

Temperature and Substrate Requirement for Germination of Dicoccum Wheat

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ABSTRACT A laboratory study on germination of dicoccum wheat (cv. DDK-1009) indicated that the temperature of 20°C is better for the germination per cent and seedling length in husked seeds as compared to the dehusked seeds. Among the substrates, these parameters were more in between paper. Among the interaction effect the combination of temperature at 20°C with between paper recorded maximum values for germination parameters for both husked and dehusked seeds. However, the husked seeds recorded higher values for germination.

Key words: Dicoccum wheat, temperature, substrates, germination, vigour index

The dicoccum wheat [*Triticum dicoccum* (Shrank.) Suhulb.], locally called as Khapli, Khapla, Samba, Sajjaka, Jave, Sajjage, etc., is capable of withstanding higher temperature stress as compared to other two cultivated species. The dicoccum wheat are characterised by higher protein content, total carbohydrates, total sugars and total dietary fibers and lower values for fat and ash content [1]. Considering the importance of dicoccum wheat in diet, the University of Agricultural Sciences, Dharwad has released DDK-1001 and DDK-1009 dicoccum wheat varieties in 1995 and 1997, respectively [2]. The information on the requirement of temperature and substrate for germination of husked and dehusked seeds of dicoccum wheat is very meagre. Further, the International Seed Testing Association (ISTA) has been recommending and prescribing the requirements of temperature and substrate in ISTA rules [3] for germination test for various agricultural and horticultural crops periodically, is not comprehensive enough and many of the crops including dicoccum wheat have not been included. Standardisation of requirement of temperature and substrate is absolutely essential for the correct assessment of planting value of any crop. In view of these facts, the present study was

undertaken to assess the requirement of temperature and substrate for germination test.

MATERIALS AND METHODS

Freshly harvested seeds of dicoccum wheat (cv. DDK-1009) were obtained from the Main Research Station, University of Agricultural Sciences, Dharwad. Germination studies were conducted on husked seeds by selecting the suitable temperature and substrates in accordance with the ISTA rules [3]. The experiment consisted of different temperature regimes viz., 15°C, 20°C, 25°C constant and 15°/25°C, and 20°/25°C (alternating 16 h low temperature and 8 h high temperature) and substrates (Between paper, top of paper and sand) laid out in CRBD with 5 replications. Speed of germination was recorded every day until no germination was observed for three continuous days. Seedling evaluation was done on 8th day of seed germination. Observations on per cent germination and seedling length were recorded.

RESULTS AND DISCUSSION

The results indicated that the germination in both husked and dehusked dicoccum wheat seeds was significantly influenced by temperature regimes. At

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20°C germination was significantly higher (97.25%) followed by 20°/25°C (95.33%), 15°/20°C (92.25%), 15°C (90.00%) and 25°C (87.66%) (Table 1). The similar trend was observed in seedling length (Table 2). The maximum germination observed at 20°C may be attributed to higher amylase activity during germination which is triggered by higher synthesis of gibberellins. With an increase in temperature from 20° to 25°C there was a decrease in per cent germination and seedling length, which may be due to denaturation of protein in the seed. These results are in conformity with the findings of Singh et al. [4] and Macchia et al. [5]. The alternate temperatures, recorded lower germination, values as compared to constant temperatures, which could be attributed to the inability of the seeds to cope up the metabolic activities to a shift in the diurnal temperature [6]. It was reported that alternate temperatures were

not suitable for maximum germination of pigeonpea seeds [7].

It was observed that among the substrates between paper recorded higher values for all seed quality parameters as compared to top of paper and sand. The lowest values for germination and speed of germination were recorded in top of paper whereas, the seedling length was lowest in sand. This clearly indicated that between paper was found to be better because of seed is covered fully thereby maintaining the required level of moisture necessary for germination and seedling development. The lowest germination was observed in top of paper, which may be attributed to insufficient space for seedling growth. Germination and seedling growth were maximum in husked seeds as compared to dehusked seeds, because of intact embryo and better retention of seed moisture

Table 1. Effects of temperature, substrates and seed conditions on germination (%) in dicoccum wheat (cv. DDK-1009)

Temperature (°C)	Germination (%)						Mean (T)
	Between paper		Top of paper		Sand		
	Husked Seed	Dehusked Seed	Husked Seed	Dehusked Seed	Husked Seed	Dehusked Seed	
T ₁ -15°C	93.25 (74.97)	89.25 (70.88)	90.25 (71.82)	87.25 (69.11)	91.50 (73.09)	88.50 (70.20)	90.00 (71.68)
T ₂ - 20°C	100.0 (90.00)	96.00 (78.51)	98.25 (82.61)	94.75 (76.80)	99.25 (86.53)	95.25 (77.50)	97.25 (81.99)
T ₃ - 25°C	92.00 (73.67)	86.50 (68.46)	88.25 (69.97)	84.25 (66.64)	89.50 (71.12)	85.50 (67.62)	87.62 (69.58)
T ₄ -15°/20°C	94.50 (76.51)	91.50 (73.62)	92.75 (74.97)	90.25 (71.85)	93.75 (75.85)	90.75 (72.30)	92.25 (74.13)
T ₅ -15°/25°C	93.50 (75.24)	87.50 (69.30)	90.00 (71.60)	88.50 (70.18)	90.50 (72.06)	89.00 (0.66)	89.83 (71.50)
T ₆ -20°/25°C	98.50 (83.07)	94.00 (75.98)	96.50 (79.36)	93.00 (74.71)	96.25 (78.90)	93.75 (75.56)	95.33 (77.93)
Mean (S x C)	95.29 (78.91)	90.29 (72.79)	92.67 (75.05)	89.67 (71.55)	93.46 (76.21)	90.46 (72.31)	92.05 (74.47)
For comparing the means of	S.Em.±		CD at 5%				
Temperature (T)	0.28		0.78				
Substrate (S)	0.20		0.55				
Seed condition (C)	0.16		0.45				
T x S	0.48		NS				
T x C	0.39		1.10				
S x C	0.28		NS				
T x S x C	0.68		NS				

Figures in parenthesis indicate arc sine transformed values; NS: Non-significant

Table 2. Effects of temperature, substrates and seed conditions on seedling length in dicoccum wheat (cv. DDK-1009)

Temperature (°C)	Seedling length (cm)						Mean (T)
	Between paper		Top of paper		Sand		
	Husked seed	Dehusked seed	Husked seed	Dehusked seed	Husked seed	Dehusked seed	
T ₁ -15°C	20.33	19.10	18.67	16.57	12.27	11.59	16.42
T ₂ -20°C	26.48	23.22	24.94	21.70	14.37	12.89	20.60
T ₃ -25°C	16.74	14.78	13.12	12.49	9.32	8.20	12.44
T ₄ -15°/20°C	24.50	20.60	21.35	19.67	12.50	12.02	18.44
T ₅ -15°/25°C	20.05	18.69	16.06	14.90	10.94	10.38	15.17
T ₆ -20°/25°C	25.87	20.85	23.17	20.55	16.63	12.23	19.88
Mean (S x C)	23.33	19.54	19.55	17.65	12.67	11.22	17.16
For comparing the means of	S.Em.±	CD at 5%					
Temperature (T)	0.17	0.49					
Substrate (S)	0.12	0.34					
Seed condition (C)	0.10	0.28					
T x S	0.30	0.84					
T x C	0.25	0.69					
S x C	0.17	0.49					
T x S x C	0.43	1.19					

NS: Non-significant

and less prone to attack of insects and other environmental factors. Thus, the presence of husk is required in dicoccum wheat not only for protection but also to maintain the seed in good condition until the next planting season. The interaction effects indicated that the treatment combination of husked seeds incubated at 20°C in between paper recorded significantly higher germination and seedling length. The lowest values were found in dehusked seeds at 25°C in sand substrates.

Based on the results obtained in the present investigation, it is inferred that the maximum seed germination, seedling length were observed at 20°C in between paper with husked seeds as compared to dehusked seeds.

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