v. 3, n. 18, 2023

Journal of Agricultural Sciences Research

MOISTURE CONTENT OF CINNAMON SEEDS (*CINNAMOMUM ZEYLANICUM* J. PRESL) AND ITS EFFECT ON THE EMERGENCY OF SEEDINGS IN THE NURSERY

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Abstract: Cinnamon is an aromatic spice used as a condiment for a wide variety of dishes. In Mexican culinary art, this spice is highly consumed, it is the special touch for sweet and savory dishes. Due to its content of essential oils and carminitive properties, it is used in medicine for different stomach diseases. The objective of this work was to evaluate the content and rate of moisture loss of cinnamon seeds, as well as its effect on the emergence of seedlings in the nursery. The seeds were collected from the trees of the El Palmar-INIFAP Experimental Field. In the laboratory, the seeds were processed and separated into three batches of 500 seeds divided into 5 repetitions of 100 each. Three treatments 50, 20 and 10% humidity were evaluated and the response variable was the percentage of emergence obtained in the nursery. The data were analyzed in a completely randomized design with five repetitions. The results obtained showed significant differences ($p \leq 0.05$), seeds with 50% humidity presented 80% emergence, while those with lower humidity only reached around 19%. In all three levels, emergence began at 10 days, but only in two (50 and 20%) did it reach its maximum at 35. Seeds with 50% humidity presented the highest speed of emergence between 15 and 25 days later. of sowing, in contrast to those with lower humidity. The results showed that cinnamon seeds exposed to room temperature and devoid of the pericarp can lose up to 95% of humidity in five days and this is decisive for emergence in the nursery, as well as for their conservation.

Keywords: cinnamon, emergence, humidity, seed, nursery.

INTRODUCTION

Cinnamon is an aromatic spice widely used as a condiment in Mexican food, its aroma and flavor are the perfect touch for sweet and salty dishes. The cinnamon stick: *Cinnamomum zeylanicum*, it is originally from Sri Lanka (Ceylon); It is currently distributed in different parts of the warm humid tropics of the world. This species is mainly composed of cinnamaldehyde, the component responsible for its aroma, and eugenol, the substance that gives it its flavor. Due to its phenolic contents, it has medical properties such as anti-allergenic, anti-inflammatory, antimicrobial, antioxidants, among others (Senanayake, 2004). According to data from the agri-food and fishing information system (SIAP), in 2016, close to 7 thousand tons of this species were imported, equivalent to 78.4 million dollars, so, according to the information source, we becomes the main importing and consumer country of the product. Although it is true that in Mexico there are appropriate conditions for cultivation, currently there are no established commercial plantations, only small plantations are known in Chiapas, Puebla and Veracruz, therefore, all the cinnamon consumed in the country is imported. Due to the rural programs promoted by the Mexican federal government, there is an interest and demand for the cultivation of this species, whether for pure plantations or associated with other crops, so it is important to know the management and quality of the seed of this aromatic plant. In this sense, seeds are the beginning for the production of species and their development depends on different factors that intervene in each of the processes for germination and emergence, therefore, the study of their characteristics allows us to have better knowledge for its management and conservation (Peretti, 1994). The components of seed quality include genetic, physical, physiological and health aspects (Velázquez,

2014), and are determining factors for its storage and conservation. According to some authors, seeds are divided into three groups, orthodox, intermediate and recalcitrant, and this division is based on moisture content or tolerance to dehydration, thus those of the first group are within 5%, those of the second between 10 and 12.5% and those of the third are between 15 and 50% moisture content (Magnitskiy and Plaza, 2001). The objective of this work was to evaluate the content and rate of moisture loss of cinnamon seeds and its effect on the emergence of seedlings in the nursery.

MATERIALS AND METHODS

The work was carried out in the El Palmar-INIFAP experimental field, located in the municipality of Tezonapa, Veracruz, Mexico. From the cinnamon trees located within the field, 10 kg of seeds were collected and soaked in a bucket for 24 hours, then removed from the water and pulped manually. Once clean and well rinsed, they were taken to the laboratory and divided into 3 batches of 500 g each and these were separated into 5 samples of 100 g of seeds for each batch. The percentage of moisture was obtained with the Burrows model DMC500 digital portable seed moisture meter. 100 g of seed were poured into the meter hopper and a reading of the percentage of moisture was taken for each sample from the three lots. Once the parameter of each batch was measured, 5 samples of 100 seeds were taken (repetitions). The seeds of batch 1 with 50% humidity were sown in the seedbed on the same day that the pulping was done and the humidity was measured. Batches 2 and 3 continued to be measured and were kept at room temperature in plastic bags until they reached humidity 25 and 10% respectively to sow them. The distribution in the seedbed was done in a completely randomized design with 5 repetitions of 100 seeds for each treatment, which were the seeds with 50%, 20% and 10% humidity determined in the laboratory. Seedlings were considered emerged when the first leaves protruded from the substrate. The data were analyzed with R software version 4.3.2 and bbplot2 graphics package.

RESULTS

The results of the analysis of variance carried out to evaluate the emergence percentage of cinnamon cinnamon seedlings in relation to the moisture content of the seeds, showed that there are significant differences ($p<0.05$) in the emergence percentages observed in the nursery. Table 1 shows the results of the mean test, where it can be seen that the percentages of the moisture content of the seed are related to its emergence, the seeds with 50% humidity presented above 80% germination, while the seeds with lower humidity presented the lowest values.

% moisture	averages	significance
H50	81.50	a
H25	55.70	b
H10	19.00	c

Averages with different letter are significantly different ($p \leq 0.05$)

Table 1. Test of means of the germination percentage of cinnamon seeds

Likewise, in the paired means test in Table 2, it can be seen that the difference in emergence between the seeds with higher and lower humidity is 60%, while in the seeds with 25% humidity compared to those of The higher the percentage, the difference is 25%. The results indicate that the higher the moisture content in the seeds, the greater the emergence of seedlings in the nursery.

Percentage of moisture in seeds	Differences between the means	Lower endpoint of the confidence interval	Upper endpoint of the confidence interval	P value, after adjustment for multiple comparisons
H25-H10	36.06	29.37	42.75	0.0001*
H50-H10	61.86	55.17	68.55	0.0001*
H50-H25	25.80	18.95	32.64	0.0001*

Significance p ≤ 0.05

Table 2. Multiple comparison test of pairwise means of cinnamon seed germination.

Figure 1 shows the results of the paired comparison of averages, the differences between the moisture contents and the germination percentages of the seeds are observed. The largest value in the comparison of the means between treatments is observed in H50-H10 with the range of 60 and 70%, while in the comparison of treatments H25-H10 the difference range was between 30 and 40%. %. Since there were significant differences between the treatments, the zero line is not shown.

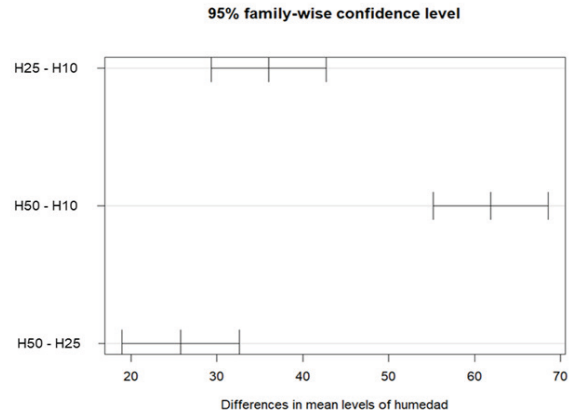

Figure 1. Paired comparison of emergence averages of cinnamon seeds in relation to their moisture content.

Figure 2 shows the percentage of emergence of cinnamon seedlings. It can be seen that emergence began 10 days after sowing and concluded after 35 days in the treatments with 50 and 25%. treatment with 10% after 30 days the seedling finished emerging. Likewise, between 15 and 20 days after sowing, the highest percentage of seedlings was obtained with 50% seed humidity, while those with lower humidity did not present this pattern.

The moisture content obtained in the cinnamon seeds was decisive for the percentage of emergence in the field. Figure 3 shows the speed of moisture loss after collection and the benefits thereof. After pulping, the moisture content was measured and showed values of 50%, and decreased on average 10% every 24 hrs, until day 5 where the values dropped to 5%. This characteristic of moisture loss at that speed is very important in making decisions for the collection and conservation of the seed, as well as to ensure the production of plants of this species.

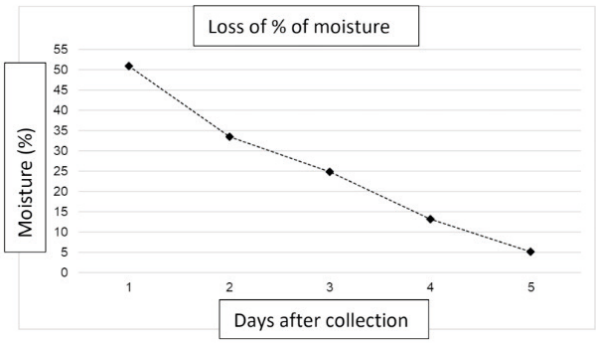

Figure 3. Loss of moisture content in cinnamon seeds

CONCLUSIONS

The moisture content in cinnamon seeds is decisive for germination; those seeds with the highest moisture content (50%) obtained above 80% emergence in the nursery and this began 10 days after sowing. The maximum rate of moisture loss was five days, so these seeds are located in the recalcitrant group and a well-defined protocol must be developed for their conservation, and they must also be sown immediately after collection to obtain the highest percentage of seedlings in the nursery. To make the most of the seeds, it must not take more than two days to sow them when the pericarp has been removed.

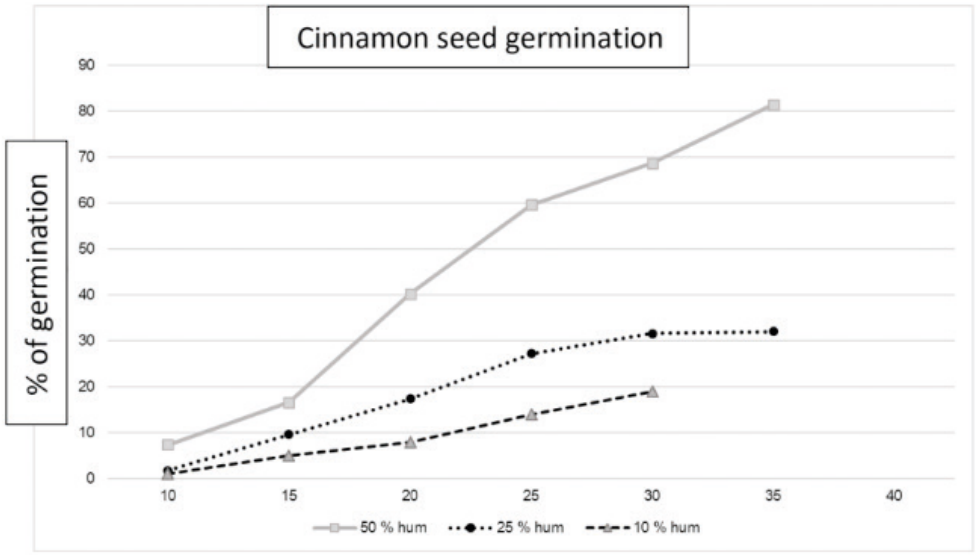

Figure 2. Percentage of emergence in relation to the moisture content of cinnamon seeds.

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