



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2015; 1(13): 38-40  
www.allresearchjournal.com  
Received: 22-10-2015  
Accepted: 25-11-2015

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## Effect of temperature on germination in wheat and jowar

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### Abstract

Temperature in seed germination has been studied extensively since it is the most important factor of the external environment in ensuring the transition from dormancy to vigorous life activity. Systematic experiments for deciding minimum, optimum and maximum temperatures for seed germination of field crops was already conducted.

Seed pretreatments with water needs standardization in each case for the appropriate concentration and application, amount of soaking solutions, soaking dilutions etc. In the present investigations effects of presoaking of seeds of most important crops of the region wheat, jowar, were studied, the effect of temperature required for soaking on percentage germination and seedling growth in terms of shoot and root lengths and dry weight distribution.

**Keywords:** Temperature, presoaking, pretreatments, germination, seedling growth

### 1. Introduction

Exposing the seed to repeated wetting and drying has been shown to enhance its ability to withstand drought, high temperature, low temperature and salinity (Mayer, 1975; Malik, 1987) <sup>[11, 12]</sup>. The efforts to increase crop production depend upon our knowledge of factors that affect growth, development and yield of a crop plant. In recent years, presoaking of seeds has been suggested as one of the most promising methods of increasing yield of crop plants (Saxena, 1985) <sup>[16]</sup>.

Heydecker (1973) <sup>[6]</sup> summarised results obtained with various crops and suggested that presoaking is achieved by soaking seeds in water for 2 days followed by air drying. Slow drying results in greater response than rapid drying in many seeds (e.g. carrot and beet). Slow drying is likely to continue the processes into the drying period. One could hydrate for seed for 8h at 24-25 °C and even into 20h at lower temperature.

In India presoaking method was first tried by Chinoy (1970) <sup>[3]</sup> in wheat. The process involved a single soaking in water for about 24 h (30% moisture by weight) at 10 to 25 °C and drying back to the original weight. Modifications were suggested in repeated cycles of soaking and drying.

Temperature in seed germination has been studied extensively since it is the most important factor of the external environment in ensuring the transition from dormancy to vigorous life activity. The experiments for deciding minimum, optimum and maximum temperatures for, seed germination of field crops.

Harrington (1973) <sup>[5]</sup> investigated the effect of temperature on seed germination in a large number of vegetable plants. From the data collected by him it can be concluded that the lower the temperature, the higher the number of days required for seed germination. Some seeds (e.g. spinach, parsnip, onion) germinate even at 0 °C, while some (e.g. tomato, bean, chilli) or require a temperature of not less than 10 °C.

Seeds of different varieties may respond differently to temperatures. Very often a higher temperature is require: 1 for the emergence of seedlings than for the germination of seeds. It has been established that for the germination of some seeds treatment with low temperature is essential as it facilitates further changes in the physiological processes in the plant. A large number of plants are known whose seeds germinate better under conditions of alternating high and low temperatures.

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Seed pretreatments with water needs standardization in each case for the appropriate concentration and application, amount of soaking solutions, soaking dilutions etc. In the present investigations effects of presoaking of seeds of most important crops of the region -wheat, jowar were studied for determining effect of temperature on percentage germination and seedling growth in terms of shoot and root lengths and dry weight distribution.

## 2. Materials and Methods

Seeds of 2 crops, wheat (cv. 147), jowar (cv. M-35-1 MSSC) were studied in this investigation. In this experiments were

conducted. In each experiment the seeds were divided into 2 lots:

Lot A] was soaked in water.

Lot B] was air dried for 24 hours at room temperature and then soaked in water.

The seeds taken after soaking them at optimum hour standardized in experiment A were then kept at three different temperature Refrigerator ( $7\pm 1$  °C), room temperature ( $32\pm 2$  °C) and in BOD ( $25\pm 2$  °C). The root length shoot length, percent germination, fresh and dry weights of three part of the seedlings were determined.

## 3. Observation and Observation Table

**Table 1a:** Effect of different temperature condition on % germination, root length, Shoot length and leaf of wheat

Temperature	% Germination	Root			Shoot			Leaf	
		LN	FW	DW	LN	FW	DW	FW	DW
Refrigerator	83.33	9.27	132.3	19.33	9.77	112.0	15.00	104.3	10.00
Room temperature	83.33	10.20	137.3	23.00	9.87	116.0	19.67	107.3	12.00
BOD germinator	100.0	11.07	140.0	26.00	40.90	121.0	23.67	108.7	20.00
S.E.	2.72	0.14	0.71	0.71	24.95	0.94	2.48	0.71	0.73
C.D. (P = 0.05)	7.55	0.38	1.97	1.97	69.26	2.60	6.88	1.97	1.90

LN- Length, FW- Fresh weight, DW- Dry weight

**Table 1b:** Effect of different temperature condition on % germination, root length, Shoot length and leaf of wheat after air drying.

Temperature	% Germination	Root			Shoot			Leaf	
		LN	FW	DW	LN	FW	DW	FW	DW
Refrigerator	73.33	9.03	116.0	21.00	9.10	106.0	15.00	106.0	15.33
Room temperature	86.67	9.43	118.7	23.00	10.07	107.0	19.00	109.0	12.00
BOD germinator	96.67	10.27	120.7	26.00	10.30	110.3	21.00	111.0	21.00
S.E.	5.44	0.07	0.27	0.29	0.007	0.42	0.94	0.46	1.87
C.D. (P = 0.05)	15.10	0.19	0.74	0.78	0.01	1.16	2.60	1.27	5.19

LN- Length, FW- Fresh weight, DW- Dry weight

**Table 2a:** Effect of different temperature condition on % germination, root length, Shoot length and leaf of Jowar.

Temperature	% Germination	Root			Shoot			Leaf	
		LN	FW	DW	LN	FW	DW	FW	DW
Refrigerator	80.00	4.30	113.0	21.00	4.87	121.0	15.00	122.0	11.00
Room temperature	83.33	5.27	116.0	23.67	5.17	123.0	19.00	124.0	13.67
BOD germinator	63.67	6.20	118.7	26.00	5.43	125.0	22.33	125.0	15.33
S.E.	27.75	0.02	0.27	0.27	0.05	0.08	0.86	0.46	0.66
C.D. (P = 0.05)	77.03	0.05	0.74	0.74	0.13	0.12	2.38	1.27	1.83

LN- Length, FW- Fresh weight, DW- Dry weight

**Table 2b:** Effect of different temperature condition on % germination, root length, Shoot length and leaf of Jowar after air drying.

Temperature	% Germination	Root			Shoot			Leaf	
		LN	FW	DW	LN	FW	DW	FW	DW
Refrigerator	73.33	5.17	112.0	21.00	6.17	114.7	15.00	108.0	12.67
Room temperature	90.00	5.57	116.0	23.00	7.80	118.0	19.00	107.3	17.67
BOD germinator	100.0	6.10	118.7	25.00	9.17	121.3	21.00	110.3	21.00
S.E.	2.72	0.11	0.86	0.46	0.27	0.32	0.94	1.08	0.71
C.D. (P = 0.05)	7.55	0.30	2.36	1.27	0.66	0.88	2.60	2.99	1.97

LN- Length, FW- Fresh weight, DW- Dry weight

## 4. Result and Discussion

The percent germination of wheat seeds in both lots A and B was maximum in BOD incubator followed by at room temperature. The root and shoot lengths were also maximum in seeds kept for germination in BOD There was not much difference in the process as far as the parameters investigated here are concerned in presoaked seeds kept for germination before and after air drying. The average root length ranged from 9.03 to 11.07 cms, shoot length from 9.10 to 14.90 cms in both air dried and non-air dried

(Tables 1 a and 1b) at three temperatures. The dry weight yields from roots after 5 days were 9.03 to 26.0 for roots, 15.0 to 23.67 for shoots and as small as 10.0 to 21.0 for leaves at 3 temperatures.

Tables 2a and 2b include results obtained on Jowar seeds kept for germination without and after air drying at 3 temperatures respectively. The results on Jowar were not as good as those from wheat. However the pattern, common for the two seeds was that BOD again gave the best result for all the three temperature treatments studied. The difference in

the process of germination so far as the root and shoot length and dry weight yields were concerned between the two soaking treatments was statistically insignificant. On an average, the root length ranged from 4.30 to 6.20 cms and shoot length from 4.87 to 9.17 cms in 5 day old Jowar-seedlings (Tables 2a and 2b).

### 5. Conclusion

For getting even better result, the seeds soaked in water for their optimum period should be kept in BOD incubator for germination, if one is available. Otherwise they should be left over at room temperature. It may not be necessary to air-dry seeds before soaking them in water. Most of the results with respect to the seedling growth between presoaked seed before (lot A) and after air-drying (lot B) were statistically insignificant.

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