

## SUMMARY

**Thesis title:** SOYBEAN RESPONSE TO WATER STRESS IN INVITRO GERMINATION

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Course: MSc Crop Production Engineering

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Soybean is one of the most important widely cultivated crops grown mainly for oil and food for human consumption. It is a rich source of protein and an excellent feed supplement. Soybean growth, development and crop yield vary annually and is dependent on the various biotic and abiotic factors that affect its germination. In the present research work, we aimed to carry out in vitro experiment the response of soybean seed germination to water stress as an abiotic factor. To do this, the Hungarian hybrid seed samples were first sown at the University experimental field. After sowing, it was irrigated immediately with subsequent irrigation within the first and second week but it yielded no result as no seed germinated. This was due to the extreme summer drought that year. The second trial was carried out in the laboratory of crop production in the Faculty of Agriculture and Environment at Hungarian University of Agriculture and Life Sciences (MATE) Gödöllő Hungary following the standard laboratory procedure. The same Hungarian variety was used for the trial in nine water treatments with 4 replications and it yielded no result as no seed germinated. A similar experiment carried out by Kiet Anh Huynh using the same Hungarian hybrid variety formed the bases of my evaluation. The study examined the viability, radicle, and plumule growth in three-levels of water treatments (6 ml; 9 ml; 12 ml) following the general laboratory standards and was conducted in the laboratory of crop production in the Faculty of Agriculture and Environment at Hungarian University of Agriculture and Life Sciences (MATE) Gödöllő, Hungary. The treatments were set in randomized complete block design with three repetitions and

the parameters recorded from the experiment were Germinated seeds, Radicle length and Plumule length. ANOVA one way and LSD tests using the SPSS software were used to analyse the significant difference between seeds for each water level treatment. Our results showed a significant difference at the level of  $p < 0.05$ . The two levels of water, 6 ml and 9 ml, had the highest soybean seed germination ratios, with seeds germination percentages of 40.74 and 22.22 for 12 ml of water, respectively. The percentage of seeds that germinated in each treatment did not differ significantly from one another.

A substantial difference between the effect of water levels on the radicle length and plumule length of seeds that germinated was observed. There was a significant difference in the length of radicle between the 9 ml water level and the treated seeds by 12 ml of water, which was about -0.444 at  $p = 0.031$ , and between the seeds treated with 9 ml and 6ml of water, which is about 0.481 at  $p = 0.020$ . The length of the radicle was decreased when the soybean seeds were germinated under water stress conditions (6 ml and 12 ml). The length of the radicle of the seeds that germinated was 0.44 mm, 0.93 mm, and 0.48 mm at water concentrations of 6 ml, 9 ml, and 12 ml, respectively. The length of plumule showed a significant difference between the two levels of water 9 ml and 12 ml. At  $p = 0.040$ , the difference was around -0.459. In condition 12ml, the length of the plumule decreased by about 49.5%. Our result showed soybean growth is greatly affected by water stress. Under water deficit, the growth and emergence of the plumule is retarded while under waterlogged condition, there is a slow down in the germination process due to the lack of oxygen to facilitate the metabolic activities and processes within the seed.

- Waterlogging conditions have obstructed germination after the second day, while normal and abundant but no flood water supply applications contributed to higher viability.
- The initial growth of the plantlets had shown significant differences in relation with the moisture conditions.
- Waterlogging had a deteriorating impact on the development of the growth of organs.
- Plumule growth was blocked significantly more than that of the radicles.
- The stress processes were detected, and identified, however more detailed physiological observations are needed in the future to specify stress conditions.