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Humidification and dried seed like alternative as recover of germination and vigor deteriorate seed corn

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Abstract

One of the aspects that contribute to loss of the germination and the vigor in seeds is the time and conditions of storage. With the propose to recover the germination and vigor in seed of deteriorated maize, in this work a series of humidification treatments and drying of seed were made during two phases; in the first seed it was imbibed in the times of 2, 4, 6, 8, 12, 24, 36 and 40 hours in water as much purified and water without purifying; in the second, seed was imbibed in the times of 2, 8 and 12 hours adding products to him like activol, gibiotin, gibgro, biozyme, maxi grow, calcidef y calciofem. The evaluated variables were standard germination and speed of emergency, completely analyzing themselves in a design at random in a factorial adjustment. In first stage the analysis of variance we throw difference significant in standard germination and speed of emergency over time of imbibitions and type of water, the best periods of imbibitions corresponded to 12 hours. In the second phase, analysis of variance for the two variables significant differences in time and the products were found. Better product Activol dose was 0.2 g / l of water to 12 hrs imbibition, followed by product Biozime and Calcidef both in doses of 1 g / l of water imbibition 8 hrs respectively.

Corn, drie humidification, imbibition, standard germination, speed of emergency

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Introduction

Deterioration is defined as the degenerative and irreversible changes that occur after the seed has reached the maximum level of quality (Mc Donald and Nelson, 1986). Wetting and drying of the seeds reinvigorates accelerates and uniforms germination under optimum and adverse conditions (Hacisalihoglu and Ross, 2010). At the same time, several physical and chemical treatments are currently known to reinvigorate deteriorated seeds; Such as polyethyleneglycol (PEG) and KNO3 (Heydecker et al., 1973, Khan, 1980, Priestley, 1986, Mayer and Mayber , 1989, Sánchez et al., 2001). In the present study with the purpose of recovering the vigor and germination of deteriorated maize seed, a series of treatments were carried out using the technique of wetting and drying of seeds and the incorporation of different chemicals containing gibberellic acid and calcium. Objectives were to: a) determine the optimal imbibition period in impaired maize seed, and b) evaluate seed response to be imbibed in two types of water and with different chemical products.

Methodology

The work was carried out in the University Center of Biological and Agricultural Sciences of the University of Guadalajara. Hybrid seed of deteriorated maize with 70% germination was used. For the research, a germinating stove at constant temperature of 25 ° C, germinating paper, unpurified water, purified water, sand bed for planting of 1x2m., Stanlite electronic moisture determiner, Reagents:

Calcidef (tablets of: Lactate Maxi-Grow (gr / 1 = auxins 0.09, gibberellins 0.10, cytokinins 1.5, N 6.6, P 13.3, K 13.3, Ca 2.0, calcium gluconate 2.94 g, calcium carbonate 0.30 g, equivalent to 500 mg of ionizable calcium) Mg 4.0, Fe 17.2, Zn 26.5, Mn 13.3 and Cu 13.3), Calcium fem (Calcium 600 mg, Vit 749.51 mcg, vit.D2 10 mcg), Activol (10 g Ag3), Gibgro (10 g Ag3), Gibiotin (10g Ag3), Biozyme (Gibberellins 77.4ppm, AIA 33ppm, zeatin 128.7ppm, extract broth 79.10% extract organic matter 0.74%).

The research was developed in two phases: In the 1st. Phase was carried out the wetting-drying of the seed, incorporating water type factors and imbibition time; While in the 2nd Phase were incorporated the factors chemicals + dose + imbibition time.

1st. Wet-drying phase: The seed was subjected to nine imbibition times 2, 4.6, 8, 12, 18, 24, 36 and 40 hrs, plus the control without imbibing. They were then dried at room temperature for 5 days, then seeded in both germination chambers and seedlings. The following data were taken: Initial moisture content and Moisture content after imbibition period. The following variables were measured: 1. Standard germination. 2. Emergency speed (data were taken on the number of germinated seeds per day x treatment / plot for 15 days). The emergency speed calculations were made according to the methodology proposed by Maguire (1962). The experimental design was completely randomized with 4 replicates in a split plot arrangement where plot A corresponded to the imbibition time and plot B to the water types. As a comparative test of means, the Significant Minimum Difference (DMS) was used at 99% probability. In the germination percentage variable the data obtained were transformed to the sine-arc function.

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2nd Moistening phase - drying + product dose + imbibition time. In this phase 3 imbibition times (2, 8 and 12 hrs) were used, combining with 7 chemicals at 3 doses per product (1gr, 0.5 g and 0.2 g / 1 of water respectively), obtaining 63 combinations or treatments. Standard germination and emergency speed were taken as variables. A completely randomized experimental design was used, with 4 replicates in an AxBxC factorial arrangement where factor A corresponded to the 7 chemicals, factor B at 3 doses and factor C at 3 imbibition times. As a comparative test of means, the DMS statistic was used at 99% probability.

Results

Moisture content. After imbibition, the highest moisture content of the seed was at 40 hrs. In purified water (35.58%), and at 12 hrs in unpurified water (35.4%); the difference in time may be due to the fact that purified water in theory has less salts than ordinary water, the seed reaching a higher moisture content in unpurified water in a shorter period. As reported by Delouche (1979) and Bidwel (1990); the absorption of water by a seed essentially comprises a special type of diffusion called imbibition. Water or other moving materials move from a site or area where the concentration is high, to an area where the concentration is lower, by diffusion until equilibrium is established. And after the drying period, the lowest moisture percentages were obtained in purified water in the imbibition treatment of 6 hrs, and for the unpurified water at 24 hrs. The treatments that lost the least amount of water obtained during the imbibition were in the 12 hrs. With purified water and 18 hrs. With unpurified water.

Standard germination and emergency speed. In the analysis of variance, significant differences ($\alpha \leq 0.01$) were obtained in the variables studied and in the type of water.

When performing the test of means (DMS) in the standard germination test with unpurified water, imbibition treatments that exceeded the percentages presented by the control (70%) were at 6, 12 and 36 hrs. (80, 90 and 86% respectively); While in purified water the imbibition periods that exceeded the control were at 2 and 12 hrs (80 and 85% respectively). Although in the purified water the highest moisture content was obtained at 40 hrs, a drop in germination was observed when compared to the control (<70%), which suggests that an imbibition period above 40 hrs . Can cause a deterioration in the seed possibly due to deficiencies of oxygen within the seed. These results agree with Arellano, et al; (2000); In a similar experiment they obtained percentages of germination above the control with 18 hrs. Of imbibition of the seed in running water. Meanwhile, in the variable emergency speed the control had an average value in this variable of 13. The highest value of vigor in unpurified water corresponded to 12 hrs (17.6). While in purified water the best imbibition periods corresponded to 2 and 12 hrs (15.34 and 14.70 respectively). Some species have the ability to preserve, during a temporary dehydration, the physiological changes as the differential expression of proteins induced by the hydration of the seeds. This is known as "hydration memory" (López-Urrutia, et al., 2014). Sharma, et al. (2014) have studied the influence of the wetting and drying cycles on some species, which have responded with a higher germination in treated seeds than the control or control.

2nd stage wetting - drying + chemical treatment + imbibition time. In the second phase significant differences ($\alpha \leq 0.01$) were obtained in the variables germination standard and emergency rate in the factor product, time and dose. Germination percentages above 90% and high values of emergency speed (15-20) were achieved by incorporating the studied products into the water.

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In general, the best percentages of germination occurred with the use of Activol product at doses 0.2 gr / lt water at 12 hrs imbibition and 0.5 gr / lt water at 8 hrs, followed by the product Biozime and Calcidef both in doses Of 1gr / lt of water to 8hrs of imbibition respectively.

Conclusions

The imbibition time played a decisive role in the variables germination and emergency speed, finding that the optimal period of imbibition in both types of water was at 12 hrs. With a greater increase of 15% in germination and favoring the rapid emergence of the seed when incorporating products based on gibberellic acid and calcium.

References

Arellano, R. L. J.; Sánchez, M. J.; Padilla, G. J.M. y Hurtado, de la P. S. 2000. Efectos de la imbibición de semilla sobre la calidad fisiológica en semilla de maíz y sorgo. En: Memorias XVIII Congreso Nacional Somefi. Sociedad Mexicana de Fitogenética. P 199.

Bidwel, R. G. S. 1990. Fisiología Vegetal. A.G.T. editor, 1ª edición. México. 250p.

Delouche, J. C. 1979. Precepts of seed Storage.Proceding of the Mississipi State Seed Procesors Shortcourse 1979.

Gómez, G. O. J. 1992. Mejoramiento Genético del Frijol (*Phaseolus vulgaris L.*) Considerando Longevidad y Vigor de Semillas como Criterios Iniciales de Selección. Tesis de Maestría en Ciencias. Colegio de Posgraduados. Centro de Genética.

Hacisalihoglu, G. and Ross, Z. 2010. The influence of priming on germination and soil emergence of non-aged and aged annual ryegrass seeds. Seed Sci. Technol. 38: 214-217.

Heydecker, W.; Higgins, J. and Gulliver, R. L. 1973. Accelerated germination by osmotic seed treatment. Nature 246: 42-44.

López-Urrutia, E.; Martínez-García, M.; Monsalvo-Reyes, A.; Salazar-Rojas, V.; Montoya R. y Campos J. E. 2014. Differential RNA-and protein-expression profiles of cactus seeds capable of hydration memory. *Seed Science Research, 24,* 91-99.doi: http://dx.doi.org/10.1017/S0960258513000317.

Khan, A. A. 1980. The Physiology and Biochemistry of Seed Dormancy and Germination. 2nd printing. North-Holland Publishing Company.

Maguire, J.D. 1962. Speed of germination- AID in selection and evaluation for seedling emergente and vigor. Crop. Sci. 2: 176-177.
Mayer, A. M. y Mayber, P. A. 1989. The Germination of Seeds. Fourth edition. Pergamon Press. 325p.

Mc Donald, M. B. Jr. y Nelsin, C. J. 1986. Pisiology of Seed Deterioration. CSSA Special Publication Number 11. Crop Science Society of America, Inc. Madison, Wisconsin, USA.
Priestley, A. D. 1986. Sees Aging. Implications for Seed Storage and Persistence in the Soil. Comstock Publishing Associates.

Sánchez, J. A.; Orta, R. y Muñoz, B. 2001. Tratamientos pregerminativos de hidratación-deshidratación de las semillas y sus efectos en plantas de interés agrícola. *Agronomía Costarricense*. 25:67.

Sharma, A. D.; Rathore, SVS; Kalyani, S. and Tyagi, R. K. 2014. Comparison of various seed priming methods for seed germination, seedling vigour and fruit yield in okra (*Abelmoschus esculentus* L. Moench). *Scientia Horticultura, 165*,75-81. doi: 10.1016/j.scienta. 2013.10.044.

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