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EFFECT OF DIFFERENT TEMPERATURE LEVELS ON GERMINATION, ROOT AND SHOOT DEVELOPMENT OF RICE VARIETIES

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# EFFECT OF DIFFERENT TEMPERATURE LEVELS ON GERMINATION, ROOT AND SHOOT DEVELOPMENT OF RICE VARIETIES

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#### ABSTRACT

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Temperature is one of the most important environmental factors influencing rice germination growth, development and yield processes. An experiment was conducted with 12 rice varieties *viz*. Binasail, Iratom-24, Binadhan-4, Binadhan-5, Binadhan-6, Binadhan-7, Binadhan-8, Binadhan-9, Binadhan-10, Binadhan-11, Binadhan-14 and Binadhan-17 in plant growth chamber at Bangladesh Institute of Nuclear Agriculture during July to December, 2015 to assess the effect of different temperature levels on germination, root and shoot length and to find out suitable temperature for proper germination. Five temperature treatments *viz*. 20, 25, 30, 35 and 40°C were imposed for 7 days. Rice varieties showed better germination% at 25-35°C, medium at 40°C and the lowest at 20°C. The lowest root and shoot length was also recorded at 20°C. More than 95% germination was observed in Binasail, Iratom-24, Binadhan-6, Binadhan-7, Binadhan-8, Binadhan-10, Binadhan-11 and Binadhan-14 under the temperature treatments. Among those Binasailand Binadhan-7 also showed better root and shoot length.

Key words: rice, temperature, germination, root, shoot

#### **INTRODUCTION**

Temperature is one of the most important environmental factors influencing crop growth, development, and yield processes. Temperature is becoming the major concern for plant scientists worldwide due to the changing climate. Global climate change is making high temperaturea critical factor for plant growth and productivity. It is now considered to be one of the major abiotic stresses for restricting crop production, which has a favorable and in some cases unfavorable influence on the development, growth and yield of rice. Rice being a tropical and sub-tropical plant requires a fairly high temperature, ranging from 20° to 40°C. Rice cultivation is conditioned by temperature parameters at the different phases of growth. However, germination under temperature stress indicates tolerance level of a variety. So, the study was undertaken to evaluate12 rice varieties under different temperature levels and also to find the suitable temperature for proper germination.

# MATERIALS AND METHODS

An experiment was conducted with 12 rice varieties *viz*. Binasail, Iratom-24, Binadhan-4, Binadhan-5, Binadhan-6, Binadhan-7, Binadhan-8, Binadhan-9, Binadhan-10, Binadhan-11, Binadhan-14 and Binadhan-17 in plant growth chamber at Bangladesh Institute of Nuclear Agriculture (BINA) during July to December, 2015. Five temperature treatments *viz*. 20, 25, 30, 35 and 40°C were imposed for 7 days in plant growth chamber. The experiment was laid out in a completely randomized design with three replications. Three hundred seeds of each rice variety for each temperature treatment were soaked in tissue paper in Petri dishes. Then those varieties were exposed to each temperature treatment in plant growth chamber. Data on germination, root and shoot length were recorded. Data were analyzed statistically and means were compared by DMRT.

# **RESULTS AND DISCUSSION**

Result indicated that germination percentage and root length increased with increasing temperature until 35°C followed by a decline whereas shoot length increased with increasing temperature until 40°C (Table 1). Rice varieties showed better germination% at 25-35°C, medium at 40°C and the lowest at 20°C. The lowest germination percentage, root and shoot length was recorded at 20°C. More than 95% germination was observed in Binasail, Iratom-24, Binadhan-6, Binadhan-7, Binadhan-8, Binadhan-10, Binadhan-11 and Binadhan-14 under the temperature treatments (Table 2). Among those Binasailand Binadhan-7 also showed better root and shoot length.

Suitable temperature for better germination of the rice varieties ranged between 25-35°C. Lower and higher temperature of that range affected germination. The results are in conformity of many researchers (Srinivasulu and Vergara, 1988; Krishnasamy and Seshu, 1989; Vidotto and Ferrero, 2000; Sato *et al.* 2001; Kang and Saltveit, 2002). Better germination, root and shoot growth of the rice varieties at 25-35°C might be due better enzyme activity and cell division.

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Temperature °C	Germination (%)	Root length (cm)	Shoot length (cm)	
20	76.58c	0.89d	0.45d	
25	95.78a	2.24c	1.30c	
30	96.06a	4.40b	3.45b	
35	97.03a	5.87a	4.38a	
40	92.19b	4.37b	4.42a	

Table 1. Germination, root and shoot length of rice varieties under different temperature levels

Values having common letter(s) in a column do not differ significantly at 5% level as per DMRT

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Varieties	Germination (%)	Root length (cm)	Shoot length (cm)
Binadhan-8	95.73a	3.57cde	3.16ab
Binadhan-10	97.53a	3.46cdef	3.06b
Binadhan-11	89.40b	3.19ef	2.71c
Binadhan-17	95.60a	3.40cdef	2.69c
Binadhan-7	95.93a	3.78abcd	3.12ab
Binadhan-6	96.33a	4.12ab	2.64c
Binadhan-9	86.07c	3.72bcd	3.39a
Binadhan-14	96.00a	3.01f	2.72c
Binadhan-5	82.07d	3.01f	2.19d
Binasail	96.87a	4.27a	3.11ab
Binadhan-4	76.87e	3.84abc	2.72c
Iratom-24	89.93b	3.28def	2.33d

Table 2. Varietal effects on germination, root and shoot length under the temperature treatments

Values having common letter(s) in a column do not differ significantly at 5% level as per DMRT

#### CONCLUSION

Rice varieties showed better germination% at 25-35°C, medium at 40°C and the lowest at 20°C. The lowest root and shoot length was also recorded at 20°C. More than 95% germination was observed in Binasail, Iratom-24, Binadhan-6, Binadhan-7, Binadhan-8, Binadhan-10, Binadhan-11 and Binadhan-14 under the temperature treatments.

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