

## Use Of Waste Of The Fruit And Vegetable Industry By Production Of Compound Feeds

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### ABSTRACT

Results of researches on identification of chemical, amino-acid and vitamin composition of waste of the fruit and vegetable industry are given in this article: feeding meal from musts; feeding meal from waste of processing of tomatoes; feeding meal from waste of dried potatoes. Recipes of compound feeds with use of feed additive from waste of the fruit and vegetable industry are provided. Results of production tests of efficiency of use of compound feeds on the basis of feed additive from waste of the fruit and vegetable industry by the milk cows are given.

**Keywords:** compound feeds, feed additive, feeding meal from musts, feeding meal from processing of tomatoes; feeding meal from waste of dried potatoes.

### INTRODUCTION

Important condition of development of a forage production and animal husbandry is use of all available raw material resources.

Development of animal husbandry in Kazakhstan requires steady increase in production of full-fledged forages with use of all food components and additives. One of limiting factors in increase in production of compound feeds is the lack of raw materials.

Therefore for production of compound feeds it is necessary to use all available raw material resources.

In our country the inputs of grain crops in animal husbandry on a unit of production is essential, therefore use of additional raw material resources and increase of assimilability of forages for the purpose of depreciation of compound feeds is an actual task.

Substitute of scarce grain components by more available and cheap waste of the fruit and vegetable industry will allow without essential decrease in nutritiousness of ration to increase the productive qualities of farm animals.

Secondary raw material resources of vegetable and animal origins which now are waste in essence, without bringing obvious benefit, at best - they are used as fodder, but often are thrown out, worsening thereby an ecological situation [1,2].

Waste of the food industry, in most cases, in moderate quantities can be directly used in agricultural industry for

feeding of animals. They have energy and biological value, are harmless, hypoallergenic, easily give in to enzymatic and microbiological bioconversion, different types of processing. The limiting factor, thus, usually is the high content in waste of water that increases transportation cost, limits quantity of this waste in rations and does not promote of long storage of the product.

Results of experimental data [3,4,5] received at feeding of animals and poultry of waste of processing of fruit and vegetables (musts, marcs, pumpkin pressed skins, tomato pressed skins) showed that their use in compound feeds and field forage production are effective components in economy of grain and compensation of a lack of exchange and physiological energy.

All essential amino acid which quantity makes 26,6-29,8% of the total amount of amino acids are a part of must. This product differs from many other plant foods in the maintenance of a lysine - one of scarce amino acids [6].

Results of the conducted theoretical researches give the basis for a conclusion about availability of use of waste of the fruit and vegetable industry as pectin-contained raw materials, which promotes an elimination from an organism of harmful heavy elements and pesticides, and also contains a number of valuable components: fats, carbohydrates, vitamins and irreplaceable amino acids.

Pectin is useful as gastrointestinal tract is normalized work of body, and promotes decrease in level of cholesterol [7].

### MATERIALS AND METHODS

In this work we were defined the physical-mechanical properties and a chemical composition of components of feed additive: feeding meal from must; feeding meal from waste of processing of tomatoes; feeding meal from waste of dried potatoes by the following techniques: moisture content (State standard specification (SSS) 13496.3-92); content of nitrogen and raw protein (SSS 13496.4-93); content of crude fat (SSS 13496.15-97); content of crude cellulose (SSS 13496.2-91); content of calcium (SSS 26570-95); content of phosphorus (SSS 26657-97); the general sugar – (SSS 8756.13 - 87); the content of vitamin C (SSS 24556 – 89); content of pectin (SSS 29059-91); amino-acid structure on a method of a capillary electrophoresis with use of system of a capillary

electrophoresis of "DRIP"; the content of vitamins by the technique of M 04-41-2005 of making of measurements of a mass fraction of free forms of water-soluble vitamins in tests of premixes, vitamin supplements, concentrates and mixes by method of a capillary electrophoresis with use of system of a capillary electrophoresis of "DRIP -105".

**RESULTS AND DISCUSSION**

Research of physical and mechanical properties of offal of crop production was shown that they have of adverse physical and mechanical properties: at feeding meal from must the smallest volume weight is 410 kg/m<sup>3</sup>, the greatest average size of particles is 2,32mm. In comparison with other components feeding meal of waste of processing of tomatoes have also the worst physical properties, besides as a result of storage within 4-6 days the acidity of these products increases for 18-22%.

We are investigated the chemical composition of waste of processing of tomatoes, grapes and potatoes for the purpose of their use in production of compound feeds (table 1).

**Table 1 Chemical composition of waste of the fruit and vegetable industry**

№	The used raw materials	Humidity, %	Protein, %	Fat, %	Cellulose, %	Mineral substances, - 1 kg			Total sugar, %	Pectinous substances
						Ca	P	N		
1	Flour from potato waste	6,22	6,22	1,14	12,2	0,16	1,08	0,06	21,2	4,7
2	Flour from musts	9,82	9,82	2,12	17,8	0,71	0,02	0,02	26,4	2,8
3	Flour from the dried-up tomato waste	9,82	18,77	7,02	13,7	0,45	0,28	0,03	19,3	4,3

On a chemical composition the dried-up waste is equated to grain crops. Apparently from the presented data the maintenance of a crude protein in flour from potato waste is 6,22%, flour from musts is 9,82, flour from the dried-up tomato waste is 18,77%, this waste, according to the content of the main nutrients, represents a valuable forage that it is allowed to recommend them as a component of compound feeds. Besides this waste contains in the structure the pectines - 2,8-4,7%.

In table 2 there are given the results of researches of waste of the fruit and vegetable industry, used by production of compound feeds, regarding the residual contents toxic and harmful to an organism of animal elements.

**Table 2 The maintenance of toxic elements in waste of the fruit and vegetable industry, used for production of compound feeds**

№	Name of elements	PC toxic elements, mg/kg, no more	Feeding meal from musts	Feeding meal of waste of processing of tomatoes	feeding meal from waste of dried potatoes
1	Mercury	0,05	0,01	0,01	0,02
2	Cadmium	0,5	no detected	no detected	no detected
3	Lead	5,0	0,11	0,56	no detected
4	Arsenic	5,0	0,76	1,04	0,43
5	Fluorine	30,0	no detected	no detected	no detected

Apparently from table 2, the content of toxic elements in waste of the fruit and vegetable industry doesn't exceed the admissible levels established by the requirements [8] that it is testified to possibility of their use in production of compound feeds.

Results of research on the residual content of pesticides and mycotoxins were showed that in waste of the fruit and vegetable industry the content of toxic elements doesn't exceed maximum-permissible concentration and in the most cases they are absent, and residual pesticides and mycotoxins are not revealed. Thus, it is established by researches that the considered objects are ecological, differ in a good sanitary shape and can be used in production of compound feeds.

The analysis of the amino-acid structure presented in table 3 shows that the studied waste of the fruit and vegetable industry contains a big range of replaceable and irreplaceable amino acids, including: a lysine, methionine, valine and others, that it is confirmed a high nutritional value of this waste and expediency of their application in production of compound feeds.

The greatest number of a lysine contains in flour from musts - 5,13g/kg that surpasses of wheat - 1,76 times, barley - 1,28

times and corn - 2,13 times. Flour from a tomato residue is rich with amino acid – tryptophan, and it can be used for enrichment of compound feeds missing amino acids.

**Table 3 Amino-acid structure of waste of the fruit and vegetable industry**

Name of indicators	Waste of the fruit and vegetable industry		
	Feeding meal from musts	Feeding meal of waste of processing of tomatoes	Feeding meal from waste of dried potatoes
Amino-acid structure of g/kg of production			
Valin	6,38	0,70	0,11
Isoleucine	5,13	2,41	0,17
Leucine	7,63	1,09	0,31
Lysine	5,13	1,49	0,46
Methionine	2,13	0,28	0,19
Treonin	2,50	2,61	-
Tryptophan	1,13	2,79	0,18
Phenylalanine	4,88	2,43	0,21
Cystine	2,63	0,19	0,13

The content of vitamins in feeding meal from waste of the fruit and vegetable industry is given in table 4.

**Table 4 Vitamin structure of waste of the fruit and vegetable industry**

Name of indicators	Waste of the fruit and vegetable industry		
	Feeding meal from musts	Feeding meal of waste of processing of tomatoes	Feeding meal from waste of dried potatoes
Vitamin B <sub>1</sub>	0,16	12,2	0,11
Vitamin B <sub>2</sub>	0,46	3,4	3,9
Vitamin C	14,8	16,9	-
Vitamin A	7,1	7,6	-
Vitamin E	0,54	14,7	-

Results of researches of vitamin structure of waste of the fruit and vegetable industry showed that waste is rich with bioactive substances. In flour from a tomato residue is more vitamin E and vitamin C than contains in other waste.

Therefore, waste of the fruit and vegetable industry is full-fledged protein fodder sources and can be recommended as protein feed additive for all species of farm animals, and also as raw materials for the formula-feed industry for the purpose of production the full-rations compound feeds, concentrated compound feeds and fodder mixes.

It is developed the science-based recipes of feed additives from by-products of processing of crop production for different types of farm animals. Recipes include to 12,0% of feeding meal of must and to 12% of flour of processing of tomatoes, fodder from waste, to 10% of feeding meal of waste of dried potatoes, to 14% of a wheaten germ, to 12% of a corn germ, to 15% of corn gluten, to 37% of wheat bran, to 4,0% of

fodder zeolite, to 6,0% of chalk fodder, to 3,0% of table salt and to 0,03% of a preparation of pro-biotic action of "Biokons". The ratio of components in recipes defines the balancing additive of compound feeds, proceeding from resources of formation of by-products and creates conditions of receiving feed additive of a technological and stable form [9].

The analysis of the existing receipt of forages is carried out. Researches on a source of raw materials of forages for farm animals in Kazakhstan are carried out. Compound components for preparation of forages are selected.

For determination of efficiency of use of feed additive the recipe of concentrated compound feed with input of the granulated feed additive in number of 25% instead of grain components is developed for dairy cows.

Recipes of compound feeds on the basis of feed additives from secondary waste of crop production are provided in table 5. Feed additive to be entered into composition of compound feed by the grain components.

**Table 5 Recipes of compound feeds on the basis of feed additives from secondary waste of production of crop production for farm animals, %**

Components	For cattle 60-5K	
	basic	experimental
Fodder barley	21,1	11,0
Corn		
Wheat		
Fodder oats	5,0	-
Fodder flour		
Waste products of wheat 70-85	6,0	-
Wheat bran	55,2	55,2
Sunflower meal	6,5	6,5
PVC yeast		
Grass fodder	2,0	-
Tribasic calcium phosphate	1,3	1,3
Chalk	1,1	-
Salt	0,8	-
Premix	1,0	1,0
Feed additive	-	25,0
TOTAL	100,0	100,0
100 kg of compound feeds is contained:		
Fodder units, kg	83,2	84,97
Crude protein, %	15,1	16,42
Crude fat, %	3,85	4,22
Crude cellulose, %	7,81	10,49
Calcium, %	0,9	0,97
Phosphorus, %	0,95	1,1

Production tests of efficiency of use of compound feeds on the basis of feed additive from by-products of processing of crop production on dairy cows were carried out in Bayskerke "Agro" LLP (Almaty Region).

For detection of efficiency of the offered fodder it is made the experiments on dairy cows in farm Bayskerke "Agro" LLP.

Replacement in rations of cows of 25% grain components for the granulated feed additive raised average daily a milk yield

for 8,5%. During experience the content of fat in milk on groups didn't change considerably. However, thanks to high yields of milk in experimental groups it was received additional production in terms of basic fat content 15,0 c bigger than in control.

## CONCLUSIONS

For creation of feed additive from waste of the fruit and vegetable industry it was chosen and analysed the chemical composition, physical and technological properties of waste of the fruit and vegetable industry: fodder flour from potato waste, fodder flour from musts, fodder flour of the dried-up tomatoes.

On a chemical composition the dried-up waste is equated to grain crops. According to the content of the main nutrients this waste has valuable forage that it is allowed to recommend them as a component of compound feeds. Besides this waste contains in the structure the pectin substances - 2,8-4,7%.

The analysis of amino-acid structure shows that the research waste of the fruit and vegetable industry contains a big range of replaceable and irreplaceable amino acids. The greatest number of a lysine contains in flour from musts which is 5,13g/kg, that surpasses wheat on 1,76 times, barley 1,28 times and corn 2,13 times. Flour from a tomato residue is rich with amino acid tryptophan that it is possible to use it for enrichment of compound feeds missing amino acids.

It is developed scientifically grounded recipes of compound feeds with use of feed additive from secondary raw materials of processing of crop production. Recipes include to 60% of grain components, 20-25% of feed additive and to 26% of mealy raw materials.

Production tests of efficiency of use of compound feeds on the basis of feed additive from by-products of processing of crop production on dairy cows were carried out at Bayerker "Agro" LLP.

Replacement in 25% cow rations of grain components for the granulated feed additive raised average daily a milk yield for 8,5%. During experience the content of fat in milk on groups considerably didn't change. However, thanks to high yields of milk in experimental groups it was received additional production in terms of basic fat content 15,0 c bigger, than in control.

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