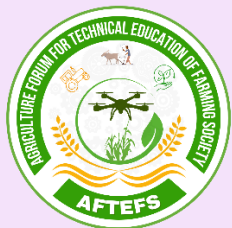


AGRICULTURE FORUM FOR TECHNICAL EDUCATION OF FARMING SOCIETY

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Evaluation of Seed Germination Efficacy in *Oryza sativa* (Rice)

Authors

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INTRODUCTION

Germination testing is a fundamental procedure in rice cultivation, essential for quantifying the viability of a seed lot. When analyzed in conjunction with seed vigor, germination quality provides a reliable estimate of prospective field performance and subsequent crop yield. Although germination kinetics may exhibit minor variation across cultivars, physiological development generally requires moisture absorption within two days, followed by the emergence of the radicle and the first leaf within four days, at which point the seed is formally considered to have germinated.

Germination test: A Basic need for Farmers: A germination test helps farmers determine whether seed is suitable for planting. Rice seed stored in traditional open systems usually loses germination after about six months, and some varieties remain dormant for 1–2 months after harvest. Knowing the germination rate allows farmers to adjust seeding rates and achieve the desired plant population in the field.



Figure 1: Paddy seed and its seedling stage.

Standardized measurement protocol:

Seed germination test: A germination test is used to measure the proportion of viable seeds in a seed lot by determining the percentage that can successfully sprout under suitable conditions. When evaluated

together with seed vigor, the germination percentage provides a reliable indication of expected field establishment and crop performance. Although germination speed may differ slightly among varieties, healthy seeds generally absorb water within two days and develop a primary root and the first leaf within four days. Once these structures emerge, the seed is considered to have germinated.

Sample collection: To ensure that the seed sample accurately represents the entire seed lot, collect seeds from different locations within each bag or storage container. When the seed lot consists of multiple bags, samples should be drawn from several bags rather than just one. A practical guideline is to sample a number of bags equal to the square root of the total number of bags in the lot. For instance, if the seed lot contains 9 bags, samples should be taken from at least 3 bags. Similarly, for a lot of 100 bags, samples should be collected from at least 10 bags before combining them into a representative sample for germination testing.

Equipment Required

- Waterproof tray (e.g., a flat-sided plastic bottle cut lengthwise or a shallow plastic tray)
- Water-absorbent material (tissue paper, paper towels, or cotton wool)
- Rice seed sample
- Clean water
- Measuring cylinder or beaker
- Forceps
- Marker pen and labels
- Calculator (for calculating germination percentage)

Procedure

- Clean the waterproof tray and line it with a layer of moist tissue paper or cotton wool.
- Take random samples from each seed lot and mix those in a container
- Take at least three seed samples from the mixed grain.
- Count out 100 seeds from each sample and place on absorbent material inside the tray.
- Carefully saturate the absorbent material
- For each of 10 days, check to see that the absorbent material remains moist and record the number of germinated seeds.
- Compute germination test for five 5 days and for ten 10 days.
- While calculating the germination rate, one should take root and shoot length. There shouldn't be any water soaked lesion and infection in the root and shoot because, these seedling may not establish in the main field.
- The rate of germination is an indicator of vigor. Rapid seed germination increases the chance of the seed establishing in the field.

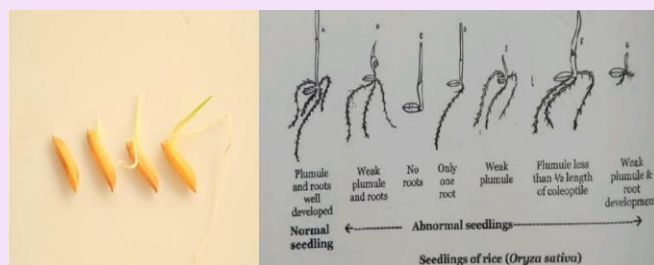


Figure 2: Seed germination of Rice

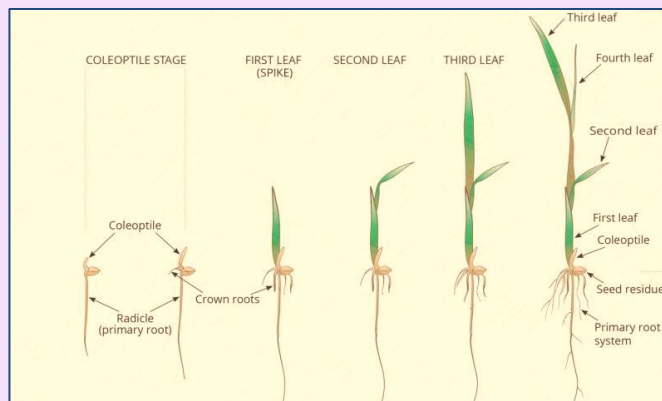


Figure 2: Stages of seedling growth in a rice plant, *Oryza sativa*.

Rice Germination vs Seedling Emergence

Rice Germination	Seedling Emergence
Begins with water absorption	Begins when the shoot reaches the soil surface
Ends with seedling establishment	Visible above ground
Mostly hidden below the soil	Easily observed

Common Problems during Rice Germination

- **Poor Seed Quality:** Old or damaged seeds often show low germination rates.
- **Low Temperature:** Cold conditions slow metabolic activity and delay emergence.
- **Water Stress:** Both drought and prolonged oxygen deficiency can reduce successful germination.
- **Seed-Borne Diseases:** Fungal or bacterial infections may kill seedlings before establishment.

Calculation:

Germination rate is the average number of seeds that germinate over the 5- and 10- day periods. For example,

If 86 seeds germinated in a tray of 100 seeds after 10 days, then,

$$\text{Germination (\%)} = \frac{\text{Number of seeds that germinated}}{\text{Number of seeds on the tray}} \times 100$$

$$\text{10-day germination (\%)} = \frac{86}{100} \times 100 = 86\%$$

Result: The rice seed sample exhibited a germination percentage of 86%, indicating that 86 out of every 100 seeds produced normal seedlings and the seed lot has good planting quality.

Recommendation: Use seed with a germination rate of at least 80% for planting to achieve good crop establishment. If the germination rate is between 60% and 80%, increase the amount of seed sown in the seedbed to compensate for reduced viability. Seeds with a germination rate below 60% should generally be avoided and used only if no better-quality seed is available.

Precautions

- Use clean and healthy seed samples.
- Maintain adequate moisture without waterlogging.
- Keep seeds evenly spaced to prevent fungal growth.
- Avoid direct sunlight during the test.
- Use clean equipment to minimize contamination.