Data of selected set of rice accessions at the germination stage under cold stress

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\begin{abstract}
Hungary is northernmost temperate rice growing country in Europe. One of the main limiting factors is low temperature, especially at germination and seedling developmental stages. In early developmental stages, low temperature can impair and delay germination, as well as have negative impacts on seedling growth, causing poor stand establishment and non-uniform crop maturation [1]. Temperatures lower than 15 °C are generally detrimental for germination [2] under filed conditions for establishment of the crop. This article describes some key germination parameters of 165 rice accessions including breeding lines and varieties. Each genotype was grown in three replicates in a controlled cabinet under 13 °C for 4 weeks' duration. Growth was measured every 7th day. Growth traits such as coleoptile and radicle length were measured at the end of the experiment. The average data were calculated for three replicates. This dataset contains germination raw data and five germination parameters such as median germination time (MGT), final germination percentage (FGP), germination index (GI), coleoptile length (CL) and radicle length (RL). These data may provide reliable support for researchers and breeders to select the right rice genotypes for low temperature conditions.
\end{abstract}

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Specifications Table

| Subject                      | Agricultural Science /Agronomy and Crop Science |
|------------------------------|--------------------------------------------------|
| Specific subject area        | Varietal based germination and growth descriptions at chilling temperature. |
| Type of data                 | Tables and Figures                               |
| How the data were acquired   | The germination test was carried out in a Lovibond TC 256 G thermo-statically controlled cabinet for 4 weeks at 13 °C. Every week we counted the germinated seeds and at the end of the experiment we counted the coleoptile and radicle which were longer than 5 mm. Basic mathematical analyses (mean and standard deviation) were run by Microsoft Excel 2016. |
| Data format                  | Raw and Analyzed                                  |
| Description of data collection | Seeds of 165 different variety/breeding line were germinated in cooled environment at 13 °C with 0.1 °C accuracy. Three replications were maintained throughout the experiment. |
| Data source location         | Institution: Hungarian University of Agriculture and Life Sciences, Institute of Environmental Sciences, Research center of Irrigation and Water Management. |
|                             | • City/Town/Region: Szarvas                     |
|                             | • Country: Hungary                              |
|                             | • Latitude and longitude (and GPS coordinates, if possible) for collected samples/data: 46°52′16.3″N 20°31′38.6″E |
| Data accessibility           | The data is provided in this article and Mendeley Data |
|                             | Data identification number: https://data.mendeley.com/datasets/g84t2279zx/2 or doi: 10.17632/g84t2279zx.2 |

Value of the Data

- These data are useful because they provide baseline information on cold tolerance properties of rice under germination and early seedling stage. The importance of these germination data is considerable, because in the temperate region the rapid germination and growth are essential properties to reach uniform population in rice production. Furthermore, it is also necessary to better understand rice lines’ tolerance to varied environmental conditions and determine more precise breeding traits.
- Our variety collection contains also some well-known reference varieties (M202 [3], HSC55 [4], and Nipponbare [5]). Part of the genetic materials that were used for the experiments is originated from the International Network for Genetic Evaluation of Rice (INGER) as global network based at International Rice Research Institute, Philippines for exchange of rice elite improved germplasm that has been established since 1975. Therefore, these data can support other researchers to extend their analysis and make more detailed comparisons.
- These data represent an easy way to evaluate the cold tolerance abilities at early developmental stages which may be used in multivariate analysis. The additional values of these data are the relatively easy screening method and thus the repeatability; to enable comparison among rice germplasm.

1. Data Description

The dataset contains 8 Tables [6]. Tables 1–3 are raw data. Tables 4–8, were calculated from the raw data. The experimental data were recorded continuously each week (four measurements) and the growth parameters were calculated at the end of the experiment. The Table 1 of dataset provides the list of rice varieties with their status (released variety or breeding lines) and the country of origin. The germplasm collection originated from 23 different countries. The
Fig. 1. Median Germination time (MGT) of 165 different genotypes. The data show the means of three replicates.

Fig. 2. The final germination percentage (FGP %) at the end of the experiment (28th day). The data show the means of three replicates.

Table 2 contains raw data of germination screening with three replicates. It describes the germination parameters under the 4-week experiment duration. Each data cell represented the germinated seeds from 40 surface sterilised seeds. From these data, we calculated the median germination time, germination index and final germination percentage. During the experiment, a seed was considered as germinated when radicle was observed as 1 mm long. The third table (Table 3) showed the number of coleoptiles and radicles which are longer than 5 mm recorded at the end of the experiment. The Table 4 represented the median germination time which shows the time that is necessary for the germination of the 50% of the seeds (Fig. 1). Table 5 shows the final germination percentages (FGP) that are calculated at the 28th day of the experiment (Fig. 2). The germination index (GI) values which combine the germination time and germina-
Fig. 3. The germination index (GI) of examined varieties.

Fig. 4. The percentage of coleoptiles which are longer than 5 mm (CL) on the 28th day under 13 °C.

tion percentage is described in Table 6, and visible in the Fig. 3. The Figs. 4 and 5 shows growth parameters such as the percentage of coleoptiles and radicles that are longer than 5 mm.

2. Experimental Design, Materials and Methods

The plant materials were chosen from the Rice Variety Collection maintained by MATE IES ÖVKI Galambos Rice Research Station (Szarvas, Hungary). The seeds were harvested in the same cropping season in 2020. In our study, altogether 19,800 seeds were investigated during the germination phase (165 varieties, 40 seeds in 3 replications). The selection of the seeds was
based on size uniformity. To avoid the utilization of damaged or deformed seeds, all the accessions were soaked for 5 min in 10% sodium chloride solution, and empty or partially filled seeds were collected from the surface of the solution. Prior to the commencement of the experiment, dormancy of the seeds, especially in indica genotypes was checked as per Narim et al. [7], because they reported in their studies that Oryza indica lines generally had usually higher dormancy than O. japonicas. The seeds were surface sterilized with sodium hypochlorite solution (40 g/L) for ten minutes. Seed were placed in petri dishes between two layers of filter paper and were soaked with 9 ml of distilled water. Than all the petri dishes were put into a Lovibond TC 256 G thermostatically controlled cabinet for 4 weeks at 13 °C. To avoid the infection with fungi and bacteria, the filter paper and distilled water were changed weekly. The experiment was conducted in a randomized block design, and the blocks constituted of different shelves in the chamber. The place of petri dishes was changed in the cabinet in every week.

This experiment used two methods to evaluate cold tolerance of different rice genotypes. First method was a germination test and the second method was the determination of growth ability under low temperatures.

During our experiment, a seed was considered as germinated when radicle was observed as 1 mm long. The germinated seeds were counted in every 7th day. In the present study, five parameters were used to describe germination dynamics of the selected rice varieties:

- Median germination time (MGT): time (in days) for 50% of germination:

\[ MGT = ti + (N/2 - ni) - (tj - ti)/(nj - ni), \]

where, N is the final number of germinated or emerged seeds and nj and ni are the cumulative number of seeds germinated by adjacent counts at times tj (day) and ti, (day) respectively, when ni < N/2 < nj. [8].

- Final Germination Percentage (FGP): number of germinated seeds on the fourth week/total number of seeds * 100.

- Germination index (GI): \( GI = (N_{14} + N_{21}/2) / 40 \times 100 \), where \( N_{14} \) = number of germinated seeds 14 days after the beginning of the cold treatment; \( N_{21} \) = number of germinated seeds 21 days after the beginning of the cold treatment; 40 being the total number of seeds per genotypes per replications [9].
• Percentage of seeds with coleoptile (CL) and radicle (RL) superior to 5 mm: radicle and coleoptile length of seedlings were measured after 28 days of cold treatment [9].

Ethics Statements

Not applicable.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT Author Statement

Árpád Székely: Data curation, Writing – original draft, Writing – review & editing; Tímea Szalóki: Project administration, Investigation, Visualization, Writing – original draft, Writing – review & editing; Csaba Lantos: Supervision, Project administration, Supervision, Writing – original draft, Writing – review & editing; János Pauk: Supervision, Project administration, Supervision, Writing – original draft, Writing – review & editing; Shoba Venkatanagappa: Project administration, Writing – original draft, Writing – review & editing; Mihály Jancsó: Writing – original draft, Writing – review & editing.

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Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi: 10.1016/j.dib.2022.107929.

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