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THE INFLUENCE OF SEED TREATMENT ON CORN GERMINATION

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Abstract

This paper presents a study on the influence of seed treatment on seed germination in 10 consanguineous lines and 10 simple hybrids (from KWS Ltd), grown in the area of the Traian commune, Brăila county, in the 2018-2019 crop year. Seed treatment was performed with the Redigo M fungicide (100 g/l Protioconazole + 20 g/l Metalaxil) and the Langis insecticide (300 g/l Cypermethrin). In the laboratory, the germination potential was determined using the STAS 1634/1999 method, both for untreated and treated seeds and the potential of emergence was determined using the cold test method 6 ˚C, for treated seeds only.

From the data analysis, the germination value varied between 93 - 95% for simple hybrids for both untreated and treated seeds, and for consanguineous lines, it varied between 92 - 95% for untreated seeds and 91 - 94% for treated seeds; the value of the cold test varied between 92 - 95% for hybrids and 91 - 93% for consanguineous lines. All hybrids and consanguineous lines recorded germination and cold test values above the minimum values allowed by STAS (a minimum germination value of 90% and a minimum cold test value of 85%). The treatment of corn seeds did not adversely affect their germination and viability.

Keywords: corn, seeds, hybrid, consanguineous line, germination, cold test, fungicide, insecticide

1 INTRODUCTION

Infected seed can contribute to a low- and poor-quality production, manifested either by poor germination leading to an uneven emergence or by the transmission of diseases that cause significant damage to the rest of the crop.

The main objective of chemical treatment is to apply the most effective chemicals for each pathogen species as closely as possible to the date of sowing. In addition to the toxic effect on seed-borne pathogens, fungicides can also have a direct effect on the seeds themselves. Excessive doses of pesticides, as well as prolonged periods of storage after treatment, can negatively affect seed germination.

The protection of corn seedlings during the germination and emergence process is one of the most important measures for achieving crop density in the corn crop. The seeds carry many pathogens which, together with the soil-specific pathogens, significantly increase the difference between germination in the laboratory and emergence in the field, especially in the case of early sowing or when after sowing there are drops in temperature, accompanied by excess moisture. Such conditions affect plant vigour and crop density. Treating seeds with fungicides before sowing removes these shortcomings [1]. Seed treatment for pest control (*Agriotis sp. Tanymecus dilaticolis*) is also a measure to remove environmental pollution if it is carried out directly on the surface of the soil after the emergence of corn plants [1].

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The notion of vigour, a relatively new indicator for seed quality, developed from the need to explain that several batches of seeds may have the same germination under optimal laboratory conditions, but may be quite different in their outcome in suboptimal conditions, be it in the laboratory or the field [2].

The cold test is the weakest emergence expected from a batch of seeds when sown in reasonably satisfactory field conditions, while the germination test represents the best-expected potential for emergence. When the cold test results are close to those of the standard germination test, the seed batch is expected to thrive in a wide range of humidity and temperature conditions [3].

2 METHODS

The biological material under investigation consisted of the seeds of 10 consanguineous lines and 10 simple corn hybrids from KWS Ltd, grown in the area of the Traian commune, Brăila county, in the 2018-2019 crop year. The seeds were treated with the Redigo M fungicide (100 g/l Protioconazole + 20 g/l Metalaxil) and the Langis insecticide (300 g/l Cypermethrin).

In the laboratory, the samples of untreated seeds were subjected to analysis to determine the germination potential using the STAS 1634/1999 method (25˚C). The samples of treated seeds underwent the same analysis to determine the potential for germination using the STAS 1634/1999 method (25˚C) but were also tested for their emergence potential, using the 6˚C cold test method.

The determination of the germination potential was carried out using the STAS 1634/1999 method (BP 25° C) as follows: the seeds were placed on rolls of industrial filter paper moistened with water to 60% of its holding capacity, for eight trials of fifty seeds. The rolls were introduced into the germination chamber for seven days at a temperature of 25° C and a humidity of 85% in light conditions. Germination was assessed through two readings, the first at 4 days for germination energy and the second at 7 days for germination capacity.

The determination of the potential of emergence was carried out using the cold test method (6° C) as follows: the seeds were placed in a 1:1 soil and sand mixture, moistened with water to 60% of its holding capacity, for four trials of 100 seeds each. The germination temperature was 6° C for 6 days, with 90% humidity after which the biological material was moved to the climatic germination chamber at a temperature of 25° C and 85% humidity for 7 days. The assessment of the germs was performed after 11 days based on SR 1634/99.

3 RESULTS AND DISCUSSION

The ability of seeds to germinate and grow in cold, moist soil is influenced by genotype, seed quality, the presence or absence of pathogens in seeds or soil, and the treatment applied to the seeds.

Table 1 shows the data obtained from laboratory determinations on germination potential and emergence potential, in the form of cold test (6° C) values for the seed samples belonging to the consanguineous corn lines studied.

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Table 1. The influence of the seed treatment x genotype interaction on germination potential and emergence potential (Cold test 6 ° C) in consanguineous lines

Genotype	Untreated seeds			Treated seeds								
	Germination capacity (%)			**Germination energy** (%)			**Germination capacity** (%)			**Cold test** (%)		
	G.	G.A.	S.M.	G.	G.A.	S.M.	G.	G.A.	S.M.	C.T.	G.S.V.	S.P.
L1	93	3	4	92	5	3	95	3	2	92	5	3
L2	93	4	3	93	3	2	96	2	2	93	4	3
L3	92	5	3	91	5	4	94	4	2	92	5	3
L4	92	5	3	93	5	2	95	3	2	92	6	2
L5	93	4	3	91	5	4	94	3	3	91	5	4
L6	93	5	2	93	4	3	95	3	2	93	4	3
L7	94	3	3	93	4	3	96	3	1	92	4	4
L8	94	4	2	93	5	2	95	3	2	93	4	3
L9	95	3	2	94	4	2	96	2	2	93	5	2
L10	94	4	2	93	4	3	95	3	2	93	4	3
Media	***93***	***4***	***3***	***93***	***4***	***3***	***95***	***3***	***2***	***93***	***5***	***3***

L. - consanguineous line; G.A. - abnormal germs; S.M. - dead seeds; C.T. - cold test; G.S.V. - vigorous weak germs; S.P. - rotten seeds.

Regarding the germination values determined at 25° C, they exceeded the STAS limit (90%) for all consanguineous lines studied, being between 92 and 95% for untreated seeds and 94 and 96% for treated seeds.

Regarding the values of emergence potential, expressed by cold test, they exceeded the STAS limit (85%) for all consanguineous lines studied, being between 91 and 93%.

Table 2 shows the data obtained from laboratory determinations on germination potential and emergence potential, expressed by cold test values (6° C) for the samples of simple corn hybrids included in this study.

Table 2. The influence of the seed treatment x genotype interaction on germination potential and emergence potential (cold test 6° C) for the simple hybrids under study

Genotype	Untreated seeds			Treated seeds								
	Germination capacity (%)			**Germination energy** (%)			**Germination capacity** (%)			**Cold test** (%)		
	G.	G.A.	S.M.	G.	G.A.	S.M.	G.	G.A.	S.M.	C.T.	G.S.V.	S.P.
H1	95	3	2	95	3	2	97	2	1	94	4	2
H2	94	4	2	93	4	3	96	2	2	94	3	3
H3	94	4	2	94	5	1	96	3	1	93	4	2
H4	95	3	2	95	3	2	97	2	1	95	3	2
H5	93	4	3	94	3	3	96	2	2	93	4	3

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H6	94	3	3	93	4	3	96	2	2	94	4	2
H7	95	3	2	94	3	3	97	2	1	95	3	2
H8	93	4	3	94	4	2	95	3	2	93	4	3
H9	93	4	3	93	4	3	95	3	2	92	5	3
H10	94	4	2	93	4	3	96	2	2	93	5	1
Media	***94***	***4***	***3***	***94***	***4***	***2***	***96***	***2***	***2***	***94***	***4***	***2***

H. - simple hybrid; G.A. - abnormal germs; S.M. - dead seeds; C.T. - cold test; G.S.V. - vigorous weak germs; S.P. - rotten seeds.

Regarding the germination values determined at 25° C, they exceeded the STAS limit (90%) for all hybrids studied, being between 93 and 95% for untreated seeds and 95 and 97% for treated seeds.

Regarding the emergence potential values, expressed by the cold test, they exceeded the STAS limit (85%) in all hybrids studied, being between 92 and 95%.

Table 3 shows the average germination potential and emergence potential for untreated and treated seeds belonging to the consanguineous lines and corn hybrids included in this study.

Table 3. The influence of seed treatment on germination potential and emergence potential (cold test 6° C) in the corn plant

Type	**Untreated seeds**	**Treated seeds**	
	Germination capacity (%)	**Germination capacity** (%)	**Cold test** (%)
Consanguineous lines	93	95	93
Simple hybrids	94	96	94

The analysis of the data in Table 3 shows that the average values for germination capacity of the treated seeds were higher than for the untreated ones, both in the case of consanguineous lines and hybrids, exceeding the STAS limit (90%).

The values of the germination potential as well as the emergence potential recorded for the hybrid seeds were higher than those recorded for the consanguineous lines.

4. CONCLUSIONS

From the results of the study on the influence of seed treatment on germination potential and emergence potential, the following conclusions can be drawn:

- The germination potential of the simple hybrids included in this study (94 - 96%), determined in laboratory conditions using the STAS method (25˚C) was higher than that of the consanguineous lines (92 - 95%) included in the study;
- The germination potential of treated seeds [with the Redigo M fungicide (100 g/l Protioconazole + 20 g/l Metalaxil) and the Langis insecticide (300 g/l Cypermethrin)], determined under laboratory conditions using the STAS

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method (25˚C) (95 - 96%) was superior to that recorded for untreated seeds (93 - 94%);

- The germination potential of both untreated and treated seeds, belonging to both the simple hybrids and consanguineous lines included in this study, exceeded the STAS baseline (90%), taking values between 92 - 96%;
- The emergence potential, determined in laboratory conditions using the cold test method (6˚C) for treated seeds belonging to both the simple hybrids and consanguineous lines studied, was lower than the germination potential, but above the minimum limit allowed by STAS (85%), being between 91 and 93%;
- Treating seeds with the Redigo M fungicide (100 g/l Protioconazole + 20 g/l Metalaxyl) and the Langis insecticide (300 g/l Cypermethrin) increased the seed germination potential values for all consanguineous lines and hybrids included in this study;
- The results obtained from the laboratory determinations clearly show that all seeds, both of the consanguineous lines and of the hybrids included in this study, will grow well even in suboptimal conditions of humidity and temperature.

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