

Assessment of seed germination and morphological characteristics of two chickpea (*Cicer arietinum* L.) cultivars under temperature stress

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Nowadays, the transformation on global and local food system is crucial to ensure the delivery of healthy, safe and sustainable, nutritious food. With the significant reduction of Earth's water resources, it is necessary to transform our nutrition since the population is expected to reach nearly 10 billion by 2050. As the availability of water resources is projected to decrease in the future, it is becoming increasingly important to identify and investigate alternative plants and other protein sources that can contribute to meeting the growing demand for protein while also managing nutritional imbalances worldwide. Chickpea (*Cicer arietinum* L.) is a pulse grain which often used as an alternative protein source for vegetarians or vegans since it contains around 18 to 25 % by weight. As one of the oldest and most commonly cultivated members of the Legumes family, it binds nitrogen from the atmosphere, reducing the need for nitrogen-containing fertilizers among farmers. The economic importance of chickpea is also outstanding, since it can be grown in humid conditions, even without irrigation, due to its extreme drought tolerance. However, among the environmental factors, drought stress can significantly impact the germination and emergence of chickpea seedling. Recent changes in climate risk the success of germination, which is the first step in chickpea cultivation.

Germination is one of the most important biochemical processes that leads to the chemical and structural transformation of grains, resulting in the formation of functional and nutritional components and in the reduction of antinutritional factors. In order to increase the agroecological potential of chickpeas, germination biological tests should be conducted first. The aim of this research was to investigate the germination biology of chickpea, which has gained importance recently in Hungary due to increasing protein import dependency and energy crisis. Our goal is to improve the knowledge of chickpea biology and help to guide future research and production practices in sustainable agriculture.

The research was conducted in Petri-dishes under laboratory conditions at the Research Laboratory of Plant Production Sciences Institution, Hungarian University of Agriculture and Life Sciences to ensure the conditions requested. During the testing period, different temperature levels were used as the most important environmental factors that influence germination are temperature and light. Seeds were obtained from the Plant Breeding Research Station located in Irgszemcse, Hungary. The varieties used in the experiment have certified properties to guarantee the specified requirements. The germination test was conducted with four replications (each Petri-dish as one replicate), and the number of germinated seeds was recorded daily until the end of the experiment.

According to our result, the germination of Hungarian breeding chickpea varieties was significantly influenced by temperature. We observed that subjecting the seeds to alternate temperatures of 20°C and 25°C during the incubation period resulted in the maximum percentage of seed germination. This research provides valuable information on the

germination of chickpea in response to different environmental temperatures, which can improve future research and production practices among researchers.

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