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# Physiological Quality and Vigor of Coriander (*Coriandrum Sativum*) Seeds Produced in an Agroecological Transition Area

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*Abstract* – **Problems associated with the low vigor of coriander seeds and the establishment are a constant in this culture. In the present work, lots of coriander seeds of cv. Verdao, produced in an agroecological transition area were evaluated, aiming to determine the quality of coriander seeds produced in the agroecological system, thus relating the physiological potential of the seeds with cultivation system. Were evaluated : degree of humidity, weight of one thousand seed, electric conductivity test, emergency percentage, first count, emergency Speed Index, Average Time and emergency speed coefficient. The results demonstrate that the seeds produced in an agroecological transition area presented similar physiological quality and vigor to the seeds produced in other cropping systems.**

*Keywords* – **Production System, Vegetables, Physiological Potential, Agroecology, Condiment.**

## I. Introduction

Coriander (*Coriandrum sativum* L.) is an annual vegetable, edible plant, including its seeds, being used as a condiment in everyone's cooking [1], [2]. In Brazil it is considered a crop of low economic value, but the quantity of producers involved in its production is great, presenting a great socioeconomic importance, mainly for family agriculture.

It stands out in the vegetable producer market, leaving only lettuce at the national production level. Regions North and Northeast their present favorable climatic conditions, which makes possible their cultivation throughout the year. Its seed-fruit is made up of two achenes, being generally marketed whole.

The high quality of seed of vegetables is of great importance, mainly as far as the uniform germination, necessary to guarantee an ideal plant stand. Therefore, the seeds that have high vigor become a basic and basic element, aiming the production with quality [3].

With regard to the relationship of seed vigor and field plant development, this issue is not well understood. There is a consensus about the influence of vigor on seedling emergence and early development, but it is unknown to what extent these effects on the different phenological stages, thus affecting crop production.

According to Burris [4] effects of seed vigor on crop pe--rformance, they should be analyzed separately, monitori--ng the development stages of the plant, taking into account that the harvested organs are distinct among species, according the purpose intended.

Another relevant factor is the seed production system. The Brazilian production is directly linked to the conventi--onal farming system, but this has been changing over the years.

With the various transformations that the environment has been suffering, be it naturally or by the action of man, and the socioeconomic crisis, has been sought to adapt to new technologies that preserve the natural resources existing in the environment in which we live.

The system of agroecological seed production has growing year after year. Studies conducted by Rodrigues et al. [5] on conventional and agroecological onion seed production systems (*Allium cepa*) found that the producti--on of onion seed through the agroecological system is economically viable and ecologically sustainable.

This change in properties with conventional farming systems in relation to the use of nonrenewable sources has caused changes in the relationship between food production and environmental impacts. These changes imply a reduction of chemical dependence and greater use of biological processes in the systems [6].

Even with the advance of the agroecological system seed production, there is not much information, referring to the quality of seeds produced in this type of system, mainly regarding the origin of the seed, physiological quality and vigor. Making studies relevant to these aspects are of great relevance.

Therefore, this study was conducted with the objective of determining the quality of coriander seeds produced in the agroecological system, thus relating the physiological potential of the seeds with the cultivation system.

## II. Material and Methods

### *Study Location*

The research was carried out in the dependencies of the Federal Rural University of Pernambuco at the Academic Unit of Serra Talhada, Serra Talhada, PE, Brazil.

### *Description of the Experiment*

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The implantation of the field of coriander seed production was in a transition area from the conventional production system to the agroecological production system, coriander (*Coriandrum sativum*) cv. Verdao in 200 cell polystyrene beads containing as substrate a mixture of soil and bovine manure tanned in a ratio of 1: 1. After the production of the seedlings in a protected place, they were transplanted to the field 21 days after sowing.

Total area of the experiment was 260 $m^2$, divided into 24 plots of 2.4 m x 2 m, each plot was formed by four rows with a spacing of 0.80 m between rows and 0.10 m between plants, using the spacing of 1 m between plots.

The seeds were harvested at the physiological maturity point, when the seeds were brown, the seeds were divided into 6 lots, then sawed in polystyrene trays of 200 cells containing commercial substrate (Tropstrato HA) to evaluate their quality physiological and determination of its vigor. The design was the completely randomized design with four replicates of fifty seeds per lot.

*Cultural Treatment*

The daily-applied irrigation depth was determined according to the water requirement of the crop in its different stages of development, using the following formula:

Etc = Kc x Eto.

where,

Etc = Crop evapotranspiration;

Kc = Crop coefficient;

Eto = Reference evapotranspiration.

The irrigation slide was applied to the experimental plots of 100% of the daily evapotranspiration of the crop.

Data on the crop coefficient were obtained through the Cultivation Evapotranspiration Bulletin [7], while the evapotranspiration data were obtained through the automatic meteorological station installed at the Campus of the Serra Talhada Academic Unit (INMET).

Bovine manure tanned at the rate of 0.02 kg / plant as organic fertilizer was used, weeding was done manually.

*Degree of Humidity*

Determined with the use of a greenhouse at 105 ± 3 ° C, during 24 hours [8], using two samples of each batch of each culture system. The results were expressed as a percentage.

*Weight of One Thousand Seed*

The weight of one thousand seeds was determined according to the Rules for Seed Analysis [8].

*Electric Conductivity Test*

Determined with four sub samples of 50 seeds which were weighed to the nearest four decimal places (0.0001g) and placed to soak (distilled water) in 75 ml plastic cups for 24 hours. After conditioning, the electrical conductivity of the solution was measured by means of conductivity meter readings and the results expressed as $\mu S\ cm^{-1}\ g^{-1}$.

*Emergency Percentage*

The evaluations were done by counting the emergent seedlings with the expanded cotyledonary leaves, ending on the 9th day after sowing according to the Rules for Seed Analysis [8].

*First Count*

It was conducted together with the emergency test, consisting of recording the percentage of normal seedlings found in the first count (7th day) of said test, according to the Rules for Seed Analysis [8]. The results were expressed as mean percentage of normal seedlings.

*Emergency Speed Index*

Determined in conjunction with the seedling emergence test. Daily counts were performed for the corresponding period of time until the last count of the number of seedlings emerge. The calculation of the emergency speed index was, according to formula Maguire [9].

*Average Time*

Calculated according to the formula presented by Labouriau [10].

*Emergency Speed Coefficient*

It was determined according to the formula proposed by Roos and Moore III [11].

*Statistical Analysis*

Data were submitted to normality, homoscedasticity and variance analysis. The averages were compared by the Scott-Knott test at the 5% probability level using statistical software Assistat 7.7.

## III. Results and Discussion

*Physiological Quality of Seeds*

The results of the electrical conductivity (EC) showed a significant difference between the lots evaluated (Table 1), allowing the verification of different levels of seed deterioration, because the premise is that the cell membranes of the seeds are the last to be arranged in the ripening process, but are the first to express signs of deterioration in the final stage of physiological maturity [12], [13]. Thus, it is possible to verify the integrity of the lots by the differentiation of the electrical currents observed [14].

However, for the variable weight of one thousand seeds (WTS), no significant difference was observed among the lots evaluated, showing that the lots have a standard in relation to the WTS.

The degree of humidity (DH) observed in the seeds of the different evaluated lots corroborates with the results of EC, where in general the lots with higher EC values presented higher DH, revealing a greater deterioration of their seeds.

The emergence of seedlings from the seed lots produced in an agroecological transition area used in this evaluation was superior to the established minimum (60%) for commercialization of coriander seeds [8].

According to table 2, it is observed that in the emergency seedlings Test (ES), emergency Speed Index (ESI) and average emergency time (TEA) of the evaluated batches did not have a significant difference between them.

The first count (FC) was verified that batches 4, 5 and 6 were greater than lots 1, 2 and 3, presenting significant differences between them (table 2).

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Table 1. Means obtained in the evaluations of the electrical conductivity (EC), weight of one thousand seeds (WTS), degree of humidity (DH) of seeds coming from an agroecological transition area.

| Production System | Lots | EC ($\mu S.\ cm^{-1}.\ g^{-1}$) | WTS (g) | DH (%) |
|---|---|---|---|---|
| Agroecological | 1 | 211.375 c | 17.680 a | 40.74 |
| | 2 | 204.025 c | 17.690 a | 32.19 |
| | 3 | 231.395 c | 15.820 a | 34.12 |
| | 4 | 171.425 b | 14.250 a | 23.88 |
| | 5 | 171.538 b | 14.490 a | 26.68 |
| | 6 | 114.400 a | 14.640 a | 34.07 |

Distinct letters within each column differ from one another by the Scott-Knott test at 5% probability.

Table 2. Means obtained in seedling emergence tests (ES), first count (FC), emergency speed index (ESI), emergency speed coefficient (CSE) and average emergency time (TEA) of the seeds coming from an agroecological transition area.

| Production System | Lots | ES (%) | FC (%) | ESI | CSE | TEA (days) |
|---|---|---|---|---|---|---|
| Agroecological | 1 | 92.00 a | 3.00 b | 4.703 a | 37.197 b | 4.503 a |
| | 2 | 92.00 a | 7.00 b | 4.735 a | 37.348 b | 4.500 a |
| | 3 | 95.00 a | 5.00 b | 5.077 a | 37.763 b | 4.500 a |
| | 4 | 86.00 a | 13.00 a | 4.752 a | 43.008 a | 4.498 a |
| | 5 | 97.00 a | 10.00 a | 5.243 a | 36.845 b | 4.503 a |
| | 6 | 90.50 a | 11.00 a | 4.943 a | 40.380 a | 4.503 a |

Distinct letters within each column differ from one another by the Scott-Knott test at 5% probability

This may be associated with the lower EC values presented by lots 4, 5 and 6. Revealing that lots with lower EC gives a higher percentage of emergence of normal seedlings in the first 7 days after sowing.

For the variable speed coefficient of emergency (CSE), there was a significant difference between the lots evaluated, where lot 6 and 4 were higher than the others.

The seeds produced in an agroecological transition area presented physiological quality within established standards [8], becoming an alternative for producers who want to change their conventional farming system to agroecological cultivation, thus maintaining seed quality product and a better balance with the environment.

The results corroborate Silva et. al., [15] that when evaluating the vigor of coriander seeds from conventional and organic cultivation systems, did not observe significant differences between the evaluated lots of the different cultivation systems.

These different responses in relation to the physiological quality of the coriander seeds, may be associated with agronomic factors of the region where the seed production field is located, as well as the productive management adopted.

In general, the agroecological production system has been shown to be efficient, environmentally, productive, stable and tending towards long-term sustainability [16], [17].

The choice for this cultivation system is not a return to the past, but a search for equilibrium with the environment. Providing greater interaction with the harvested crop, recycling of nutrients and other resources, reducing the use of artificial fertilizers, synthetic pesticides, and minimizing environmental pollution [18].

The expansion of the production of seeds in agroecological system has been an alternative to the conventional system of agriculture, seeking to achieve sustainability in the fields producing seeds, mainly for farmers who produce organic vegetables, where it is necessary to use seeds produced in the organic system of agriculture, aiming at obtaining the organic certification of its product.

## IV. Conclusion

The results demonstrate that the seeds produced in an agroecological transition area presented similar physiological quality and vigor to the seeds produced in other Cultivation systems, as demonstrated in the literature.

The evaluated lots remained within the established standards, thus attesting their physiological quality, allowing the formation of seedlings with greater vigor. In addition, it allows small farmers to use their area's transition from the production system, from the conventional to the agroecological, providing a crop with greater sustainability.

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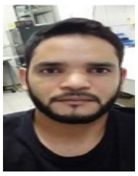

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