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STUDIES ON COLD TREATMENT EFFECT ON GERMINATION OF BRASSICA JUNCEA SEEDS

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Abstract: The Brassica juncea seeds soaked in water for 24 hours were treated with cold temperature 20, 40, 60 and 80 minutes before sowing. The observation were made daily upto 10 days of sowing with adequate watering. There was no significant variation in control and cold treated seeds with respect to days for germination, germination % vigor %, plumule formation, average shoot length, average number of roots, root length and fresh weight of seedlings. The days for germination in control and cold treated seeds was about the same. The germination % and vigor % not affected by cold treatment. Plumule formation average shoot length in cold treated seeds was neither increased or decreased over control. The root number, root length and fresh weight of seedling neither stimulating nor suppressing due to cold treatment as compared to control.

Keyword: cold treatment , germination , Brassica juncea seeds , observation.

INTRODUCTION:

Brassica juncea , also known as mustard greens, Indian mustard and leaf mustard. Leaves, seeds and stems are used in Indian cuisine (Chandrasekaran, 2013). Indian Mustard is a folk remedy for arthritis, footache , lumbago and rheumatism (Duke and Wain, 1981). Chinese eat the leaves in soups for bladder, inflammation or haemorrhage. Mustard oil is used for skin eruptions and ulcers (Perry, 1980). Leaves applied to the forehead are said to relieve headache (Burkill, 1966). Many species of plants are capable of adapting to low temperature and freezing conditions. Generally, this adaptations requires a prior period of acclimation at low, non freezing temperatures, during which time a number of morphological, physiological and molecular changes occur (Singh and Laroche, 1988, Guy, 1990; Alberdi and Cocuera, 1991).

In present investigation, the Brassica juncea seeds are treated with cold temperature (O c) for 20 minutes, 40 minutes, 60 minutes and 80 minutes. The Brassica juncea pregerminated seeds treated with cold temperature and sown to study the effect of cold temperature on the germination.

The germination is vital process. The cold treatment may affects the germination percentage, plumule formation, shoot length, root number, root length and fresh weight of seedling. The physiological changes may reflect in the morphology of germination.

MATERIALS AND METHODS :-

Seeds of Brassica juncea were kept in petridish containing moist blotting papers. The Petridish containing seeds kept under dark condition for 24 hrs. It triggers the process of germination. The germinations ready seeds were subjected to cold temperature (O° C) for 20 minute, 40

minute, 60 minute and 80 minute. For each treatment, 10 seeds were subjected. The treated and control seeds then sown in pots containing garden mixture. The process is done in two replica.

The sown seeds were watered adequately. The observations were made considering the parameters of germination such as germination percentage, days required for germination, days required to emergence of plumage, length of seedling, number of roots per seedling, average length of root per seeding, and fresh weight of seedling.

The experiment was set in two replicas. In each replica for each treatment ten pregerminated Brassica juncea seeds were selected. The observation were made for ten days from date of sowing the seeds.

Plants were uprooted on 10th day of sowing after treatment for number of roots length of roots and fresh weight of seedling. The average is work out by applying arithmetic mean biostatistical application.

Germination was deemed to have occurred when the radical was visibly extended beyond the surface of the seed, usually protruding through a fracture in the seed coat. Number of seeds germinated each day was counted and % of germination was calculated. Germination vigor was determined using the method described by (Zabator(1962), modified to include the number of days of incubation at each temperature and each treatment. modified to include the number of days of incubation at each temperature and each treatment. The vigor value was calculated as follows :- $V = (a/1 + b/2 + c/3 + \dots + x/n)/s \times 100$

Where a,b,c,d and x represent the number of seeds which had germinated after the first, second, third, fourth and nth day of incubation n respectively, and "s" represents the total number of seeds in the sample.

RESULTS AND DISCUSSION :-

(I) Effect of cold treatment on germination of Brassica juncea seeds. Effect of cold temperature treatment on germination of Brassica juncea seeds.

Days after sowing	Cold Treatment (germination out of 10)				
	Control	20 min.	40 min	60 min	80 min
1 st	-	-	-	-	-
2 nd	-	-	-	-	-
3 rd	2	2	2	4	3
4 th	3	2	4	4	4
5 th	4	5	4	5	4
6 th	6	5	6	5	5
7 th	8	7	7	8	7
8 th	8	8	7	8	9
9 th	9	9	9	10	10
10 th	10	10	10	10	10

Germination temperatures vary greatly among plants. A plants natural environment and more specifically the environmental conditions at the time of natural seed disposal, will reveal information regarding the optimal temperature range for germination.

Alternating temperature regimes are often more favorable for germination than constant temperatures, Some species will only germinates at alternating temperature. (Baskin and Baskin 2001).

Table I shows the number of seeds germinated out of ten seeds on the days after sowing. There is no germination of seeds for first and second day of sowing. The control and cold treated seeds of Brassica juncea germinated since the 3rd day of sowing.

There is no any significant difference between number of seeds germinated in control and cold treated seeds. On 10th day at sowing, all seeds germinated of control as well as 20 min, 40 min, 60 min and 80 min. cold temperature treated seeds of Brassica, Bellairs and Bell (1990) reported that low temperatures tended not to affect germination. According to Khan and Ungar (1999) at higher temperature differences between light and dark germinated seeds were not significant.

(I) Effect of cold treatment on germination % of Brassica juncea seeds :-

Table II Effect of cold treatment on Brassica juncea seeds germination

Days after sowing	Cold Treatment germination %				
	Control	20 min.	40 min	60 min	80 min
3 rd	20 %	20 %	20 %	40 %	30 %
4 th	30 %	20 %	40 %	40 %	40 %
5 th	40 %	50 %	40 %	50 %	40 %
6 th	60 %	50 %	60 %	50 %	50 %
7 th	80 %	70 %	70 %	80 %	70 %
8 th	80 %	80 %	70 %	80 %	90 %
9 th	90 %	90 %	90 %	100 %	100 %
10 th	100 %	100 %	100 %	100 %	100 %

Seed germination depends on external factors include temperature, water, oxygen . Various plant require different variables for successful seed germination. The temperature. may induce or inhibits the seed germination, To study the effect of cold treatment on seed germination may

prove significant factor.

Table II indicates effects of cold treatment germination % of Brassica juncea seeds.

It seems to be about 20 % to 40 % seed germination in control and cold treated seeds on 5th day of sowing. The 100 % germination of seed is seen on 10th day in control and cold treated seeds of Brassica juncea seeds, There is no significant variation in the germination percentage of the control and 20 min, 40 min, 60 min and 80 min cold treated seeds. A 2009 study of Carroll Sarah, showed that temperature has a significant effect on both the time to germinate and the proportion of mustard seeds, However, Present study reveals that there is no significant variation in germination due to cold temperature treatment.

It is concluded from above result and discussion that the germination percentage not affected by cold treatment in Brassica juncea seeds.

(I) Effect of cold treatment on vigor value of Brassica juncea seeds :-

Table III – Effect of cold treatment on vigor value of Brassica juncea seeds :-

Control	20 min.	40 min	60 min	80 min
0.0076	0.0069	0.0073	0.0074	0.0071

Table III shows the effect of cold treatment on vigor value of Brassica juncea seeds.

From the Table III it is clear that the vigor value of control seeds is 0.0076. The vigor value of cold treated seeds of Brassica juncea is in the rate of 0.0069 to 0.0074. Thus, there is no significant variation in vigor value of control seeds as well as cold treated seeds of Brassica juncea. High temperature affect in yield and quality of Brassica juncea. (Anan def.al.2010). The plants of Brassica juncea exposed to temperature stress exhibited a significant dedine in growth (Hayat et.al. 200)

(I) Effect of cold treatment on plumule formations in Brassica juncea seeds :-

Table IV – Effect of cold treatment on plumage formation in Brassica juncea seeds

Days from sowing	Cold Treatment (Days required for plumule formation)				
	Control	20 min.	40 min	60 min	80 min
4 th day	-	-	-	-	-
5 th day	-	-	-	-	-

Table IV shows the effect of cold treatment on plumule formation in Brassica juncea seeds germination. It is observed that in control as well as cold treated seeds of Brassica juncea shows plumule formation on fifth day of sowing. There is no variation in plumule formation during germination in Brassica seeds due to cold temperature.

(V) Effect of cold treatment on average length of shoot in Brassica juncea seeds:-**Table V – Effect of cold treatment on av. Length of shoot in Brassica juncea seeds.**

Days after sowing	Control	20 min.	40 min	60 min	80 min
10 th day	1.7 cm	1.6 cm	1.6 cm	1.5 cm	1.6 cm

Table V depicts the effect of cold treatment on average length of shoot in Brassica Juncea seed germination. On the tenth day, the average length of seedling in control and cold treated seeds is almost similar. There is 1.6 cm average seedling length in control seedling of Brassica juncea. However the length of seedling is in between 1.5 cm to 1.6 cm. in the cold treated seeds at 20 min, 40 min, 60 min and 80 minutes. There is no remarkable change in the seedling length due to cold treatment over the control.

(VI) Effect of cold treatment during germination on number of roots and root length in Brassica juncea:-**Table VI Effect of cold treatment during germination on number of roots, in Brassica Juncea seeds and root length**

Days after Sowing	Control		Cold of 20 min.		Cold of 40 min		Cold of 60 min		Cold of 80 min	
	Number Of roots Per seeding	Root Length cm	Number Of roots Per seeding	Root Length cm	Number Of roots Per seeding	Root Length cm	Number Of roots Per seeding	Root Length cm	Number Of roots Per seeding	Root Length cm
10 th day	3.1	1.1	2.8	1.4	3.2	1.0	3.3	1.2	3.6	1.3

The table VI indicates the effect of cold treatment during germination on number of roots and root length in Brassica juncea seeds. It is clear from the table that average number of roots per seedling is 3.1 in control seedling. The average number of roots per seedling is in range of 2.8, 3.2, 3.3 and 3.6 in Brassica juncea seeds treated with 20 min, 40 min, 60 min and 80 min cold treatment respectively. It seems to be no remarkable change in average root length in seedling due to cold treatment for variable time period. The table VI also shows the average root length per seedling in control as well as cold treated seeds of Brassica juncea. The root length is 1.1 cm in control seedling while it is 1.4 cm i.e. maximum root length in 20 minutes cold treated seedlings.

The 40 min, 60 min & 80 minutes treated seedlings shows the root length as 1.0 cm, 1.2 cm and 1.3 cm respectively. Thus, it is observed no consistent variation in the root length in control and cold treated seedlings.

(VI) Effect of cold treatment on fresh weight during germination of seedlings in Brassica Juncea :-**Table VII- Effect of cold treatment on fresh weight during germination of seedlings in Brassica juncea.**

Days after sowing	Cold Treatment				
	Control (gm.)	20 min. (gm.)	40 min (gm.)	60 min (gm.)	80 min (gm.)
10 th day	0.56	0.53	0.52	0.54	0.51

Table shows the effect of cold treatment on fresh weight of seedling during germination of Brassica juncea seeds on 10th day of sowing. The range of fresh weight of 10 seedlings in control and cold treated seeds is 0.51 gm to 0.56 gm. The variation in fresh weight due to cold treatment over the control is no remarkable. It is non significant change.

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