ASSESING THE GERMINATION PROPERTIES OF TWENTY-SEVEN *TRITICUM AESTIVUM* VARIETIES WITH TWO DIFFERENT METHODS

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Abstract*. Seed germination is one of the most important factors determining the crop production and its quality. Seed testing has been developed to aid agriculture to avoid some of the hazards of crop quality and production by furnishing the needed information about different quality attributes as purity, moisture, capacity of germination, vigorously and health. The importance of seed testing was realized more than one hundred years ago. This study reflects the results obtained in the research Laboratory for seed quality control at the University of Life Sciences "King Mihai I" from Timişoara, using the standard methods based on a selection of twenty-seven wheat varieties from Agricultural Research and Development Station Lovrin regarding germinative energy and capacity of germination in optimal conditions of temperature, humidity and light. Seed germination was determined using two approved Standard ISTA methods (SR 1634-the standard which establishes the maximum germination potential of seeds), the first one using the Jacobsen germinating apparatus and the second one with the seed germination cabinet. The determinations were made in four sets of 1000 seeds each and the results were obtained by calculating the mean value. The differences of values between the two methods, occur due to the fact that the filter paper used in the Jacobsen germinator was too thin, this leading to a higher percent of abnormal germs*

Keywords: *germination, seed testing, wheat, abiotic stress, ISTA*

INTRODUCTION

Wheat is one of the most important cultivated plants with a high alimentary value. The plant has a high ecological plasticity, being cultivated in areas with very different climates and soils. Wheat is grown in over one hundred countries. Germination is the first and the most sensitive stage of the plant life cycle. This stage of growth is strictly influenced by environmental factors especially, temperature and humidity. Germination analysis involves determining the percentage of pure seeds, capable of producing normal germs and in optimal growing conditions to produce normally developed plants (PORTER, 1999). Wheat germination begins when the seed absorbs water and ends with the appearance of the radicle. It has three phases: water absorption(imbibition), activation and visible germination. Two notions are defined in the technique of determining the germination: germinative energy and capacity of germination. These two indicators play a direct role and are the key factors in determining the seed quality. Determination of germination under field conditions is unsatisfactory because the results are not reproducible. As a result, laboratory methods have been developed so that external conditions can be controlled, in order to give the most accurate, fast and complete germination results for the studied samples (RAWSON, 2006).

ISTA describes the germination test as the laboratory analysis through which the development of those essential structures from the seed embryo is ascertained, which for the

analyzed species shows the ability of the embryo to develop into a normal plant under favorable field conditions (ISTA, 1999).

MATERIALS AND METHODS

The biological material used in the research is represented by twenty-seven varieties of wheat: Dacic, Miranda, Alex, Litera, Ciprian, Crişana, Biharia, Glosa, Boema, Sothys, Sacramento, Rubisko, Certiva, Aurelius, Aspekt, Papilon, Activus, Centurion, Tika Taka, Chevignon, Sosthene, Vivendo, Sophie, Solindo, Tiberius, Arrezo and Apexus. The experiment was carried out at the Seed quality control laboratory of Faculty of Agriculture.

Seed germination was recorded daily for 8 days after the start of the experiment using simultaneous two methods agreed of ISTA standard for germination.

For each testing method, were chosen randomly from the pure seed, four repetitions of one hundred seeds.

The first method was performed using the Jacobsen apparatus. This apparatus consists from a germination plate over which round filter papers substrate are placed. Filter paper was used paper as a germinative layer. Ten seeds were places symmetrically on each layer, using the TP (top of) method. Layers' humidity was continuously maintained with the help of a wick made also from filter paper which was reaching the water from the water bath through the holes of the germination plate. Seeds were covered with plastic cups equipped with holes for aeration and also to avoid layers' drying. The temperature was regulated by heating the water. The water was heated at a temperature of 20°C by the machine's thermoregulator.

In the second method the germination cabinet was used. The germination cabinet is well isolated so the temperature and the humidity are continuously maintained. Temperature was regulated by water and air circulation. For the symmetrical arrangement of each 100 seed repetition was used the BP (between papers) method. The seeds are placed between the two filter paper layers, after that a roll was formed and placed vertically into a zipper plastic bag. The temperature was set at 20°C.

The readings to determine germinative energy were made on the fourth day and those to determine germinative faculty on the eighth day according with the ISTA standard.

In order to be considered normal germs, at the time of the faculty of germination's analysis, all the seeds had to have the following structures formed: well-developed root system, vigorous and undamaged coleoptile, intact plumule with a well-formed leaf inside the coleoptile.

Anormal germs were those which had

- primary root: split at the tip, strangulated, stopped from growing, absent, trapped in the seed coat, with negative geotropism, rotted as an effect of a primary infection;
- coleoptile: absent, short and thick, cracked or fissured, twisted, fusiform, which forms a spiral or a loop, rotted as an effect of a primary infection, is shorter than less twice of the seed's length.

Also, seeds unable to germinate were those which absorbed water but have stopped their development, dead seeds and seeds infected with pathogens.

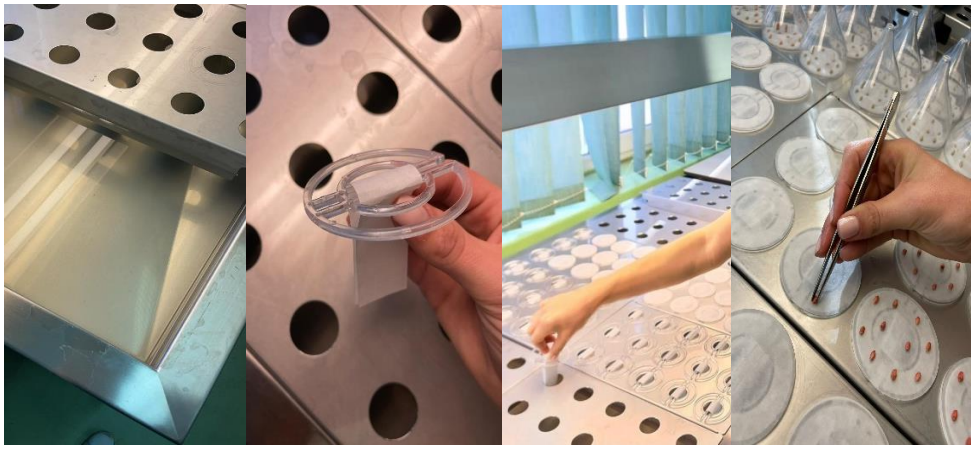

Figure 1 Preparing the germinative layers for the first method with the Jacobsen apparatus

Figure 2 Preparing the germinative layers for the second method with the germination cabinet

RESULTS AND DISCUSSIONS

Seed germination is an important characteristic for wheat which could provide advantage for crop establishment. The germination percentage shows the numerical proportion of seeds that produced normal classified germs under optimal humidity and temperature conditions and within the specified period.

Table 1

Germination Energy and Germination faculty for the 27 wheat varieties using two distinct methods

Results obtained using Jacobsen germinator		
Variety	GE	GF
DACIC	69	97
MIRANDA	73	81
ALEX	52	74
LITERA	98	97
CIPRIAN	60	67
CRIȘANA	74	80
BIHARIA	79	95
GLOSA	55	83
BOEMA	28	60
SOTHYS	63	73
SACRAMENTO	85	97
RUBISKO	89	100
CERTIVA	100	100
AURELIUS	90	97
ASPEKT	82	94
PAPILON	81	90
ACTIVUS	73	87
CENTURION	78	80
TIKA TAKA	95	100
CHEVIGNON	65	86
SOSTHENE	50	72
VIVENDO	80	64
SOPHIE	77	91
SOLINDO	80	91
TIBERIUS	74	86
ARREZO	100	100
APEXUS	81	95

Results obtained using germination cabinet		
Variety	GE	FC
DACIC	89	100
MIRANDA	75	99
ALEX	91	98
LITERA	95	99
CIPRIAN	83	95
CRIȘANA	93	100
BIHARIA	92	100
GLOSA	90	96
BOEMA	88	98
SOTHYS	91	98
SACRAMENTO	87	94
RUBISKO	90	99
CERTIVA	91	99
AURELIUS	96	99
ASPEKT	92	100
PAPILON	88	100
ACTIVUS	93	100
CENTURION	96	100
TIKA TAKA	90	100
CHEVIGNON	92	100
SOSTHENE	96	100
VIVENDO	97	100
SOPHIE	88	100
SOLINDO	89	98
TIBERIUS	79	100
ARREZO	90	100
APEXUS	88	97

Although the two methods that were used for assessing the germination energy and germination faculty are accepted in scientifical research, the results are quite distinctive. When using the Jacobsen germinator, both parameters showed lower values, implying improper use in agriculture. Thus, a second method was used for assessing germination energy and germination faculty. When using the germination cabinet higher values were registered, values that correspond to the ISTA standard.

Studying the differences of values between the two methods, we agreed on the fact that the filter paper used in the Jacobsen germinator was to thin, this leading to a higher percent of abnormal germs.

Figure 3 Anormal germs and seeds unable to germinate

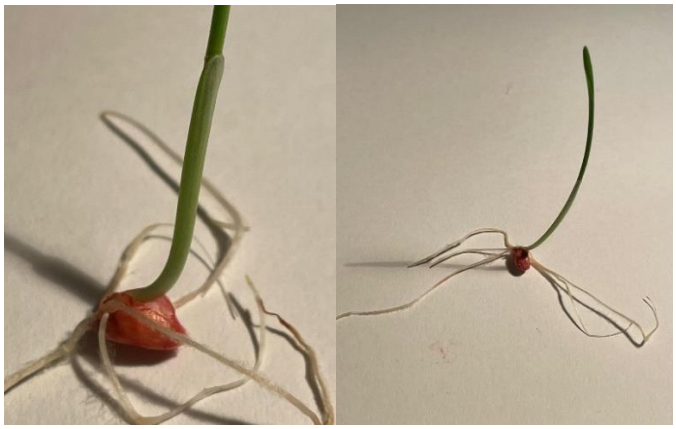

Figure 4 Normal germs

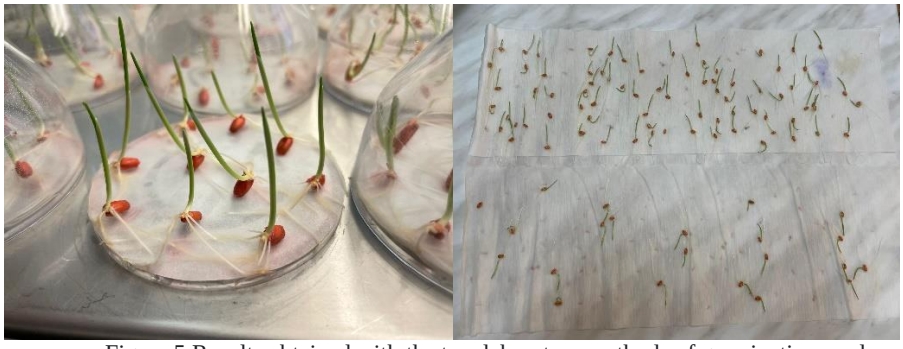

Figure 5 Results obtained with the two laboratory methods of germination seeds

CONCLUSIONS

Regarding the differences between the two methods, it is recommended that when using the Jacobsen germinator, more layers of filter paper should be used and if the research facility permits the use of a germination cabinet, using this second method will reveal more real data.

Considering the significant differences for germinative energy and germinative faculty, it is recommended that farmers pay close attention to optimal sowing intervals, depending on the temperatures each year. Delayed sowing increases the risk of having fewer emerged plants. Should there, for any reason, occur a delay in sowing, it is recommended to use a higher quantity and a higher density of seeds, in order to avoid a crop with low density.

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