

ADVANCED ENGINEERING IN PROCESSING OF LEAFSTALK BIOMASS OF SOWN GRASSES

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ABSTRACT

The energy saving base technological processes were substantiated and high efficient equipment for the wet fractionation of the leafstalk biomass of the annual and perennial sown grasses into the multipurpose products was designed.

Key Words : Sown grasses, Equipment, Wet fractionation, Fodder, Feed

INTRODUCTION

The numerous experience of exploitation of the technological lines and plants in Russia and other countries showed the perspective of the production of the fodder and protein-vitamin supplements on the base of the technology of wet fractionation (mechanical dehydration) of the leafstalk biomass of sown grasses "Novicov and Proydak (1989)".

The technology consists in the disintegration and fractionation by the mechanical way the leafstalk biomass into the hard fraction - the vegetable press made of plants and liquid fraction - the vegetable juice. The press made of plants is used for the laying in silage or for the production of the grass flour. The vegetable juice after purifying of the cellulose is coagulated. The obtained coagulate is fractionated on the hard fraction - the protein paste and liquid fraction - the deproteinised liquid (the brown juice).

By drying the protein paste is treated into the dry protein concentrate - the full-bodied substitute of the protein of the annual origin in the rations of the farm animals and poultry. The brown juice is used for the production of the biologically active substances, preparation of the wet fodder, straw silage and other "Dolgov and Proydak (1989)".

At the present time the plants and technological lines for the wet fractionation of the sown grasses are successfully operated in France, Italy, New Zealand, Ukraine, Russia. But the further extension of the given technology is limited by using of the power-consumed basis processes and expensive equipment.

The purpose of the present investigations is the usage of the advanced engineering in designing of the new high efficient equipment for the sown grasses treatment on the base of the technology of the wet fractionation.

MATERIALS AND METHODS

As the initial vegetable material the leafstalk biomass of the annual and perennial sown grasses was used.

With the choice of the new energy saving base technological processes of the sown grasses treatment the systemic analysis of the Russian and foreign a priori information on the given scientific trend were used "Proydak and Dolgov(1994)". With the design of the high efficient equipment the formerly worked out by us mechanical-technological principles were applied "Proydak (1990)", "Proydak (1996)".

By the experimental study it were determined the meaning of the empirical coefficients re-entering the mathematical models. On the basis of the results of the theoretical and experimental investigations the methods of calculation of the new equipment were worked out.

RESULTS AND DISCUSSION

Analysis of a priori information showed that the most energy-consuming base technological processes is disintegration of the leafstalk biomass, squeezing out of it the vegetable juice, coagulation of the juice protein, further treatment of the protein paste and brown juice "Proydak (1993)".

As the results of the numerous investigations it was the design of the new highly efficient equipment for disintegration of the leafstalk biomass - the disintegrator of the extrusion type and for squeezing out of it the vegetable juice - drum press. It was established that the usage of the equipment allows to cut on 70-85% the energy consumption on the disintegration and mechanical dehydration of the biomass "Dolgov and Proydak (1996)".

The new method of the hydromechanical coagulation of the vegetable protein was suggested. The worked out hydromechanical coagulator ensures the coagulation of the vegetable protein with the temperature lowering on 8-10 °C as compared with the traditional thermal method. This occurs because of the molecular friction of the liquid layers with the simultaneous cavitation and hydraulic impact.

The hydromechanical coagulation is especially effective with two-stage coagulation of the vegetable protein with subsequent their employment for the fodder and feed purposes "Proydak and Kireeva (1993)".

The new energy saving method and equipment for the chemical coagulation of

protein with the simultaneous preservation of the dry substances re-entering into the vegetable juice was worked out. The given method eliminates the need in the further drying of the protein paste as it ensures the possibility for its long-term storage in the aerobic conditions for 6-8 months "Proydak et al. (1995)".

For the effective employment of the brown juice the technological process was substantiated and the equipment for its concentration by the method of reverse osmosis was designed. This allows to save the native properties of the products and to cut the energy expense on its concentration on 140-210% "Proydak and Fomin(1988)".

On the basis of the results of the numerous theoretical and experimental investigations the high effective technologies and equipment for the sown grasses treatment into the fodder "Proydak (1993)" and the multipurpose products-fodder, feed, biologically active substances, new sources energy and other "Proydak et al. (1995)" worked out by us.

CONCLUSIONS

The further efforts are turned on the modification of the equipment for the large scale inculcation of the technology of the sown grasses wet fractionation into the multipurpose products. It is necessary to expend the investigations in the field of controlling the surroundings on the base of the technology of the fractionation by means of purifying of the land and water resources by means of the sown grasses from radionuclide, nitrate, nitrite, pesticide, heavy metals and other, and also reducing the level of penetration into the air of nitrogen with fermentation of the manure because the content of protein in fodders for the farm animals is decreased.

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