

Original article

The Influence of Calibration and Treatments with Fungicide Topsin 70 Pu on Germination and Strength of Maize Seeds in Maine Hybrids Cultivated in Transilvania, Romania

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Abstract

The paper deals with a study on the influence of seed calibration and treatment with product Topsin 70 PU (PU-powder wet) on germination and seed strength at main hybrids cultivated in Transilvania. By determining in laboratory of germination and cold-test, it is being followed the obtainence of strength indices on basis of which one can appreciate the behaviour of maize seeds in field when it meets sub-optimal germination conditions, respectively low temperatures and excess humidity. The biological material taken into consideration in the study was created by SDCA Turda (Agricultural Research and Development Station Turda city), from hybrids seen in production and having potential, respectively: Turda 201, Turda 200 and Turda 165. The results obtained in experimental years 2007-2008, show us that the treatment of seeds with Topsin raises with differences worth taking into consideration the values of energy and of germinative faculty at most experimental calibres, and the cold test as the most representative indicator of seed strength at maize seeds appreciated through the percentage of vigorous germs is determined in most parts by the cultivated hybrid and by the seed calibre.

Keywords: maize, calibre, treatment, germination and strength

1. Introduction

Germination is defined as the totality of fiziological processes that take place in the seed in the moment when the embryo passes from latent life to active life. The germination of seeds is a phenomena of fiziological and biochemical nature of great complexity wherein a series of biological factors are involved that action on the embryo [4].

The determination of germination is important because it fits into the calculation formula of seed norm per hectare, along with the purity at the establishment of quality class of seeds and offers

information on the keeping conditions, the orientative estimation of seed oldness and about the future normal development of the embryo [3].

The strength of maize seeds is a quality feature of seeds that is appreciated in all cultivation areas of maize in the world being determined by genetical, biological, morfological and preparational factors of seeds for sowing.

The cold-test was the first analysis for strength and for many years the only one. The ability of seeds to germinate in cold and wet soil is affected by the genotype, the quality of seeds, the patogenous agents of seeds and soil and their treatments [1].

The cold test represents the weakest rising that is expected from a lot of seeds when it is sowed in reasonable satisfying field conditions, wherein the germination test represents the best expected

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rising potential. When the results obtained in the cold-test are close to those from the standard germination test, it is expected that the lot of seeds to rise well on a large conditional scale of humidity and temperature [2].

Results of the determination of the cold-test allows classification of seed lots in resistance groups, giving the possibility of choosing the optimal sowing period for each lot.

2. Material and method

The choice for the biological material, respective of the hybrid, represents the basis element in the aim of accomplishing the experiences in field and in the laboratory.

The hybrid can influence the strength through its biological features: the hybrid type, the maturity group, bean type.

The biological material taken under study was created by SDCA Turda and: **TURDA 201** – tri line hybrid, semi-early, created by SDCA Turda, group FAO 340, **TURDA 200** double hybrid, early, registered in 1976, rewritten in the Official Catalogue in year 2000 and **TURDA 165** – tri line hybrid, early, belonging to group FAO 270.

The seed size has a special importance for the agricultural practice because, in comparison with medium seeds and especially the large ones, having a higher content of nourishing substances and better developed embryos, these ones manage to give seedlings with a better start, with a superior wander through power, rising and better development and through this a much faster development of the vegetative aid, that reflects at the end a better production.

The calibres used within the present study are those used in selection and sorting stations for corn in Romania.

LL- large wide

LR – large round

ML – average wide

MR – average round

The determination of germination is being made with the purpose of establishing the number of seeds, expressed in percentages from pure seed, capable of giving birth to normal germs in laboratory conditions.

Through the determination in the laboratory of the cold-test it is being followed the obtainence of a strength index on basis of which one can appreciate the behaviour of maize seeds in field when it meets the sub-optimal conditions for germination, respectively low temperatures and excess humidity.

The last changes at the determination of the cold test take into consideration the ranging of the methods to the European norms.

3. Data analysis

The capacity of seed germination was appreciated through two indexes: the germinative faculty and the germinative energy. The determination of germinative energy and faculty was made in four repetitions, each of 100 seeds, but the germination layer was the paper of industrial, white filter fabricated from 100% cellulose. The determinations were made twice, at four days from the determination of the germinative energy and at seven days for the germinative faculty. So that the germination can flow normally one has followed the humidity layer of germination to be sufficient in each moment, without being in excess.

Basically the cold test method exposes the seeds at 10o C for 7 days in a fertile soil at an absorbing capacity of the water of 60-70% after that previously they were exposed to a raising period for 6 days at a temperature of 25o C. The humidity and the temperature from this test stimulate the conditions that seeds would encounter during the early insemination, conditions that were favorable to the attack of the microorganisms in the soil.

For the appliance of the cold test method, the laboratory technique was the following:

- on a strip composed of 2 paper roles of industrial filter, wet, with a dimension of 60/21 cm a third strip of 60/30 cm is put, which overlaps the first two at downside on 10 cm from its width; on the strip, inside of a metallic frame of 50/15 cm a mixture of soil and sand is put into a uniform layer of about 0,5 cm.
- on the mixture strip 100 seeds are evenly disposed, which are covered with a thin layer from the same mixture and after that with the downside of the third piece of paper which is available; the whole assembly is carefully rolled; the four roles are introduced in a plastic bag and put in germinator at the values of temperature and humidity previously described
- the appreciation of the germs was made after the 13th day since it had been put at germination; the resistance mark at hatching is given by the numerical percent of the germs normally developed in these conditions.

For the treating of these seeds it was used TOPSIN 70 PU in a concentration of 2gr/10l water.

4. Results and discussions

The germinate energy and faculty of studied hybrids in interaction with treatment with Topsin at seeds in those two experimental years expresses the fact that in laboratory conditions, the differences between hybrid values are significant (table 1). In case of experimental year 2007 the appreciation of germinate energy and faculty differences in case of the Duncan test indicates significant differences among hybrids, the highest values are being seen at hybrid T-200 followed by hybrids T-201 and T-165, but in case of experimental year 2008 the highest values are seen at hybrid T-201, followed by hybrids T-200 and T-165 at untreated and treated seeds. At all determinations, at germinate energy as well as germinate faculty, the values registered at hybrid T-165 are significantly lower in

comparison with those determined at hybrids T-201 and T-200. This repeatable evidence can have only genotype reasons, fact that determines us to propose recommendations full of attention at sowing period, and at depth and sowing thickness (table 1).

The germinate faculty appreciated after a supplementary time of three days from data reading of the germinate energy, modifies the germination values for hybrids in both experimental years under conditions of constant temperature in phytotrone (25° C). The values of germinate faculty of over 90% closes germination at untreated seeds to treated ones in both experimental years, an exception making hybrid T-165 at which the values of germinate faculty descends under 90% in both experimental years for all sources from years 2005, 2006 or 2007 (table1).

Table 1. Appreciation of differences according to Duncan test determining the germination energy and capacity in two years in maize seeds of different size under the influence of treatment with Topsin 70 PU

Experimental year	Year of seed obtaining	Calibre	Germination energy		Germination capacity	
			No treatment	Treated	No treatment	Treated
2007	2005	LL	79.41 bc	84.91 a	89.16 bcd	92.58 a
		LR	78.25 c	83.00 ab	87.91 cd	90.50 ab
		ML	80.66abc	81.33 abc	92.08 a	90.33abc
		MR	77.33 c	80.66 abc	87.50 d	90.41abc
	2006	LL	78.16 c	84.41 a	88.91 bc	91.66 a
		LR	79.83 bc	82.75 ab	88.75 bc	90.83 ab
		ML	79.58 bc	80.41 bc	88.83 bc	88.75 bc
		MR	80.25 bc	82.58 ab	88.58 c	88.50 c
2008	2006	LL	79.50 de	75.67 abc	89.00 ab	88.25abc
		LR	75.00 e	74.25 bcd	86.83 bcd	89.33 ab
		ML	70.67 d	78.25 ab	85.83 cd	87.83abc
		MR	73.25 cd	70.08 a	84.83 d	90.00 a
	2007	LL	69.42 bc	76.92 a	85.00 bc	89.67 ab
		LR	62.08 d	73.83 a	86.83 abc	88.75abc
		ML	54.33 cd	77.00 a	88.08 abc	90.25 a
		MR	61.17 b	72.25 a	86.50 abc	85.17 c

LL –large wide LR – large round; ML – average wide ; R–average round

The determination of the cold test, as a test of strength at maize seeds in suboptimal conditions of germination, through the appreciation of vigorous germs, is an important element of appreciating the maize seed strength.

Determinations were made regarding vigorous germs in interaction with experimental factors: the year of obtained seeds, the maize hybrid and the seed treatments in those two experimental years.

From data presented in table 3, it results that at seeds that give birth to vigorous germs, the seed treatments do not modify their value in a significant way at neither of tested hybrids, or even one ascertains a stimulating tendency of vigorous germs as a result of the treatment with Topsin.

This finding comes into contact with the treating procedures of maize seeds with systemic fungicide Topsin, its influence being beneficial on seed strength (table 3).

Table 2. Influence of age and treatment with antifungal agents upon vigorous germs in maize hybrids experimented in the two years

Experimental year	Seed obtaining year	Treatment	Viguros germ		
			T-201	T-200	T-165
2007	2005	Not treated	70.38 ab	74.50 a	72.75 a
		Treated	73.13 a	77.75 a	72.75 a
	2006	Not treated	71.88 a	65.25 a	74.38 a
		Treated	75.13 a	68.25 a	66.63 a
2008	2006	Not treated	65.13 bc	72.38 ab	60.13 c
		Treated	76.88 a	75.00 ab	70.13 abc
	2007	Not treated	62.50 bc	62.25 abc	58.13 c
		Treated	72.63 ab	74.38 a	60.38 c

5. Conclusions

The seed strength defined as the sum of quality features that determines a better behavior of those in suboptimal field conditions is determined by genetic factors, environmental, technological and keeping conditions.

From the quality features of seeds the germinate energy and faculty constitutes the appreciation premises of strength before its expression in filed conditions.

For the same seed caliber, germinate energy as a first indicator of seed strength presents significant differences in years with favorable maturation conditions of plants and larger significant values at treated seeds with fungicide Topsin.

The treatment of seeds with Topsin rises the differences worth to be taken into consideration of germinate energy and faculty at most experimental calibers.

The cold-test as the most representative indicator of strength at maize seeds through the percentage of vigorous germs is determined on a

large scale by the cultivated hybrid and the seed caliber. At seeds out of which one obtains vigorous germs the treatment with fungicide Topsin does not modify its values in a significant way at neither of tested hybrids, one even ascertains a stimulating tendency of vigorous germs after the Topsin treatment.

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