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Notes and Comments

Turmeric powder: biostimulator from expired lettuce seeds?

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The process of seed germination is considered a critical phase of development in the life cycle of plants and is important for the establishment of seedlings, in addition to being directly related to the ability to adapt to severe environmental conditions (Steinbrecher and Leubner-Metzger, 2017; Thakur et al., 2022).

One way to maintain seed quality is through the application of chemical treatments, usually with fungicides, inoculants, stimulants, micronutrients and others. However, the indiscriminate use of agrochemicals means that there is a need for alternative products, preferably biodegradable and that do not present toxicity to humans and animals (Neves et al., 2021).

In this sense, turmeric (*Curcuma longa* L.), which has several pharmacological activities, such as anti-inflammatory, antimicrobial, antimutagenic and antioxidant effects, due to the presence of the metabolites such as curcumin (Jyotirmayee and Mahalik, 2022; Balasaheb et al., 2020), may represent benefits in seed treatment and in the initial development of seedlings.

Considering that, for various reasons, such as not having information on what procedures should be taken when a batch of seeds expires or also because they do not have large amounts of batches, the small farmer uses batches of these expired seeds, therefore, seed treatment of lettuce (*Lactuca sativa* L.) with the natural antioxidant turmeric curcuma, may allow increases in the germination process.

In view of this, turmeric would be a possible option, being a low-cost natural source to meet organic agriculture or to reduce the use of agrochemicals, in order to provide uniformity and establishment of the initial stand. Therefore, the objective was to evaluate turmeric powder in the quality of American lettuce seeds (Great lakes 659), that expired five years ago.

The experiment was carried out at the Laboratory for Processing Products of Plant Origin, Department of Agronomy, Federal University of Vales do Jequitinhonha e Mucuri (UFVJM), JK campus, in the city of Diamantina - Minas Gerais.

Lettuce seeds, cultivar Great lakes 659, with a batch expired for five years, were treated at five different doses: 0, 1, 2, 3, 4 g of dry turmeric powder/kg of pure seeds. The treatments consisted of four replications with 50 seeds each, arranged in a completely randomized design and evaluated in laboratory conditions (69% and 20°C).

Lettuce seeds were conditioning in plastic bags, and three drops of water added, with the aid of a Pasteur pipette and the different doses of turmeric powder. Then, the plastic bags were shaken as a way to homogenize the treatment and improve the fixation of powder to the seeds.

To evaluate the quality of the seeds, the substrate used was germitest® paper, two leaves were moistened with distilled water at a rate of 2.5 times the weight of the dry paper, kept in laboratory conditions under Petri dishes. With evaluation of normal and abnormal seedlings, hard and dead seeds, obtained at the end of the test, on the seventh day, and the results were expressed in percentage (Brasil, 2009).

Concomitant to the germination test, root protrusion was adapted by Nobre et al. (2021), counted 48 hours the rupture of the endosperm and emission of the radicle by the embryonic axis, the results were expressed as a percentage. And for the germination speed index (GSI), with daily monitoring after the test was set up, according to Maguire (1962).

At the end of the tests, the normal seedlings of each treatment were weighed on a 0.001g precision scale to determine the fresh mass in grams (g). And they were also measured from the root to the shoot, to obtain the length with the aid of a ruler graduated in centimeters (cm).

The data were subjected to analysis of variance, and the effects of turmeric doses analyzed by regression, with program Sisvar® (Ferreira, 2011).

All evaluated variables are significant ($p<0.05$), except for root protrusion. There was a reduction in the germination rate and an increase in abnormal seedlings, as the doses of turmeric powder were increased (Figure 1).

One hypothesis suggested for such reductions in germination is the possible water restriction of seeds with the application of turmeric powder, since solids or substances with low solubility in contact with water, attract their molecules and reduce the water potential (Kerbauy, 2013). Negative water potentials, especially at the beginning of imbibition, promote reduction in water absorption by the seeds, which may make the of germination (Taiz and Zeiger, 2009).

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Henrique et al. (2021) found that the reduction in water availability contributed negatively to the percentage and speed of germination, as well as the increase in the number of abnormal seedlings. For Toledo and Marcos Filho (1997), when the germination power decreases, many seedlings are abnormal and not able to survive until maturity.

As the doses of turmeric powder increased, a greater number of dead seeds (DS) was observed, while the germination speed index (GSI) expressed a behavior similar to that of germination, with a reduction in vigor with the increase in seeds applied doses (Figure 2).

The treatment of lettuce seeds with dry turmeric powder may have been the possible cause of water stress, and of promoting the reduction of physiological quality in the present study. Signs of water stress, promoted by reduced water availability, limit seed imbibition and promote a reduction in the germination process (Farooq et al., 2009; Felix et al., 2018).

For seedling length, reductions were also observed with the addition of turmeric powder doses, (Figure 3A). In comparison with the control, this was mainly due to the possible water restriction in the small lettuce seeds,

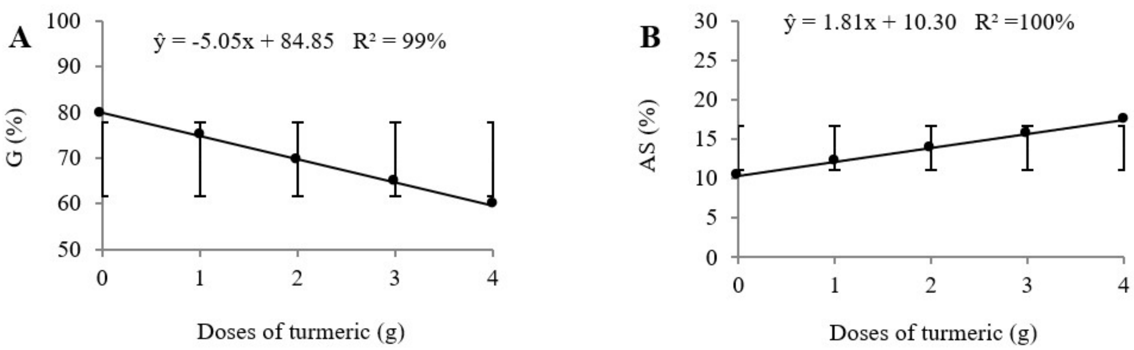

Figure 1. Germination - G (A) and abnormal seedlings - AS (B), obtained from iceberg lettuce seeds, cultivar Great lakes 659, batch expired five years ago, under doses of turmeric powder.

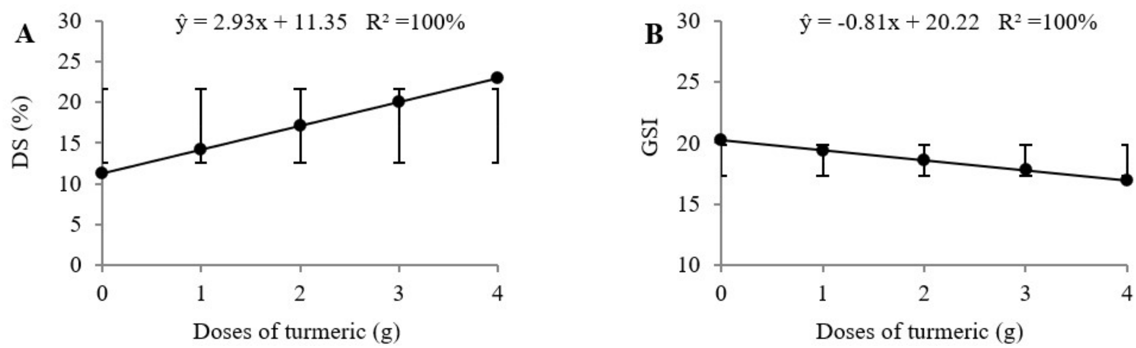

Figure 2. Dead seeds - DS (A) and germination speed index - GSI (B) of iceberg lettuce seeds, cultivar Great lakes 659, batch expired five years ago, under doses of turmeric powder.

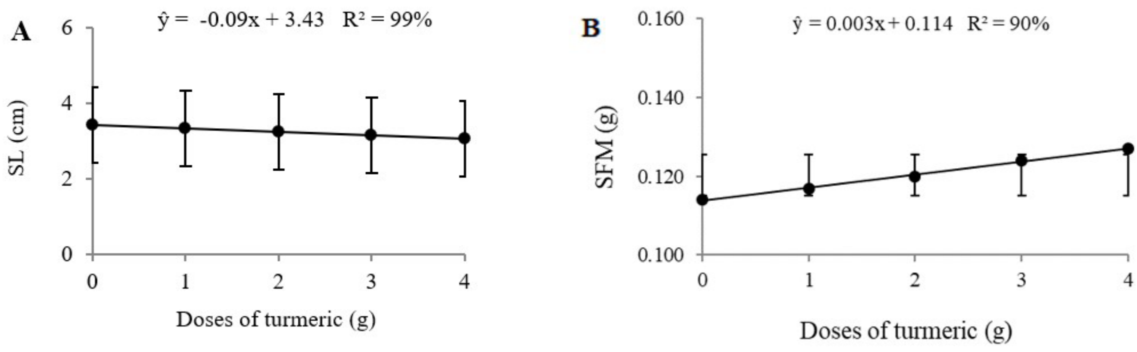

Figure 3. Seedling length - SL (A) and seedling fresh mass - SFM (B), obtained from iceberg lettuce seeds, cultivar Great lakes 659, batch expired five years ago, under doses of turmeric powder.

preventing the activation of metabolism and rapid development. The same was observed by Abati et al. (2014), where there was a reduction in the length of seedlings, mainly due to water restriction, which slowed down the physiological and biochemical processes, restricting the development of seedlings.

In opposition, to the fresh mass of lettuce seedlings, presented there was an enlarged as the doses increased (Figure 3B).

The increments presented in the fresh mass may be due turmeric has a biostimulating effect on the initial development of these seedlings after germination, thus allowing an increase in the water content in the aerial part of the seedlings via root absorption. In addition, turmeric has antioxidant action, which may have favored the defense system of the seedlings in the possible situation of water deficit caused by the dry powder.

Junqueira et al. (2017), showed that the use of bioregulator is favorable in the initial start of the seedling and increases the water content in the leaves, in addition to raising the levels of antioxidants for the defense system. Hermes et al. (2015), indicate the use of biostimulant via seeds to obtain higher values of fresh mass.

In addition, the standard deviation presented in the Figures 1, 2 and 3, are close to the observed averages, which infers greater homogeneity of the sample under study.

In view of the above, turmeric powder applied to expired lettuce seeds showed promise after root protrusion, with fresh mass gain, however it did not obtain a favorable response for physiological quality. Despite this, future works should investigate the process of water restriction with the possible treatment of seeds with dry powder, in order to use the natural biostimulant as a way to increase seed quality and reduce the use of agrochemicals.

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To the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

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