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PATHOGEN FUNGUSES OF THE SUNFLOWER SEED *(HELIANTHUS ANNUUS L.)* AND THEIR IMPACT UPON GERMINATION

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Abstract

The Central Laboratory for the Quality Control of the Seeds and of the Seeding Material Bucharest (LCCCSM) carries into effect all the analyses for the seed lots which are comercialized outside the country. In market year 2009, the Central Laboratory has made a number of 9503 analyses, assigned this way: 1030 purity analyses; 3005 germination analyses; 970 humidity analyses; 3020 of sanitary state; 949 determinations of T.G.W. (1000 seeds weight); 515 cold test; 14 different analyses. In the Central Laboratory for the Seeds and Seeded Material Quality Control, the work for the elaboration of the present study has been done, during this time, on all the sunflower samples picked up by the accredited people who could fathom them, from the economical agents.

INTRODUCTION

Sunflower is one of the most important oil-containing plants from Europe, France, Spain, Russia, Ukraine, Romania, etc. Worldwide, its seed is produced in order to ensure and cover an over 16 milion ha surface.

In Romania, quality control for the seeds is fulfilled by the Ministry of Agriculture, through the National Inspection of Seeds Quality and through the Inspectorates of the Territorial Counties (INCS).

During the stockpile, a series of funguses appear on the seeds' surface, which, generally, do not produce damages to the crop, whereas at the moment of the tilling, they disappear due to the inauspicious soil conditions. However, certain situations have been encountered, in which the storage funguses have had a major influence while keeping the seeds in deposits. It can ultimately get to the germination diminution, so much that it can drop under the limit allowed by law (specifically for seeding), and, in this case, the lot is entirely compromised and the loss is total. Also, the storage funguses negatively influence seeds in process of germination on the field, leading, in first phase, to weakling plants which afterwards recover and then, in the following phases, get to develop as good as

normal plants. Fungus species which have been identified as belonging to the following genres: *Rhizopus*, *Penicillium*, *Aspergillus* and *Alternaria*.

MATERIAL AND METHODS

The investigation of the existent lots on economical operators, was made according to the ISTA method, and the number of sacks explored was ascertained congruous to the legislation table. From the compund sample, the following probes were extracted: humidity sample, laboratory sample, witness sample.

The sample's minimum size, in order to determine humidity is of 50 g, and for the accomplishment of all the other analyses of 1 kg.

The seeds' sanitary state determination by using the macroscopic analysys seeks the determination of the *Sclerotinia sclerotiorum* sclerots. The obtained information is wrote down in the analysys data sheet by the analyst, which must be dated and signed. If *Sclerotinia sclerotiorum* sclerots are more than 10 pieces in a 1000 g sample, the lot is rejected and does not receive a quality certificate. The seed's owner can take clearance measures and then the lot can be reanalysed, and if everything is ok, the quality certificate can be awarded, and the owner has the possibility to trade.

In order to identify the pathogen agents, from the pure seed, 4 groups-each of 100 g of seed - can be taken randomly, and then arranged as uniform as possible on a paper sheet's wet surface. The wrinkled shreds of paper must be wrapped in another wet shred of paper, in order to ensure uniform humidity. These scrolls must be introduced in a plastic bag, to maintain constant humidity. The bags are introduced in the germination room, at 25ºC temperature, for a period of maximum 10 days, in the dark. In the germination room, a permanent ventilation system must be secured, and also a constant temperature, which should be computer verified. After this phase, the results can be read, by analyzing each and every seed, in order to determine the funguses found in the leafs and in the layer. Another purpose is also to determine the total bacterial count. For the results' confirmation, microscopic preparations are made, if necessary. The results are written down on the working sheet.

RESULTS AND DISCUSSION

In the present project, the results obtained after analysing 28 samples derived from 4 different crop years, and on which germination, normal germs presence, and alive and dead germs, was closely examined, and the results obtained are presented here (Table 1). From Table 2 we can observe the contamination degree with pathogen agents of the same hybrids.

Table 1

Germinative values of some maize hybrids netween years 2006-2009

No.	Sheet Code	Hybrid	Production Year	Germination (%)	G. abnormal (%)	G. dead (%)
1	3000	Zoltan	2006	49	28	23
2	3001	Valentino	2006	53	25	22
3	2347	LG5665M	2006	80	17	3
4	2936	PR64A83	2006	91	8	1
5	3002	Zoltan	2007	48	22	30
6	3057	PR64A83	2007	93	4	3
7	3059	PR64A83	2007	88	8	4
8	3060	PR64A89	2007	97	3	0
9	3058	PR64A83	2007	86	12	2
10	3003	NK Dolbi	2008	80	13	7
11	3007	Oxana	2008	80	16	4
12	3005	Valentino	2008	74	19	7
13	3074	PR63A86	2008	90	8	2
14	2943	PR64A89	2008	94	5	1
15	2910	PR63A86	2008	94	4	2
16	2909	PR63A86	2008	92	5	3
17	2944	PR64E83	2008	90	8	2
18	2942	PR64E83	2008	94	5	1
19	3061	PR63A62	2008	92	7	1
20	3055	PR64A89	2008	89	8	3
21	3043	PR64A71	2009	96	3	1
22	3044	PR64A71	2009	98	2	0
23	3071	PR64B24	2009	86	6	8
24	3017	Inigen	2009	85	7	8
25	2947	PR63A90	2009	93	4	3
26	2948	PR63A90	2009	93	4	3
27	2946	PR63A90	2009	88	4	8
28	3230	PR64B24	2009	81 + *	6	8

*Fresh not germinated seeds - in repose

Table 2

The seeds' contamination degree with pathogen agents of maize hybrids in years 2006-2009

No.	Sheet Code	*Alternaria* (%)	*Aspergillus* (%)	*Penecillium* (%)	*Rhizopus* (%)	*Sclerotinia* Sclerots (pieces/kg sem.)
1	3000	58	12	8	15	3
2	3001	49	8	3	9	2
3	2347	24	5	1	5	0
4	2936	12	3	2	2	0
5	3002	51	8	3	7	4
6	3057	23	5	0	0	0
7	3059	18	3	0	2	0
8	3060	10	1	0	0	0
9	3058	14	2	0	1	2
10	3003	29	3	0	0	1
11	3007	34	4	1	4	1
12	3005	45	7	2	5	5
13	3074	12	4	1	3	0
14	2943	5	0	0	0	0
15	2910	7	0	0	0	0
16	2909	11	5	2	3	0
17	2944	5	0	0	0	0
18	2942	6	0	0	0	0
19	3061	12	3	0	0	0
20	3055	14	2	1	2	4
21	3043	3	2	0	0	0
22	3044	4	0	0	0	0
23	3071	9	4	0	0	4
24	3017	20	5	1	5	3
25	2947	5	0	0	0	0
26	2948	4	0	0	0	0
27	2946	3	0	0	0	2
28	3230	25	3	3	2	0

From Table 1 we can observe that the seed lots with code numbers 3000 and 3001 have a germination which is very close to 50%, while lots with 2347 and 2936 codes have an equal or bigger germination than 80%, although they are produced in the same crop year, meaning in 2006. It can also be seen the fact that there exists a direct correlation between the germinative value and the dead and abnormal germs' presence. The higher the value of the germination is, the lower the number of germs with problems is.

On the 2007 year level, the 3002 lot has a 48%, germination, while lots 3058 and 3059 have an over 80% value, and 3057 and 3060 have over 90%. On PR64A89 hybrid, which has 97% germination, it can be ascertained that only 3% of the germs have an abnormal development, dead germs not being encountered.

On the seed produced in year 2008 there are lots with a lower germination: 3005 with 74%, lot on which the biggest number of abnormal germs was registered. (17%) and dead germs (7%), 3007 and 3003 with 80%, 3055 with 89% but there are also lots with germination values higher than 90%, such as: 3074, 2943, 2910, 2909, 3061, 2942.

On the seed produced in year 2009 there are lots with germination under 90%: 3071, 3017, 2946 and 3230, but also lots with values of 90%: 3043, 3044, 2947 and 2948.

We can observe that the deposit phase has a negative influence upon preserving the germination, however there are other factors which influence quite greatly the seeds' and germs' (the ones wich result from these seeds) quality.

If we analyse the fungus presence upon seeds (Table 2), we can observe that the number of seeds with smaller germination is directly tied to the big number of seeds infected with *Alternaria* spp. and with a longer storage phase.

Also, lower values of germination on different lots are connected to higher values of other funguses, such as: *Aspergillus*, *Penicillium* and *Rhizopus*.

Regarding these pathogens' incidence on the sunflower seeds' level, it can be observed that the highest percentage belong to species of the *Alternaria* genre and then these decrease to *Aspergillus, Rhizopus*, and the lowest values are registered at *Penicillium*.

The sclerots *(Sclerotinia sclerotiorum)* presence in some seeds lots, has a negative influence upon the seeds' quality.

The presence of the relatively high number of abnormal germs in seeds lots is closely connected to the presence of funguses on seeds.

CONCLUSIONS

1. The germinative values on analysed hybrids varied between 48% (on hybrid Zoltan from 2007) and 98% on hybrid PR64A71, from 2009.

2. On the analysed seeds, a number of five pathogen agents were identified, belonging to genres: *Alternaria*, *Aspergillus*, *Rhizopus*, *Penicillium* and *Sclerotinia.*
3. The older the seed is, the bigger the attack's incidence with pathogen agents can be.
4. Funguses of the *Alternaria* genre have the highest percentage values, in what the seeds' contamination degree is concerned, while funguses belonging to *Penicillium* genre have made a very light presence.
5. Both the deposit phase and the funguses presence on seeds influence greatly the seeds and germs' quality, and the germs which result from these seeds.
6. A certain technology is recommended on the field, which should consider the purpose of reducing as much as possible the pathogen agents' presence on seeds.

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