ASPECTS REGARDING THE ASSURANCE OF SEED QUALITY INDICATORS IN AGRICULTURAL RESEARCH UNITS

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Abstract

The quality of products and services has become a determining factor of organizations' competitiveness. Making progress in improving the quality of products and services must be a priority concern for the entire economy. Currently, "quality management" is emerging more and more as a profitable solution for the development of organizations of any kind. The production of seeds with excellent quality characteristics depends on the scientific basis of activities in the field of seeds, including, on the one hand, the theoretical basis of genetics, seeds breeding, and on the other hand, the activities of obtaining through in-depth understanding and the application of modern methods of conservative selection. This knowledge is necessary for the permanent maintenance of the genetic structure and biological value at the initial level of the genotypes of agricultural plants. In this sense, it is necessary to apply specific techniques for the production, processing and preservation of seeds. In order to achieve these objectives, the accumulated knowledge must be optimally applied to the entire process of seed production, starting with the selection of typical plants from varieties and research in the field of conservative selection, obtaining it from the breeder's seed until ensuring the necessary certified seed. Seed quality testing is carried out by seed testing laboratories that have been authorized for this purpose by the competent authority. Official certification is achieved by issuing field inspection documents and laboratory analyzes (tests) and by applying official labels to packages containing seeds that meet the quality conditions provided for in the rules, by species or groups of species, or, as the case may be, of official vignettes and possibly seals.

Key words: quality, quality management, seed production, quality indicators

Along with the elements of production technology, biological elements such as plants and animals are also used in agriculture. Therefore, the productive process in agriculture will have to take into account the restrictions imposed by the biological factor. Biological processes are carried out on agricultural holdings, which makes it necessary to use energetic measures to regulate and prevent deviations from the normal development of plants and animals caused by diseases and pests (Brezuleanu S., 2009).

The well-defined export of agricultural products to the world market and ensuring guaranteed export efficiency makes agriculture impressive by its complexity and importance in the contemporary economy and is recognized by all countries of the world, regardless of the level of economic development (Dumitriu Iuliana M., 2020).

The quality of products and services has established itself as a main goal of the organization's copetitivity. Making progress in improving the quality of products and services must be a priority concern for the entire economy. Nowadays, "the quality management" it is increasingly emerging as a profitable solution for the development of organizations of any kind. The coordinating role rests with top management, but the implementation of quality management is carried out with the participation of all members of the organization.

The quality of products and services – as a result of a collective process, with the participation of many objective and subjective factors – is achieved following a cyclical, complex process, in which all the activities of the enterprise participate, starting with research and continuing with the design, preparation of the technological process, procurement of raw materials and materials, ensuring human resources, actual production or supply, control of the technological process (inspections, analyzes, tests, samples), sale of products, service.

The cycle of activities listed, restarts each time and is based on a higher informational basis, which allows the quality to be recorded on an evolutionary spiral, known in the literature as the "quality Spiral" (Teodoru T., 1996; Maxim E., 1998; Pop Cecilia, 2009).

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MATERIAL AND METHOD

This study aimed to analyze and present the main quality parameters of seeds in agricultural research units.

The main objectives were represented by the presentation of the biological material with superior genetics obtained in a research-development station (as activities having the presentation of the Vaslui Meadows Research-Development Station and the presentation of the main biological categories of seeds that can be obtained in this type of units) and the presentation of quality parameters by means of which the seed material is characterized from a qualitative point of view (as activities having the pre-consideration of the elements of legislation in force and the presentation of the main quality parameters analyzed in seeds).

RESULTS AND DISCUSSIONS

1. The presentation of Vaslui Grasslands Research-Development Station

Vaslui Grasslands Research-Development Station It was established in 1981 on the basis of the Decree of the Council of State No. 170, with a land fund of 1030 hectares. Since 1990, GRDS Vaslui has decreased its areas as a result of the occupation and restitution of land, currently reaching 253,54 ha.

Regarding the activity of creating *Bromus inermis* Leyss., Agropyron pectiniforme Roem. et Schult and *Onobrychis viciifolia* Scop. new varieties, the unit has obtained the approval and patenting for the following species (sainfoin: Ana Maria and Sersil varieties, smooth bromegrass: Doina, Olga, Mihaela varieties, Iulia Safir and Maia Safir and crested wheatgrass: Flaviu variety). Since 2019 the smooth bromegrass variety Vaslui 8 is being tested in five centers for approval and patenting (currently the third year of testing).

2. The main biological categories of seeds that can be obtained in research-development units

One of the main concerns of the research stations is one or more activities related to "the production of seeds of higher biological categories, with biological and phytosanitary qualities corresponding to quality standards, for species of cereals (common wheat, durum wheat, rye, triticale, barley, autumn barley, rice, maize and sorghum); grain legumes (soya, beans, peas); technical plants (sunflower, oil flax, in fiber); forage plants (grasses and legumes, annuals and perennials) and medicinal and aromatic plants.

The production of seeds with excellent quality characteristics depends on the scientific basis of seed activities, including, on the one hand, the theoretical foundations of seed genetics, improvement and production, and on the other hand, the activities of obtaining through the in-depth understanding and application of modern conservative selection methods. This knowledge is necessary for the permanent maintenance of the genetic structure and biological value at the initial level of agricultural plant genotypes. In this regard, specific techniques for the production, processing and preservation of seeds are required.

In order to achieve these objectives, the accumulated knowledge should be optimally applied to the entire seed production process, starting with the selection of typical plants from varieties and research in the field of conservative selection, obtaining it from the breeder's seed until the need for certified seed is ensured.

The whole process is long lasting, stretching over a period of 5-6 years, during which the following breeding fields are organized: Maintenance fields (over a period of 1-3 years), pre-basis fields (over a period of 1-2 years), lots for the production of basis seed (for 1 year) and those for the production of certified seed (C_1, C_2) (Băcanu C. și colab., 2019).

RDSM Vaslui it must correlate the production of leguminous and perennial grassland grasses seeds of higher biological categories with market demand, so as not to create stocks which may soon become non-compliant. Seeds of perennial legumes of meadows with certificate issued by Vaslui Territorial Inspectorate for the Quality of Seeds and Planting Material. For example, the biological category PB G_1 (pre-base generation 1) after one year of storage become non-compliant by decreasing the qualitative indices, in particular seed germination.

Depending on the provenance, the seed categories tested are:

Basis seed - means seed of the inbred line or approved variety produced under the direct responsibility of the breeder, according to the official scheme of conservative selection. This seed is the main source of production of certified seed. In order to enter the breeding process, this seed needs the act guaranteeing authenticity and health status, issued by the research unit. This act constitutes the first official act of origin of the basic seed.

Certified seed - means seed possessing the biological value act (SEM C_1 - SEM C_4), or the varietal purity certificate (for imported seed) issued by the approving inspectors, basis on field checks, where biological purity and phytosanitary status have been observed. The certified seed comes from the basis seed.

Higher Biological Category - includes the categories and stages of seed production for the Super elite basis, the Superelite (pre-basis seed) and the elite (basis seed).

Lower biological category - includes all certified seed belonging to propagating or micropropagation.

Identified seed - means the seed from cultivation originally intended for consumption and which subsequently, based on field checks, in relation to general status, authenticity and phytosanitary status, the approving inspector draws up the recognition report (SEM C_5). This seed category has two restrictions:

a) Certification is made only on the basis of the approval of the Ministry of Agriculture and only in years with deficits in the seed of the respective species. The approval of the Ministry of Agriculture shall state the quantity of seed to be identified;

b) The seed identified shall be used as seed for that species only in that year, without the right to multiply for subsequent years.

Uncertified seed - is similar to the seed identified with the difference that the approving inspector identifies the seed only in warehouses, without the possibility of performing field controls. In this case, the recognition report shall be drawn up only on the basis of the verification of the authenticity and phytosanitary status of the seed concerned. This seed category must also meet the same restrictions as the seed identified.

Commercial seed for hybrids - F_1 - is the F_0 seed obtained on the hybridization lots (HS; HT; HD), intended for the production process, which guarantees high yields due to the maximum heterois effect of hybrids in the F_1 generation (Varga P. și colab., 1976; Moga I., Schitea M., 2005; Muntean I., 2012).

3. Legislation elements at the moment

According to Law 266/2002 "on the production, processing, control and certification of quality, marketing of seeds and propagating material, as well as testing and registration of plant varieties", republished in Romania, there is and operates a regional, territorial and county network of specialized structures, which through their activity organizes, controls and certifies the entire "Annual national program for the production and multiplication of seeds and planting material".

In accordance with Law 266/2002:

a) ***The production of seeds and planting material means obtaining higher biological categories as***:

- Pre-basis seed - I (supererite base) - for autogame plant varieties;
- Pre-basis seed - II (supereritis) - all varieties of autogamous;
- Basis seed (elite) - all varieties of autogamous and allogamous plants;
- Seed of inbred lines or homozygous lines as parental forms for simple commercial hybrids (F_1);
- Seed of simple hybrids - parental forms for dual and commercial trilinear hybrids (F_1);
- mutant and polyploid lines intended for commercial hybrids;
- homozygous lines intended for polycross of synthetic varieties, etc.

b) ***Multiplication of seeds and planting material means obtaining lower biological categories (seed intended for cultivators). These categories are***:

- Certified seed 1st year (C_1) - coming from elite basis seed;
- Certified seed 2nd year (C_2) - derived from C_1seed (I1);

Commercial seed F_1 for simple hybrids (HS), double (HD), trilinear (HT);

- Seed of synthetic varieties (C_1, C_2, etc.) of perennial fodder plants.

The multiplication activity is carried out by the research stations and specialized economic agents, proposed by the county structures (Territorial Inspectorate for the Quality of Seeds and Planting Material) and approved by the Ministry of Agriculture and Rural Development. The certification documents of these biological categories shall be drawn up and issued by the state inspectors, who belong to the Territorial Inspectorates for the Quality of Seeds and Planting Material.

The agricultural production process has a permanent character, which requires that the production and multiplication of seeds be carried out year after year, needing the links of each stage. It is not allowed to interrupt this cycle of seed production and multiplication because this activity maintains the stability and the possibility of resuming the production process each agricultural year.

The main objectives in the production and multiplication of seeds are:

- maintenance of the genetic structure, production capacity and resistance characteristics of all varieties at the level at the time of approval;
- preserving the biological purity of parental forms and ensuring a high degree of hybridization of commercial seeds;
- maintaining a good phytosanitary condition of seeds of the variety / hybrid existing in the crop;
- ensuring full and permanent supply of the necessary quantities of seeds of high biological value.

In Romania, the multiplication of seed and planting material for cereals, technical plants and fodder plants is regulated by order No. 350/2002 "for the approval of the technical rules and norms regarding the production for marketing, processing, control and quality certification, as well as the marketing of cereal, oilseeds and textiles, fodder plants, beet, potato and vegetables', completed in the case of fodder plants with order no. 155/2010 "on the production for the marketing and marketing of fodder plant seed". These elements of legislation are harmonized in accordance with the relevant legislative requirements of the European Union.

A modern and efficient seed multiplication system must meet the following three requirements:

a. the development of appropriate technology for the multiplication of seed of each variety/hybrid in all plant species cultivated;

b. ensuring a permanent and efficient collaboration between state-approved, technical staff and improvers;

c. introduction of precise rules on quality control and seed certification, in line with the genetic characteristics and the way in which each grower is obtained.

4. The main quality parameters analyzed on seeds

Seed crops for the production of seed intended for marketing, at the request of the multiplier, are subject to field inspection by Territorial Inspectorate for the Quality of Seeds and Planting Material and the Central Laboratory for the quality of seeds and propagating material Bucharest or under their supervision.

The biological categories of seed to be inspected shall be all descendants of the breeder's seed: pre-basis, basis, certified, first, second and third generation certified, taking into account the particularities by species or groups of species.

Official certification shall be achieved by issuing field inspection documents and laboratory analyze(s) and by applying official labels or, where appropriate, labels to packages containing seeds which comply with the quality conditions laid down in the rules, by species or groups of species, or, where appropriate, official vignettes and possibly seals.

In these biological categories of seeds are analyzed, as main physical and biological parameters: humidity, purity, 1000 grains mass, hectoliter mass, cold-test, viability, health status and longevity.

Seed humidity (U). Moisture is expressed by the percentage of water in the seeds, which conditions the process of storing the seeds. Knowledge of moisture is of great importance for determining the optimal date of mechanical harvesting of crops, for receiving, compartmentalizing, conditioning, determining the thickness of the product storage layer and for establishing legal losses through storage when stocks are liquidated.

Seed purity (P). Purity is the percentage of pure seed of the species or variety analyzed, relative to the weight of the sample analyzed. The pure seed comprises the seeds of the varieties and varieties of the species to be analyzed, if they are normally developed and have the whole skin, capable of giving a normal plant.

Impurities are grouped into 3 categories: Seeds of other crop plants (a_1); weed seeds (a_2); inert materials (plant fragments, embryo-free seeds, dead insects, earth, sand, etc. (a_3).

Purity is important because it gives indications on the quality of the seed and serves to calculate the number of seed per hectare.

Mass of 1000 grains (seeds or fruits) (MMB). This is the weight of 1000 grains in grams at the moisture content of the seeds at the time of determination. It is important because it gives an indication of the quality of the seed and serves to calculate the number of seed per hectare.

Germination of seeds (G). Germination is expressed by 2 indices: germination capacity and germination energy.

a. Germination capacity (germination faculty) is the ability of pure seeds to germinate normally when placed in optimal conditions of humidity, temperature and air. The germination capacity is determined after a specific time interval for each plant (7-14-21 days) and expressed as a percentage.

b. Germination energy is the ability of the seeds to germinate in the shortest time possible and is expressed by the percentage of seeds germinated normally within a time between 1/3 and 2 of the established duration of the germination capacity, by species.

This quality of the seed is influenced by internal factors, such as species, variety, state of health, age, storage mode, tegument structure, etc.

Cold test. The ability of seeds to germinate in cold and moist soil is conditioned by genotype, seed quality, seed or soil pathogens and their treatments. Compared to germination, which expresses the best expected rising potential, the cold-test estimates the minimum rising capacity expected from a batch of seeds when sown under conditions of temperature and humidity in the field.

Viability: The viability of seeds is expressed in the percentage of viable germs and is determined when a rapid orientation on a batch of seeds is required or when the seeds are in germination rest.

Health status. The sanitary condition of the seeds characterizes the quality of the seeds, in terms of contamination of the seeds with diseases or pest infestation. This is very important because the presence of quarantine organisms is prohibited and the attack of harmful organisms must be limited.

The purpose of determining the health status is to establish in the laboratory sample harmful organisms whose presence is limited by current technical standards and norms; to identify the pests present in the laboratory sample and to assess the infestation of seeds with visible or hidden forms thereof; identification, in the laboratory sample, of the various seed pathogens and determination of the degree of infection with them; determination of the presence or absence of seed of doder (*Cuscuta* spp.), in order to grant the title of "doder-free" of the seed lots for which this entry is mandatory (leguminous). Usually, the health status of the seed lots is carried out at the same time as the purity analysis or the germination analysis.

Longevity of seeds. Seeds stored in areas with a high degree of humidity or too warm quickly lose their vitality. The longevity of seeds is the length of time for which they maintain their vitality, usually quantified in years or months.

The seeds can retain their qualities, from a few weeks to 50 years, depending on the species and other factors, but the determining factor of the reduction of their qualities is storage (Samuil C., 2010; Leonte C., 2011; Ene T.A., Mocanu V., 2016).

CONCLUSIONS

Seed production is a very important and responsible activity requiring appropriate qualification and specialization, and the existence of an organizational and legal framework to coordinate all specific sequences related to its production and marketing, in order to maintain the purity of genotypes, but also their technical and productivity performance.

The production of seeds with excellent quality characteristics depends on the scientific basis of seed activities, including, on the one hand, the theoretical foundations of seed genetics, improvement and production, and on the other hand, the activities of obtaining through the in-depth understanding and application of modern conservative selection methods.

In Romania, there is and operates a regional, territorial and county network of specialized structures, which through their activity organizes, controls and certifies the entire "annual national program for the production and multiplication of seeds and seedlings".

The multiplication activity is carried out by the research resorts and specialized economic agents, proposed by the county structures (Territorial Inspectorate for the Quality of Seeds and Planting Material) and approved by the Ministry of Agriculture and Rural Development. The certification documents of these biological categories shall be drawn up and issued by the state inspectors, who belong to the Territorial Inspectorates for the Quality of Seeds and Planting Material.

The agricultural production process has a permanent character, which requires that the production and multiplication of seeds be carried out year after year, needing the links of each stage. It is not allowed to interrupt this cycle of seed production and multiplication because this activity maintains the stability and the possibility of resuming the production process each agricultural year.

Seed quality testing shall be carried out by seed testing laboratories which have been authorized for this purpose by the competent authority and the main physical and biological parameters to be determined are: Humidity, purity, mass of 1000 grains, hectoliter mass, cold test, viability, health status and longevity.

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