2-6]. They are characterized by their higher nutrient and feed value[7-10].

Source of veterinary condemned products, key raw material for animal feed, are parenchymatous organs with lesions of invasion (85-92% - fascioliasis, echinococcosis, dicrocoeliasis), as well as parts of carcasses in some infectious diseases (8-15% - tuberculosis, foot and mouth disease, plague, salmonella). Given the large veterinary and sanitary trouble of this raw material, becomes important heat treatment to ensure its decontamination. The suitability of a particular technological scheme (line installation) to produce the meal of animal origin should be judged by the reliability of disinfection of raw materials[11].

Animal feed due to its biological integrity is a good breeding ground for the development of various microorganisms. Despite the fact that the mode of sterilization of raw materials for feed production guarantees a semi-finished product free from pathogenic forms of microorganisms, in domestic and foreign literature reports about

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contamination of feed Escherichia coli bacteria, salmonella, toxigenic anaerobic. To date, effects on animal feed meal high bacterial contamination have been insufficiently studied. Meanwhile, the presence of different bacteria in feed meal of animal origin can cause various diseases and adversely affect the productivity of agricultural animals and birds.

Therefore, one of the main requirements to the quality of feed meal of animal origin is to obtain a feed meal of animal origin of high biological value.

MATERIALS AND METHODS

The research material was sampled the feed meal of animal origin, produced by a new line for the production of feed meal of animal flour. For microbiological quality evaluation of feed meal of animal origin was determined following indicators in the Semipalatinsk branch of the Republican Veterinary Laboratory of the Ministry of Agriculture of the Republic of Kazakhstan: determination of the total number of microbes, eneropathogenic types of E.coli, salmonella, toxigenic anaerobic sample of feed meal of animal origin.

Appraisal of the feed meal of animal origin quality[12] was executed using conventional methods: selection of samples and techniques of the animal feed meal testing according to the effective standard[13]; selection and preparation of samples and bacteriological analysis of the feed meal of animal origin according to the effective standard[14].

Sampling for bacteriological analysis carried out with dry probe in a dry sterile glass jar. Weight of spot sample was taken more than 100 g. Weight of the combined sample was taken more than 500 g. Combined sample was thoroughly mixed and divided in half. Each part packaged into a sterile glass jar. One jar had sent to the laboratory and the other retained until the end of the analysis.

To survey product was applied microstructures scanning electron microscope JSM-U3. Pore sizes were calculated on computerized automatic analysis system of the optical image. The resolving power of the applied scanning microscope did it possible to measure the diameter of the macropores that are larger than 50 nm. or 0,05 mcm.

RESULTS

The main result of the research is the line of the manufacture of animal feed meal with including composition of drying-grinding installation. Originality of technical solutions proved by innovative patents for inventions Republic of Kazakhstan.

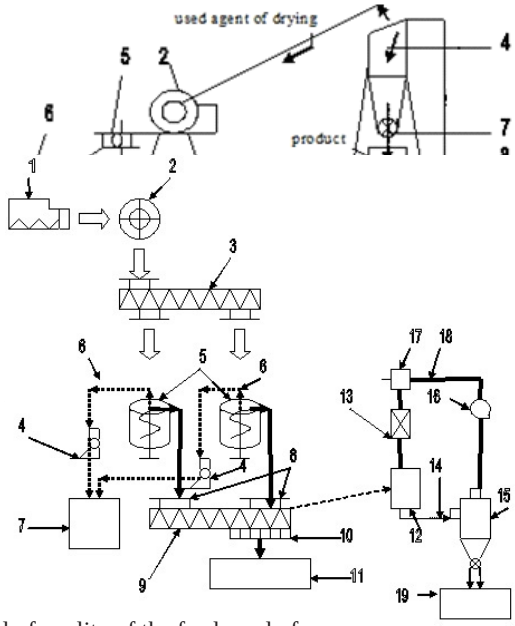
The operating principle of the developed lines for the production of meal of animal origin (Figure 1) is as follows. Waste food production, rigor chicken, condemned products, case poultry industry, were fed into the force grinder 1, diameter of hole is 50 mm, where the solid material is previously ground by shock-cutting working elements and through the magnetic metal catcher 2, which removes any metallic inclusions by a screw conveyor 3 to the boiling pans 5, where it is boiled soft, then pump 4 from the boiling pans fat drained through pipes 6 into the container 7 for collecting fat, where after the wet skimmed raw materials flows through bins 8 in a drainage device 9, where through the lattice 10 is drained the broth into the tank 11, then wet skimmed raw materials flows to the device of continuous grinding and drying the particles of bird's meat and bone meal 12. There also supplied the drying agent from the electric heating unit 13. The dried and grinded product is entrained by drying agent, generated the fan 16 and through the drying tube 14 enters to cyclone 15, were unloaded into the tare 19 of the finished product. Used drying agent which has a sufficiently high temperature after drying in water remover 17 was fed back to the electric heating unit 13.

The proposed line provides a compact, easy to repair in the new production by reducing the amount of equipment and provides a product with a high biological value due to an apparatus for grinding and drying of raw materials.

The technical result has developed apparatus is to improve the quality of the short drying and grinding of raw materials due to the uniformity of high temperature fields and humidity apparatus that reduces energy consumption and provides high-quality, biologically valuable food product[15-17].

The principle of operation developed drying-grinding installations is carried out in accordance with Figure 2. Skimmed raw materials

equally doses were loaded into machine for drying and grinding 1, where it undergoes a series of grinding rotating blades and immobileA chipping elements. As you move the processing object along the horizontal drying-grinding apparatus, particles under the influence of its rotating blades were ground repeatedly. Through another inlet nozzle directly into the working area of grinding flows hot air, injected by fan 2 through an electric heating unit 3. The same hot agent has captured air particles and by the rarefaction, created by the fan 2, has taken them out into the cyclone 4 through the separator for removing the small fraction of grinding. Large particles that do not pass through the hole of the lattice at the outlet of the DGA precipitated in the grinding zone, where subjected to regrinding. Drying each dose (12,5 kg) was carried out for 1,5 minutes during a continuous flow of hot air. In the cyclone 4, was divided a finished product and used drying agent, which was returning in a closed cycle through the dehydrator 5 to electric heating unit 3, where has been again heated and sent for drying. Additionally, in the air duct after the fan 2 is set nozzle 6 with flue damper for air delivery. Dried and grinded product through a sluice valve 7 of the cyclone 4 is unloaded into tare 8.



1 – force grinder; 2 – magnetic metal catcher; 3 – screw conveyor; 4 – impulse pumps; 5 – boiling pans; 6 – pipes for draining the fat; 7 – container for collecting fat; 8 – bins; 9 – drainage device; 10 – lattice for drain broth; 11 – tank; 12 – device of continuous grinding and drying of raw materials (DGI); 13 – electric heating unit; 14 – drying tube; 15 – cyclone; 16 – fan; 17 – water remover; 18 – air duct; 19 – tare

Fig. 1. The production line of feed meal of animal origin

Table 1. Microbiological appraisal of quality of the feed meal of animal origin, was producing on different equipments

#	Indicators	Unit	Established performance requirements	KVM – 4,6 M	DGI
1	Total number of microbes in 1 g. meal	m.c./g	No more than 500000	450000	250000
2	Coliform bacteria	-	Not allowed	Not found	Not found
3	Salmonella bacteria	-	Not allowed	Not found	Not found
4	Anaerobic bacteria	-	Not allowed	Not found	Not found

Thus the proposed DGI in line for the production of feed meal on the tests shown to be effective to produce high-quality performance feed meal of animal origin with different names.

DISCUSSIONS

The results of research by a comparative microbiological appraisal of feed meal of animal origin were generating by using the previously existing boiling pan KVM – 4,6 M and used by developed the DGI shown in Table 1.

Table 1 shows that the total number of microbes in 1 g. of meal, produced using DGI significantly less than in the meal, produced using KVM - 4,6 M, it indicates that the feeds produced by using DGI is high quality. Also, the table shows the lack of growth of E.coli group, the absence of bacteria of the genus Salmonella, the absence an anaerobic bacterias in samples of feed meal of animal origin, produced using previously existing boiling pan KVM – 4,6 M and developed using the DGI.

Records of laboratory researches are consistent with the results of foreign scientists, who believe that the optimal conditions for preservation of biological value of products subjected to heat treatment, is higher temperatures for calefaction, and at the same time reducing the time of heat treatment, rather than the cold temperatures and a longer calefaction time.

This is likely due to the fact that the heat treatment of raw materials of animal origin has a significant impact on the condition of proteins of muscle tissue, it causes a change in the ratio of different forms of nitrogen, which has not the same biological value.

During thermal processing, above all, meat proteins are subject to change, since the thermal impact changes the structure of some amino acids and they became normally metabolized in the body of the animal. Changes in the structure of proteins that occur during heat treatment can be caused by the interaction of the free amino groups of some amino acids with reducing sugars. As a result of reactions, a series of essential amino acids are partially locked. Their digestion and utilization by the body is changing, and besides the degree of changes is proportional to the intensity and duration of thermal heating. Eventually, this leads to a decrease in biological value[18].

The results of feeding produced feed meal of animal origin developed by DGI tested on laboratory mice had a positive effect. During feeding the birds in the agricultural farms of Zaysan district of East Kazakhstan Region of the Republic of Kazakhstan, manufactured meal product is not inferior to other types of feeding.

To estimate results of the research were monitored micropore structures of elaborated product, which gives the opportunity to study humidity of macro- and micro-capillary of products. According to Figure 3, the histogram shows the

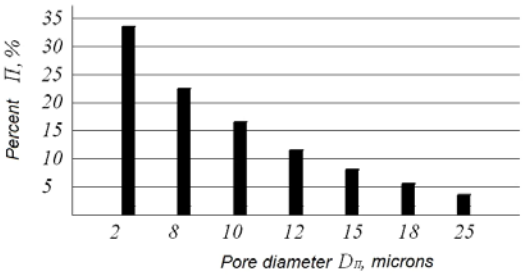
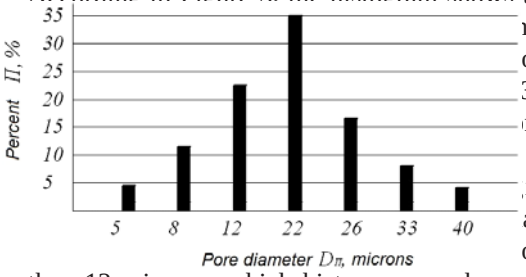


Fig. 3. The histogram for the feed meal of animal origin, produced by horizontal vacuum pan KVM – 4,6 M



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than 12 microns, which histogram as shown in Figure 4. 96% is the pores which size is more than 5 microns.

Thus, the analysis of histograms shows that the product elaborated by the horizontal vacuum pan KVM – 4,6 M has a finely porous

Fig. 4. The histogram for the feed meal of animal origin, elaborated with the help of the developed DGI

structure than the product made using the developed DGI. With decreasing particle size through grinding increases the total surface of the particles. Formation of a new surface leads to an increase in pore size, which in turn promotes mass transfer between the drying object and the drying agent. The resulting histograms clearly characterize the structure of the particles feed meal of animal origin and are one of the objective methods of assessing the state of capillary water in the product.

CONCLUSION

The feed meal of animal origin, dried using developed DGI by biological value exceeds meal, which has dried in KVM – 4,6 M. The survey revealed that the total number of germs in 1 g of flour produced using the drying-grinding installation in 2 times less than the set requirements, and 1,8 times less than the meal produced using the vacuum boiler. Improving the quality of reception meal in the drying and grinding installation due to the short duration of drying and grinding of raw materials, due to the uniformity of the distribution of high-temperature and humidity fields in the device which reduces energy costs.

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