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GERMINATION TESTS ON CREOLE MAIZE FROM THE STATES OF GUANAJUATO AND MICHOACAN

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Abstract: The purpose of the germination test is to determine the viability of a batch of seeds, which is determined through the percentage of seeds that have the capacity to generate normal seedlings under optimal conditions of light, water, air and temperature, which establishes the germination capacity. It should be noted that physiological quality refers to intrinsic mechanisms of the seed that determine its germination capacity, the emergence and development of those structures essential to produce a normal seedling under favorable conditions. The work consisted in making a comparison on germination quality between creole corn from the states of Guanajuato and Michoacan, in the Chemistry laboratory of the Agronomist Engineer Degree in Production at the University Center UAEM Zumpango, it is concluded that they had a germination behavior between 93 to 99% both, so it can be said that it is a seed that meets the physiological quality and ensures a good population in the production unit.

Keywords: Test, Germination, Maize, Criollo, Guanajuato, Michoacan.

INTRODUCTION

Mexico is considered as one of the centers of origin of maize and its genetic diversity gives them great plasticity and allows them a great capacity to adapt to different environments, the creole maize represents genetic reservoirs (germplasm) that have evolved over thousands of years of cultivation in a variety of genetically distinct races, from the selections that have been used by producers, Their great adaptation to specific local conditions of altitude, precipitation, temperature, soil quality, resistance to pests and diseases, and the establishment of a program for the conservation and improvement of creole corn will make it possible to have a germplasm that can be the key to current agriculture because it contains unique gene collections. Many of these corn

varieties have not been studied from almost any point of view of commercial importance (agronomic, nutritional quality, biochemical, functional and nutraceutical properties, nor has their genetic variability been evaluated, among others).

The genetic diversity present in creole corn gives them a lot of plasticity and allows them a great capacity to adapt to different environments, hence the importance of having characterized the regions, so it is necessary to perform germination tests to check the percentage of seed hatching and thus ensure a population density in the production unit.

Therefore, it is important to remember that seed is essential in the agricultural crop cycle, being elemental to obtain the best yields and success in agricultural production. The growing demand for seeds of the best quality has led us to a continuous research for the improvement of the methods of analysis, with the objective of increasing yields and associated in turn to increase the quality of the product to be harvested and that the germination test evaluates the percentage of seeds in a lot with capacity to germinate and produce normal seedlings in ideal environmental conditions (temperature, humidity and aeration) for the germination process in order to obtain information on the quality of the different lots for their commercialization.

GENERAL OBJECTIVES

To evaluate the quality of the seed of creole corn from the States of Guanajuato and Michoacan from germination tests to ensure that they are excellent vegetative materials to be used in sowings to increase this species based on their vigor.

BACKGROUND

In Mexico, maize is the main agricultural product due to the area planted, production volumes and quantity consumed (Martínez, 2017). Corn Production in 2017 was 27.8 million tons, while the area Sown in the same year was 7.5 million hectares, much of the national territory is conducive to production so in the 32 States of the Mexican Republic that produce this cereal (ASERCA, 2020).

The main producing States are Sinaloa (22%), Jalisco (14%), Mexico (8%), Michoacán (7%), Guanajuato (6%), Guerrero (5%), Veracruz (5%), Chiapas (5%), Chihuahua (4%), Puebla (4%) and the rest of the States represent the remaining (20%).

Mexico ranks 8th in world corn production, in 2017 it exported to 17 countries, in terms of value mainly to Venezuela (58%), Kenya (33%) and the United States (4%), among others (6%) which places us as the 10th.

This species cultivated in Mexico, 75% of this area is used seed of native varieties, which in addition to being adapted to the climatic and technological conditions of the producers, have characteristics that allow them to respond to their food tastes and preferences.

The high consumption is due to the diversity of uses given to this crop, in addition to food. From SAGARPA estimates and considering the average of 28 million tons of apparent consumption, 16.8 million (60%) is used in human food, of which 5.3 million (19%) is in the form of self-consumption by producers and 11.5 million (41 %) is consumed by the non-producer population, which acquires it already transformed into tortillas and other by-products (Madueño, 2017).

Criollo corn has a great genetic diversity, which allows them a range of colors and even more they are conferred a lot of plasticity, which originates a great capacity to adapt to different environments, hence the social and economic importance of having characterized

agroecological regions for the production of an ideal corn genotype.

The loss of creole maize varieties in farmers' fields for more than 50 years highlights the importance of ex situ conservation. CIMMYT's maize germplasm bank contains 28 000 samples of maize and its wild relatives from 88 countries, comprising collections dating back to 1943. The seeds stored in the genebank are protected from crises or natural disasters, and are available for breeding and research. Traits found in criollo maize varieties can be incorporated into new varieties to address some of the world's most pressing agricultural challenges, such as changing climates, emerging pests and diseases, and malnutrition (McLean, et.al, 2019).

It is important to mention that seeds are the sexual reproduction unit of plants and have the function of multiplying and perpetuating the species to which they belong, being one of the most effective elements for it to disperse in time and space. They constitute the mechanism of perennialization by which plants last generation after generation. They are also the mobile unit of the plant (Doria, 2010).

As the seed is important to ensure an excellent homogeneous population of plants, it is necessary to perform some tests to validate its physiological quality, so it is necessary to mention that certain tests are used to ensure that a seed is good.

The standard germination test is the most common procedure to evaluate the physiological quality of a seed lot. However, because this test is performed under optimum conditions for each species, in practice it has been shown to overestimate seed performance and, in addition, it is poor at discriminating seed lots in relation to speed and uniformity of germination (McDonald, 1980).

Physiological seed quality encompasses the sum of all properties or characteristics, which determine the potential level of seed perfor-

mance and crop establishment. Seed quality components include genetic, physical, physiological and sanitary (microorganisms and insects) aspects (Velázquez, 2014).

Seed vigor is a very important parameter since it allows identifying differences between germination and emergence in the field, mainly when field conditions can cause stress

MATERIALS AND METHODS

The work was carried out in the chemistry laboratory assigned to the Agronomist Production Engineering degree program at the UAEM Zumpango University Center of the Autonomous University of the State of Mexico, which is located in the municipality of Zumpango, State of Mexico. This municipality is located in the northwestern part of the State of Mexico, and has a geographical location of 19°40' 50" N and 99° 06'00" W (Ramírez, 1999).

This municipality has a sub-humid temperate climate, which is the least humid variant of the temperate, with summer rainfall and a percentage of less than 5 mm and its warmest temperature is between 18 C° and 19 C°, the region has a lithological constitution that refers to the composition of bedrock resulting in different types of soil. Approximately 85% is spheozen, rich in organic matter and nutrients; it is a brown soil of great fertility for irrigated and rainfed agriculture. In the north, in smaller proportion, there are cambios, young, poorly developed soil that is highly susceptible to erosion and very poor in organic matter (Ramírez C.A. 1999).

VEGETATIVE MATERIAL

We used seed of creole maize from the states of Guanajuato and Michoacán.

INTER-PAPER GERMINATION METHODOLOGY

This methodology was used to evaluate the germination of treated seeds. The seeds are germinated between two bases of Anchor paper previously moistened with distilled water, then the seeds are arranged in rows at different spaces. Ideally, the distribution of the seeds should be homogeneous along the paper. The seeds are then covered with another sheet of Anchor paper moistened with distilled water and rolled in the form of a "taco", at the end, the "tacos" are randomly arranged inside a polyethylene bag that will be placed inside a deep plastic tray.

SEEDLING EVALUATION

Normal seedlings are those that develop all their essential structures in controlled conditions (water, light and temperature), that have the capacity to generate plants of good size.

- Well developed root system, primary root and seminal roots.
- Hypocotyl with good development without tissue damage.

The result of the germination test is done by counting the seeds that have germinated and the result is expressed as a percentage of normal seedlings that germinated.

RESULTS OBTAINED

The germination test is a laboratory test, which consists of placing seeds in a humid substrate under controlled conditions of temperature, humidity and light so that they germinate and reach a certain level of development. In this way, the essential structures of the plant can be evaluated and it is possible to determine if they are apt to continue with their normal growth (www.gob.mx/snics/articulos/como-se-realiza-un-ensayo-de-germinacion).

The result of the analysis is reported as a percentage, regardless of the amount of seed used for the test. This percentage indicates the amount of seedlings that have the essential structures to continue their growth under favorable conditions, which is called: normal seedlings.

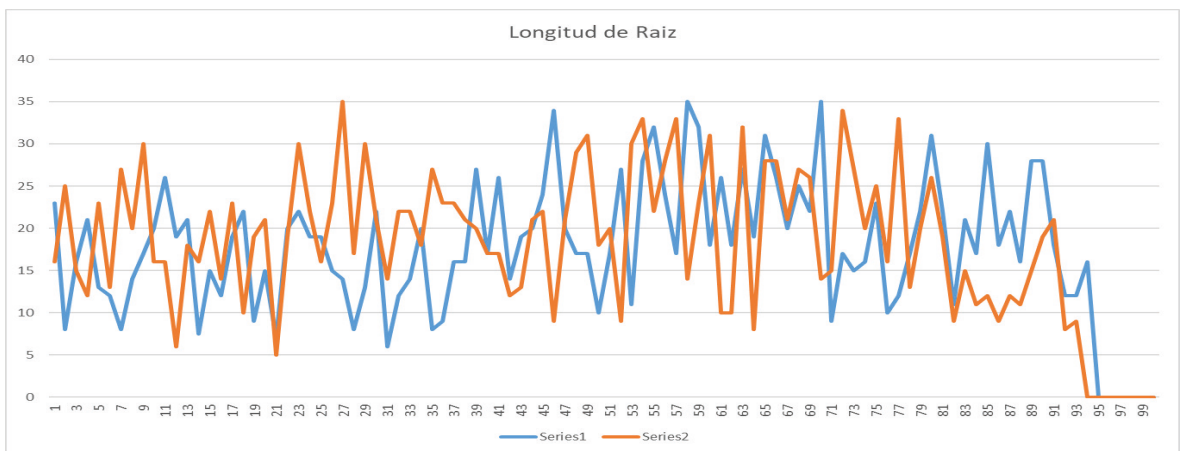
The benefits for the farmer to know the germination percentage of his seed are enormous; since, he can determine the amount of seeds that he should or needs to sow in his surface. In this way, an optimal crop is established and therefore, better results in production (www.gob.mx/snics/articulos/como-se-realiza-un-ensayo-de-germinacion)

EVALUATION OF THE GERMINATION TEST

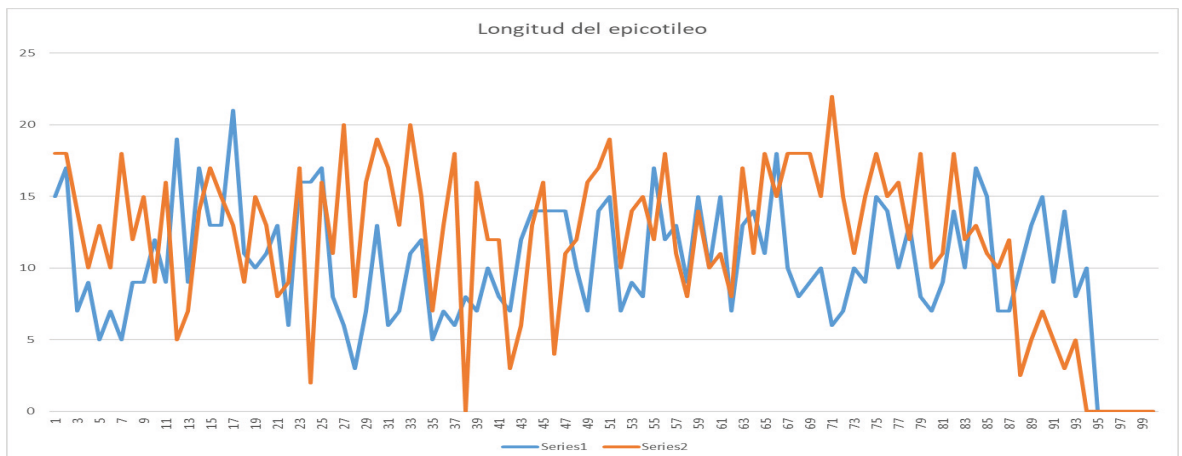
Corn seedlings are counted, normal seedlings (seedlings with root and stalk, each structure with at least twice the size of the seed in length) are evaluated as an indicator of seed germination vigor and the result is expressed as a percentage. A final count of the germination is necessary after 7, 8 or 14 days. The length of the plumule (LP) and of the radicle or stem (LR) in normal seedlings are also determined, these data are expressed in cm, and are considered an indicator of vigor.

The following graphs show the behavior of root length and epicotyl length of the creole corn of Michoacán and Guanajuato.

MAIZE FROM MICHOACÁN

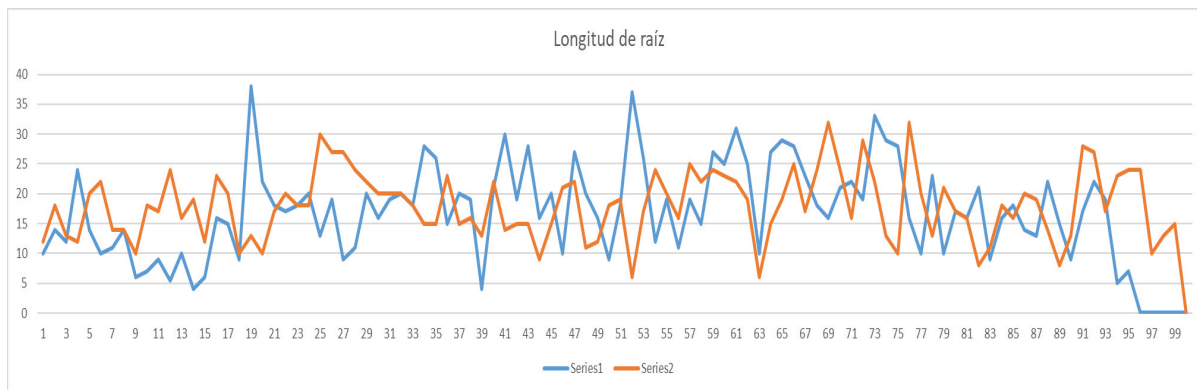


Source: Own elaboration

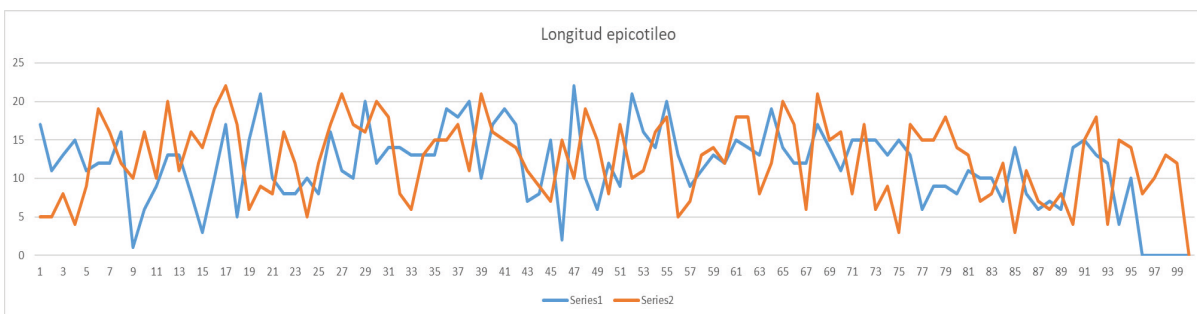


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CORN FROM GUANAJUATO



Source: Own elaboration



Source: Own elaboration: Own elaboration

We can mention that germination for corn from Guanajuato was between 95 to 99%, while corn from Michoacán had a range of 93 to 94%, which we can mention that corn from the state of Guanajuato can ensure a better population density in the plot or production unit, to ensure an optimal yield according to the environmental conditions of the region.

CONCLUSIONS

The standard germination test allows evaluating the response of seed samples to verify their physiological quality, starting from germination.

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