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ANALYSIS OF THE QUALITATIVE PARAMETERS OF THE MAIN CROPS PRACTICED AT AN AGRICULTURAL COMPANY

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Abstract

In this paper, the variation of the quality indices of the seeds obtained in the period 2021-2022 at an agricultural company is tracked and the factors responsible for the defects found were analyzed. The company under study is based in Mânăstirea commune, Călăraşi county and has an area of 183.55 ha. From the crops practiced by the society, we analyzed the quality parameters of wheat, corn and barley, the main crops practiced. We carried out an analysis of the quality of the cereals sold within the company, following the values of the most important selection criteria, based on the analysis bulletins owned by the analyzed company. Almost all the qualitative parameters were included within the norms stipulated by STAS, there being small excesses in the case of some, which led to the inclusion of the barley obtained by the company in the grade 2 category.

Key words*: qualitative indices, wheat, barley, parameter, corn*

INTRODUCTION

Product quality indicators are quantitative expressions of its characteristics [2]. They are used to determine seed quality certification. This represents a set of control operations and verification in the main phases of the multiplication, conditioning, packaging, labelling and sealing process, which ensure that products, processes and services comply with specific technical rules and norms [8]. In general, this consists of: field inspection of seed crops to establish the biological value of seeds in terms of identity, authenticity, varietal purity and phytosanitary status; survey control at the main moments of the harvesting, transport and processing process; determining the technical quality conditions of the seed, including physical purity, germination, sanitary condition; sanitary control regarding the absence of harmful quarantine organisms, which is carried out directly in the field or through samples analyzed in the laboratory by the phytosanitary authority, which issues the finding documents, as well as the verification of varietal authenticity and purity in pre- and post-control, through appropriate testing methods and techniques in the laboratory or in control plots [3]. The presence of certain pests or objects of phytosanitary quarantine in the field or in the seed batch, or the presence of certain diseases that lead to affect the productivity of crops intended for seed production, is strictly prohibited [11].

Determining seed quality is important because cultivated seeds have different uses. Depending on the indications they obtain following some analyses, they get a certain use. Grains with indices that do not meet the standards are generally used for animal feed or go to export, but at a lower price. When it is intended that the grown lots are destined back to sowing, but also for the production of seeds, they must meet very good quality conditions and will go through a process of selection and appropriate treatment for each individual crop. The price of the seeds is determined by the quality that the seeds fulfil [4].

The seeds of each grown species can reach a maximum qualitative level in a complex of conditions that ensure the most favourable interactions between their genetic nature and the large number of variables from the period of their formation on the plant and from the period of harvesting, conditioning and storage [10].

The quality of the seeds is almost maximum at the beginning of full maturity and can be maintained until harvest, if the seeds are not subjected to adverse atmospheric conditions that affect both the integument as well as the embryo. Under conditions of rapid drying and rehydration, cell membranes in the embryo may overstretch and rupture [12].

A disease that frequently affects cereals and results in reduced production is powdery mildew. It appears year after year, especially in wheat, barley and rye crops [9]. If it occurs early, in autumn, it will cause a reduction in the frost resistance of the affected plants, leaf loss and affect root development and twining [7].

MATERIALS AND METHODS

The Danube River crosses the territory of Mânăstirea commune from km 412 to km 403. Mănăstirea meadow is on the left bank of the Danube, it has relatively uniform widths of 6-9 km and altitudes of 14-15m. The quasi-horizontal relief and reduced fragmentation provide conditions for the practice of agriculture [6].

The company analyzed in the present case study carries out its activity within the radius of Mânăstirea commune, Călărași county and owns an agricultural land of 183.55 ha. It is a limited liability company, the declared activities being part of CAEN category 0111 - Cultivation of cereals (excluding rice), leguminous plants and plants producing oilseeds.

The agricultural products obtained by the company are sold on the domestic market, most of them being sold through an association.

The society is located in an agricultural area with one of the most fertile soils in the region: the soil is a leached chernozem, formed on loess, with appreciable reserves of nutrients and a high degree of fertility [6]. The climatic conditions in which they develop are characterized by relatively low precipitation (450-600 mm), large contrasts between winter and summer (amplitude +25°C) and accentuated evapotranspiration. The parent rock of the leached chernozems consists of loess or leossoid deposits. The chernozems are easy to work, they offer little or medium resistance to soil work, the value of resistance to plowing at optimal humidity being 40-50 Kgf/dm². It lends itself to autumn cereals that capitalize on water reserves accumulated in autumn and winter and reaching full maturity before summer droughts [1].

In order to determine the quality of the obtained seeds, the company has its own laboratory. The analyzed period was 2020-2021, and from the cultivated crops, the quality indices of: wheat, corn and barley were interpreted.

The main parameters monitored in the work were: humidity, impurities, broken grains, sprouted grains, fusariosis attack, gluten and protein content.

The analytical methods for determining the quality parameters are provided in STAS: 1069-67 - determination of impurities, 2522-66 - identification of defects, 6280-66 - determination of grain size, 6124-66 - determination of humidity [2].

RESULTS AND DISCUSSIONS

In order to obtain maximum and quality harvests, it is necessary to sow seeds of the best quality.

The society studied in this article practices various cultures. The company's culture plan takes into account the importance of crop rotation. It is elaborated for a period of 5 years, the cultures repeating cyclically after this period.

For each of the three crops, we will analyze the main quality indices, to find out the reasons that determined a poor/good grain quality.

Grains are of good, original and commercial quality when they have the typical colour of the grain, are free from unusual odours and parasites at any stage of development, when they meet the minimum quality criteria.

Analysis of the qualitative parameters of the wheat crop

According to the analysis bulletins and the detailed grading form for wheat, we have the following indices determined in the laboratory for the 2 analyzed years: humidity, hectolitric

mass, impurities, broken grains, damaged grains, germinated grains, grains affected by Fusarium, foreign bodies, wet gluten, protein.

Table 1. Analysis of qualitative parameters of wheat crop in the period 2021-2022

Wheat crop			
Parameters	**Year 2021 Value (%)**	**Year 2022 Value (%)**	**STAS**
Humidity	11.8%	12%	14.5%
Hectolitre mass	75.4%	74.8%	Min 73%
Impurities	2,9 %	0.7%	3%
Broken grains	1.2%	1.3%	5%
Damaged grains	2.1%	2.3%	5%
Germinated grains	0.1%	0.1%	2%
Grains affected by Fusarium	0.12%	0.1%	Max1%
Foreign bodies	0.7%	0	Max 2%
Wet gluten	31%	25%	Min22 %
Protein	9	8.3 %	10 %

Source: Quality documents of the company with an agricultural profile [9].

The critical preservation humidity is 14.5 – 15%. At a humidity of 17%, the grains breathe 4–8 times more intensively than at a humidity of 14%. Berries that have reached maturity have higher moisture, but also increased enzyme activity. Sprouted grains have high moisture and high respiration energy, posing a danger to the entire mass of wheat under storage [5].

In the 2 years, the wheat had optimal moisture, which means that it was harvested on time, the grain was not unripe, to retain moisture. The wheat fell into STAS, not needing to go through the drying process.

The higher the hectolitre mass, the better the quality of the wheat. The greater the number of well-formed, healthy, whole-shelled grains, not attacked by insects, the higher the hectolitre mass value will be. big. Impurities in the grain mass can influence the hectolitre mass depending on their nature. The presence of straw, aristas, decreases the hectolitre mass, while the presence of dust and sand increases it.

The hectolitre mass is one of the price setting parameters; it serves as a basis for calculating the sizing of silage cells; it is the basic parameter of flour extractions, with an important role in establishing the yield in flour. The hectolitre mass was higher than that stipulated in STAS, but for a very good quality wheat the hectolitre mass must be over 80.

Impurities are an analysis index that disfavours the seller. A wheat containing many impurities must then go through a selection process, and the price of selecting the wheat will be borne by the seller [3].

The impurities parameter records the normal values, often found following the analyzes performed. Thus the company avoided the selection process, a process that requires time, money, equipment and labour.

At the level of broken grains, of defective grains, we observe that they do not exceed the STAS value provided for by 5%. Broken and defective grains can be due to improper harvesting operation, as well as the occurrence of diseases that do not allow the grain to develop normally.

The sprouted grains have an equal value both in 2021 and in 2022, of only 0.1%, which is due to efficient harvesting operations.

Foreign bodies do not register values above the maximum allowed value, which are 0.7% in 2021 and non-existent in 2022.

Wet gluten is determined because it provides information about the baking properties of the wheat. The STAS value is at least 22%, and from the laboratory analysis obtained it can be observed that it can be used in bakery. Flour with higher gluten content is used for superior baked goods. Low gluten content gives bakery products a smaller volume, flattened shape and a reduced shelf life [8].

Regarding the grains attacked by Fusarium wilt, we note that the values are far below the minimum provided by STAS, of 1%. Fusarium wilt is one of the most widespread and damaging diseases in grains, causing in favorable areas losses of 10-20% of production [11]. The disease occurs with great intensity in our country as well, representing a particular problem in the production of healthy seed. The pathogenic agents are facultative parasitic fungi, ubiquitous as saprophytes, humidity being the limiting

factor for them to become parasites. Apart from the ear, Fusarium species can also attack other plant organs, especially the roots and wheat seedlings. Crop losses are reflected in flower sterility and poor grain filling. The formed grains have a low 1,000 grain mass, are scaly, and are carriers of the mycelium of the fungus, through which they can contribute to the transmission of infection. To combat this disease preventively, it is necessary to deep plow and bury the plant residues of the previous year, apply nitrogen and treat the seed and use fungicides.

Protein substances usually represent 10-16% of the grain mass (with limits between 8 and 24%) and are mostly located towards the peripheral parts of the grain (coats, aleurone layer) in the embryo and scutellum. Quantity and composition proteins give the nutritive quality of the grain. The accumulation of proteins in the grain depends on a number of factors, such as: the wheat species, the variety, the climatic conditions, the natural fertility of the soil and the doses of nitrogen fertilizers used.

Through the fertilization plan, for the wheat crop, for a production of 6,000 kg/ha, the dose of N200:P100:K80 was used. Fertilization with 40 N/ha of COMPLEX 15/15/15 in autumn has a greater effect on production than if 60 N/ha of COMPLEX 5/15/15 is applied in spring. In autumn, 150 kg/ha of COMPLEX 15/15/15+3S+Zn were applied to the analyzed company.

Analysis of the qualitative parameters of the corn crop

For the corn crop obtained within the company, we analyzed the following parameters: humidity, broken grains, foreign bodies, defective grains, weed seeds.

Foreign bodies exceed the value in 2021, while in 2022 it remains within the allowed limit. Defective grains do not exceed the STAS in any of the years, but weeds exceed the STAS value in 2022.

There can be several causes for the unfavourable indicators present, the corn crop being a sensitive one when there is a lack of water in the soil.

Table 2. Analysis of qualitative parameters of corn crop in the period 2021-2022

Corn crop			
Parameters	**Year 2021 Value (%)**	**Year 2022 Value (%)**	**STAS**
Humidity	17.2%	12.8%	17%
Broken grains	2.2%	3.5%	2%
Foreign bodies	1.2%	1%	1%
Damaged grains	0.2%	0.4%	1%
Weeds	0.5%	1.5%	1%

Source: Quality documents of the company with an agricultural profile [9].

Corn culture is sensitive when it does not have enough water in the soil, which can lead to the above unfavourable parameters. Drought is one of the main enemies, because the lack of water in the soil in time does not favour the development of corn grains, as well as the lack of some substances from the soil, necessary for their development.

Corn is stored in silos, at a humidity lower than 14%. Marketers are generally looking for corn that has a moisture content of between 13 and 14% and a percentage of broken kernels of no more than 2%. In order for the corn to reach a humidity required by the market, in some cases special drying equipment is used. Also, in order to keep the corn in good condition in the warehouse, various phytosanitary products designed specifically for this purpose can be applied.

The seed from the corn crop, at the analyzed company, was treated with Royal ECO 42S and MAXIM XL 035 FS.

According to its productive potential, maize extracts from the soil, for 1000 kg of grains and related secondary production, 22-32 kg of N; 8-16 kg P_2O_5; 22-32 kg K_2O; 10-12 kg CaO and 4 kg MgO. It is a plant, therefore, with an important need for N and K, and it has been proven that among the microelements it is sensitive and effective first of all when applying zinc, but also boron.

Analysis of qualitative parameters of barley culture

According to the analysis reports, the barley culture registered the following values of the quality parameters (humidity, hectolitre mass, impurities, broken grains, damaged grains, germinated grains, foreign bodies):

Table 3. Analysis of qualitative parameters of barley crop in the period 2021-2022

Barley crop			
Parameters	**Year 2021 Value (%)**	**Year 2022 Value (%)**	**STAS**
Humidity	12.54%	16.20%	14%
Hectolitre mass	66.62%	54.60%	60-62%
Impurities	7.9%	12.6%	10-12%
Broken grains	2%	1.6%	3-5%
Damaged grains	16.1%	6%	8-12%
Germinated grains	0	0	3-6%
Foreign bodies	1.8%	2%	3-4%

Source: Quality documents of the company with an agricultural profile [9].

The humidity for the barley crop, the best was recorded in 2021, when it had a value of 12.54% and did not exceed the STAS of 14, and the lowest value, which disadvantages the farmer, was recorded in 2022, when it had a value of 16.2%. Fees are charged for the difference from the normal value, for drying the barley.

From the point of view of the hectolitre mass, for the barley crop, the best value was in 2021 when a value above the minimum allowed limit was recorded, and the weakest was recorded in 2022, with a decrease of almost 10% from the normal value.

The impurities with the best value were also recorded in 2021, and the barley with the most impurities, which affects the entire production and causes losses from the total harvested, was in 2022.

Impurities can appear for several reasons: the lack of important substances from the soil and the appearance of weeds that retain moisture in the barley culture, foreign bodies and other foreign seeds, the inadequate herbicide, the lack of rain and the improper adjustment of the combine that harvests it - can cause losses as well as grain breaks.

Broken grains, sprouted grains, as well as foreign bodies did not exceed the limit in any of the years, while defective grains affected the production of 2021, when a value above the standard was recorded, which determines the inclusion of barley in the category of Grade 2 - a worse qualitative barley.

For 100 Kg of grains and related secondary production, barley consumes 2.4 – 2.9 kg of N; 1.1 – 1.3 kg P_2O_5 and 2.1 – 2.8 kg K_2O. In spring, the rate of absorption is intense, which determines that in the months of April - May (straw formation), the barley absorbs approx. 83% of nitrogen, 84% of phosphorus and 87% of potassium. The determination of the doses of fertilizers is done as with wheat, taking into account the level of the desired production and its destination (forage or malt), the fertility of the soil, the cultivated variety. The setting of nitrogen doses is done very carefully, avoiding the fall of the plants, which in barley causes very high harvest losses.

CONCLUSIONS

In conclusion, following the analysis of the qualitative parameters recorded in the two years, we can say that the exceedances compared to STAS existed, but in a small percentage and only in some of the analyzed parameters.

The best wheat from the point of view of hectolitre mass, impurities, the protein it contains and gluten is the wheat from the year 2021. It presents the qualities of a superior wheat through its characteristics. In the other year, 2022, values were approximately equal, but not as good as those of the previous year.

For the corn crop, the year 2022 was much better than the year 2021, the quality indices of this year being included in the STAS.

For the barley crop, of the 2 analyzed years, the best crop was recorded in the agricultural year 2021, and the one in 2022 included barley in the grade 2 category. This year we found a contaminated barley, with many impurities of organic and inorganic nature, which affects the entire production and causes significant harvest losses.

In the future, I recommend the company's staff to carry out a more careful work of the soil, as well as weeding, timely fertilization of the crops, but also the use of quality products.

In order to carry out all the works on time, it is recommended to purchase new, more efficient machines and increase the area of land both owned and leased, as well as the

practice of new crops, because its positioning is in the South-Eastern region of the Romanian Plain and we know very well that the soil is suitable for the diversification of crops, so it is a very big advantage in business optimization.

Regarding the quality of the seeds, it can be observed that the values fall within the STAS values and do not present a threat. Owning an analysis laboratory is a strong point for the object of activity, because they can very easily monitor the parameters of the quality indices.

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