

# **Proceedings of the International Scientific Conference**

## **"Topical Issues of Science and Education"**

**(July 17, 2017, Warsaw, Poland)**

**Vol.1**

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**Founder:**

RS Global S.z O.O.,

Research and Scientific  
Group  
Warsaw, Poland

**Publisher Office's  
address:**

Poland, Warsaw,  
Humanska 8,

**E-mail:**

rsglobal.poland@gmail.com

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## TECHNOLOGY OF CLEANING THE MILLET

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Today Ukraine is an important player in the global market, since more than 50% of agricultural products are sold at international prices. Last several years were favorable for record yields of grain.

Millet is one of the most widespread cereals crops, which is used in feed [1] and forage purposes. In particular, millet is directed to animal and poultry feed in Ukraine, and a certain part is used for the production of cereals.

In the structure of world production millet occupies the sixth place after corn, rice, wheat, barley and sorghum. In recent years, in Ukraine, the sown of millet has significantly decreased, the volume of production is 94.6 ... 115.0 ths. tonne According to the program "Grain of Ukraine – 2015", grain production in the country in 2015-2017 will increase to 71 ... 80 million tons. The sown area of grain crops should be about 16 million hectares, including the area of sowing of millet and sorghum – 0,5 million hectares.

According to the composition of nutrients millet is not the last place among cereal crops. Thus, the composition of the grains of this plant includes: macroelements: phosphorus, calcium, magnesium, sodium, potassium, chlorine, sulfur; Microelements: nickel, cobalt, aluminum, iron, zinc, iodine, copper, chromium, manganese, fluorine, molybdenum, boron, silicon; Vitamins: PP, beta-carotene, vitamin A, vitamin B1 (thiamine), B2 (riboflavin), B6 (pyridoxine), B9 (folic acid), vitamin E.

The biological value of millet protein is at the level of maize, bean, peanut, wheat flour proteins. On the energy value, grain of millet exceeds the energy value of rice. It contains a significant amount of unchanged amino acids – lysine, methionine, tryptophan, etc. In addition, millet is rich in fiber and contributes to the improvement of digestion, the excretion of toxins and ballast substances from the body.

It is a pity that today this product is almost forgotten, since millet and products resulting from its processing have many beneficial properties.

Medicinal properties can "boast" not millet, but wheat, which is obtained from it. Therefore, it is often included in the menu of hospitals, sanatoriums and children's institutions. Cooked in the form of porridge, it has the ability to remove from the body the residual antibiotic degradation products that were taken earlier.

Poisonous cereal is useful in malnutrition, nerve diseases, liver disorders and heart disease. Wheat is able to provide sedative and booze action, dishes are useful for watery and bone damage.

Also millet is used in the treatment of:

- pancreatitis – pancreatic disease;
- hypertonic disease (at different stages);
- diabetes mellitus;
- pains with hemorrhoids;
- sinusitis and toothache.

Whatever the useful and delicious taste of a product, as a rule, there are always some restrictions for it. So, millet and other products of its processing are not recommended for those with increased acidity of gastric juice, susceptibility to heartburn or individual intolerance to millet and its products.

During the last 10 years, the cultivated area under this crop varied from 94.6 thousand hectares in 2014 year to 191 thousand hectares in 2016 year, while in 2010 they had taken almost 437.4 thousand hectares. Significant fluctuation in these years was explained mostly by the market conditions.

According to official state statistics for 2014 year, the largest area under millet was used in Zaporizhzhia (13 thousand hectares), Dnipropetrovsk (12.9 thousand hectares), Mykolaiv (11.7 thousand ha), Kharkiv (11.5 million hectares) and Kherson (11.1 thousand ha) regions. This is

explained by the fact that millet provides fairly stable yields, which doesn't depend on the weather conditions, unlike, for example, buckwheat [2].

There were favorable conditions for increasing demand for the millet for export. According to the border statistics, Ukraine exported 47.9 thousand tons of millet in September-April 2014-2015 years (in Turkey (7.4 thousand tons or 15%), Belgium (5.3 thousand tons or 11 %) and Germany (4.8 thousand tons or 10%). This is the absolute record for the marked period in the last 15 years and it exceeds in 4.5 times a same indicator for the previous year (10.7 thousand tons).

Due to the growing demand for millet abroad, the price of millet also increases depending on the season and it's quality. But unfortunately, today we have a situation, that farmers ignore the technological conditions, adapting to market requirements, what influences on the quality of the raw materials.

From farm to fork grain goes a long way [3-6]:

- purification from admixtures on grain-cleaning equipment;
- drying in grain dryers;
- grain storage in specialized granary.

The key to quality grain storage is its purification from other impurities: grain admixture, not grain-growing and plant origin, on companies of all forms of ownership. In connection with this question there was created a system of storage and treatment of grain on specialized plants – elevators.

In the classic scheme of grain purification of different crops, various grain-cleaning machines (separators) are used [3]. These include: sieve separators, sieve-air separators, air separators (aspirators), triers and stone pick-ups.

Purification is one of the main processes of post-harvest processing of millet, which increases the technological parameters of the grain and improves its stability during storage.

Therefore, it was decided to study the process of cleaning the millet, separation it by size with definition of quality indicators and improvement of separation technology by using Fadeev's sieves.

It was carried out purification a sample of millet from impurities and it's division into fractions by size and quality of grain in the laboratory conditions on the Department of grain storage technology in Odessa National Academy of Food Technologies.

We analyzed the variability sizes of main crop and impurities that was necessary to separate by thickness and width for determining the rational dimensions of sieves for efficient cleaning grain.

Based on these data, we constructed a correlation table in which the grain of the main crop and impurities are divided into classes by size (thickness and width). Analysis of correlation table allows to identify the characteristic pattern of differences between selected characteristics between major grain and it's impurities. On this basis, it is possible to determine the rational scheme of purification of the grain.

Determination of the variability of the thickness and width of millet and it's impurities in the experimental samples was performed by a sieve analysis – sifting of grain mass using sequential sieve system with rectangular holes – 2,2x20; 2,2x20; 1,8x20; 1,6x20; 1,4x20; 1,2x20; 1,0x20 mm and round holes with a diameter of 2,5; 2,0; 1,5; 1,0 mm.

The object of the study was samples of millet harvest in 2014 year, grown in Kirovohrad region.

The analysis of the data correlation table showed that 2.54% of impurities without loss of the main grain could be received from sieve 2,0x20; the sieve 1, 8x20 and 1,6x20 would remove the maximum amount of millet – 29.41 and 45.53 % respectively. The 1.4x20 and 1.2x20 sieve can be used to produce a small fraction of 8.37 and 2.66% respectively.

The content of impurities in the studied samples is 12.78 %.

The results of sieve analysis show us that the millet is sufficiently fulfilled. Therefore 29,41 and 45,53 % of the millet is received from sieve with holes 1,8x20 and 1,6x20 mm, respectively. Coarse impurities can pick up from the sieve with holes 2,0x20 – of 2.54 % and as shallow fraction from the sieve with holes 1,0x20 mm of 1.07 %.

Directly it is possibly to use grain-cleaning equipment with the above mentioned sieves for purification from impurities and separation millet by fractions on the grain cleaning line in the scheme.

Herewith heterogeneous and incomplete small fraction of millet can be used for feed purposes, and more satisfied grains – for food purposes and food production. Thanks to using fractional millet, it is possible to achieve, for example, increasing output of cereals – polished millet with high quality indicators.

Thus, as a result of the studying physical and mechanical properties of millet, it has been established that for cleaning grain on sieve or sieve-air separators, it is necessary to apply sieve with a diameter of holes in the range of 2.2...1.5 mm.

Summarizing all, we can conclude that even in difficult political, economic and natural conditions, our state still remains an important supplier of grain crops on the world market. And now

we have an important task to make the exciting technologies more modern and effective by introducing innovations and closing collaboration of researchers with industry.

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