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Sowmya KJ
Department of Seed Science and Technology, College of Agriculture, University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India

Rame Gowda
Seed Technology Research Unit, National Seed Project (Crops), University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India

Rajendra Prasad S
Vice Chancellor, University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India

Pallavi HM
College of Horticulture, University of Horticultural Sciences, Bagalakote, Yalachahalli, Yelawala, Mysuru, Karnataka, India

Yogeesha HS
Division of Vegetable Crops, Indian Institute of Horticultural Research, Bangalore, Karnataka, India

Corresponding Author:
Sowmya KJ
Department of Seed Science and Technology, College of Agriculture, University of Agricultural Sciences, GKVK, Bangalore, Karnataka, India

Effect of osmopriming on physiological seed quality attributes of different vigour levels in Cucumber (*Cucumis sativus* L.)

Sowmya KJ, Rame Gowda, Rajendra Prasad S, Pallavi HM and Yogeesha HS

Abstract
Osmopriming involves soaking seeds in aerated, low water potential osmotica to control the amount of water imbibitions by the seed. In the present study both high and low vigour level cucumber seeds were soaked in PEG 6000 @ -1.5 MPa, at two different temperatures, in comparison to unprimed seeds. Among vigour levels, significantly, higher first count germination, final count germination, BRI, MSL, MSDW, SVI- I and SVI- II (76.17%, 90.00%, 0.514, 23.07 cm, 9.01 mg, 2077 and 811) were registered in high vigour seeds. The T_{50} value and mean germination time were also lower (1.42 and 2.24 days) in high vigour seeds and higher (3.67 and 3.03 days) in V_2. Among temperatures, higher first count germination (67.25%), was registered at 25 ^{0}C and it was lower (66.33%) in 10 ^{0}C. Among osmoticum, higher first count germination, final count germination, BRI, MSL, MSDW, SVI- I and SVI- II (74.33%, 80.25%, 0.505, 23.84 cm, 9.39 mg, 1920 and 762) were registered in PEG 6000 @-1.5 MPa(O_2), which was lower in unprimed seeds. Conversely, the low vigour seeds have recorded 22.67 per cent increase in the final count germination in contrast to 2.90 per cent increase in high vigour seeds, in comparison with unprimed seeds. It is concluded that, osmopriming cucumber seeds with PEG 6000 @ -1.5 Mpa enhanced seed physiological traits at 25± 1^{0}C in low vigour seeds.

Keywords: Cucumber, priming, vigour, temperature, seed quality, PEG

Introduction
Cucumber (*Cucumis sativus* L.) is one of the most important popular vegetable grown throughout the world. The ever growing demand for cucumber, throughout the year exerts challenge for continuous production even during off seasons either under supra or suboptimal temperatures. Plastic mulches and tunnels are major tools for overcoming low temperature problems in cucurbits but even with these, the germination, emergence and establishment of seedlings are often poor, resulting in incomplete stands and low yields. Seed quality is one of the key factors affecting the successful farming, but this seed trait inevitably declines during prolonged storage due to reduced vigour of seeds. Poor quality seeds generally show decline in their ability to germinate and emerge into vigourous seedlings, leading to problems for successful crop production (Powell *et al*., 2000) [18]. Seed priming is a pre-sowing treatment that involves controlled hydration of seeds, sufficient to allow pre germinative metabolic events to take place and to restrict radical protrusion through the seed coat (Heydecker *et al*., 1973) [10]. This technique has been used in some vegetables seeds including cucumber to augment the germination rate, total germination and seedling uniformity etc., mainly under unfavourable environmental conditions. It is a useful technique to exploit seed potential in arid and desert ecosystem. Osmopriming is known as osmotic priming, osmotic conditioning or osmoconditioning. Osmopriming involves soaking seeds in aerated, low water potential osmotica to control the amount of water imbibitions by the seed. Examples include Polyethylene glycol (PEG), KNO_3, KH_2PO_4, and mannitol. Priming exposes seeds to imbibitions in low external water potentials that allow partial seed hydration (Bradford, 1986) [4]. Polyethylene glycol (PEG) as an inert material, which can prevent embryo toxicity problem during priming. The large size of PEG molecule also prevents its penetration into seed tissues, avoiding lowering the osmotic potential Brocklehurst and Dearman (2008) [5]. Seeds primed with PEG were effective in improving seed germination and seedling establishment of sorghum under unfavourable soil moisture conditions. Seed priming with PEG reduced lipid peroxidation and stabilized cell membrane, resulting in elevation of stress tolerance under

drought environment (Zhang *et al*., 2015) [21]. In osmopriming, degree and rate of imbibitions is restricted through the exposure of seeds to low external water potential. Osmopriming can maintain the integrity of plasma membrane and gives better germination percentage (Jisha *et al*., 2013) [12]. Smith and Cobb (1991) [19] concluded that the priming response was dependent on the duration of the treatment and the osmotic potential of the solution rather than a specific salt. Fujikura and Karsson (1992) [9] observed that osmopriming of aged cauliflower seeds with –1.5 MPa PEG-6000 at 20^0C for one week reversed the effect of controlled deterioration and they clearly observed synthesis of new proteins whose expression was correlated with the rate of germination. Osmoconditioning of cucumber (*Cucumis sativus* L.) seed with 0.7 M mannitol improved the rate of germination at 25°C and 15°C in water. Osmoconditioning stimulated the rate of radical extension, seedling emergence and expansion of the cotyledons and first leaf of cucumber (Amooaghaie R, Vaviland, 2011) [2]. In this context, the aim of the present work was to assess the effect of osmopriming technique with PEG at various temperatures in enhancing the physiological seed quality attributes of different vigour level seeds in cucumber.

Material and Methods

Freshly harvested and graded cucumber seeds of cv. INDAM-11 were obtained from the M/S Indo American Hybrid Seeds Pvt., Ltd., Bangalore. The seeds were dried to reduce the moisture to safe level (<6%) and they were stored at 4^0C in refrigerator till the completion of the experiment. Fresh cucumber seeds were subjected to accelerated ageing (AA) test as per Delouche and Baskin (1973) [7] to create lots of two vigour levels, *viz*., high vigour (V_1:>90% germination) and low vigour (V_2:<60% germination) level seeds were soaked in Poly Ethylene Glycol 6000 @ -1.5 MPa (O_2) in the ratio of 1:2 (W/V) at two different temperatures (T_1- 25±1^{0}C; T_2- 10±1^{0}C) for a period of 48 hours. In addition to PEG, dry seeds were used as control (O_1). Then seeds were thoroughly washed, surface dried under room temperature until original seed moisture and used for the experiment.The experimental data were statistically analyzed as per the methods outlined by Sundararaj *et al*. (1972) [20] by adopting "Fisher's Analysis of Variance Techniques". Critical difference (CD) values were computed at 1 per cent level wherever 'F' test was significant. The following observations were recorded for the evaluation of seed physiological quality attributes due to osmopriming.

Seed moisture content (%)

Moisture content of seed sample was determined by using high constant temperature oven method as per ISTA (2015) [11]. Two grams of seeds were taken in aluminium containers and kept in a hot air oven maintained at 130± 2^0 C for a period of one hour. Then the samples were cooled in desiccators over silica gel for 30 to 45 minutes. The cooled samples were weighed and the seed moisture content was expressed in percentage on wet weight basis using the following formula.

$$\text{Moisture content (\%)} = (W_2 - W_3)/(W_2 - W_1) \times 100$$

Where,

W_1 - weight of the empty aluminium container;

W_2 – weight of the empty aluminium container + seeds before drying;

W_3 - weight of the empty container + seeds after drying

First and final counts of germination (%)

The standard germination test was conducted in the laboratory using 'between paper' method as per ISTA (2015) [11]. Fifty seeds each of four replications were placed equidistantly on moist germination paper. The rolled towels were incubated in germination chamber maintained at 25^0±1^0C and 90 per cent relative humidity (RH). The first and the final counts were taken on 4th and 8th day of germination test, respectively. The percentage of germination was expressed based on the normal seedlings.

Mean germination time (MGT)

It was calculated according to the equation of Ellis and Roberts (1981) [8] and expressed in days. The equation is as follows:

$$MGT = \sum D\,n / \sum n$$

Where, "D" is the number of days counted from the beginning of the test and "n" is the number of seeds that germinate on day 'D'.

Time to 50% germination (T_{50})

Time to get 50 per cent germination was calculated according to the formula of Coolbear *et al*. (1990) [6]. T_{50} was defined as days needed to reach 50 per cent of final germination percentage.

Speed of germination (BRI)

Speed of germination was calculated as Bartlett's Rate Index (Bartlett, 1973) [3], which was worked out from the daily germination counts and calculated as follows:

$$BRI = \frac{P_1 + (P_1+P_2) + (P_1+P_2+P_3) + \ldots + (P_1+P_2+P_3+\ldots.+P_n)}{N\,(P_1 + P_2 + P_3 + \ldots + P_n)}$$

Where, $P_1 + P_2 + P_3 + \ldots\ldots$and P_n are the germination (%) at 1st, 2nd, 3rd and nth day, respectively and 'N' is the total number of days taken for germination.

Mean seedling length (cm)

From the seeds kept for standard germination test, ten normal seedlings were randomly selected on final (8th day) counting and the seedling length was measured from root tip to shoot apex and the mean seedling length was computed and expressed in centimeter.

Mean seedling dry weight (mg)

Ten seedlings selected for seedling length measurement were used for recording seedling dry weight. After removing the cotyledons (remnant seed), seedlings were dried in hot air oven maintained at 80±2^0C for 18 hours and cooled in desiccators over silica gel. The mean seedling dry weight was recorded and expressed in milligrams per seedling.

Seedling vigour index (SVI) – I and II

Seedling Vigor Index (SVI) was calculated by adopting the method suggested by Abdul-Baki and Anderson (1973) [1] and expressed as whole number.

Results and Discussion

Seed moisture (%) and T_{50} value (days)

In varoius vigour level cucumber seeds, higher seed moisture (5.19%) was recorded in low vigour seeds and it was lower (5.17%) in high vigour seeds. Among temperatures, higher (5.21%) seed moisture was recorded in T_1 and it was lower (5.16%) in T_2. Among osmotica, O_2 has recorded higher (5.26%) seed moisture and it was lower (5.10%) in O_1. However, the T_{50} value (days) differed significantly due to the vigour levels and osmotica. Among vigour levels, lower (1.42 days) T_{50} value was registered in high vigour seeds and it was significantly higher (3.67 days) in low vigour seeds. Among osmotica, O_2 had recorded lower T_{50} value (2.33 days) and it was higher (2.75 days) in O_1. However, the T_{50} values did not differ significantly due to temperature and other combinations of V x T, V x O, T x O and V x T x O. Similar results were obtained by Lanteri *et al*. (1993) [13] who reported that osmotic conditioning of pepper seeds for 7,14, 21 days in polyethylene glycol or KNO_3 + K_3P0_4 considerably reduced the time to fifty per cent germination, the mean germination time and the effect was proportional to the duration of the priming treatment. Further, they also noticed higher DNA synthetic activity upon priming. When primed seeds were subsequently imbibed in water, the induction of DNA synthesis started about 12 h earlier than in untreated seeds.

Table 1: Seed moisture and T_{50} value as influenced by vigour levels, temperature and osmopriming in cucumber

Treatments		Seed Moisture (%)			T_{50} (days)		
		High Vigour (V_1)	Low Vigour (V_2)	Mean	High Vigour (V_1)	Low Vigour (V_2)	Mean
T_1- 25±1^{0}C	O_1- Control	5.04	5.12	5.08	1.00	4.00	2.50
	O_2- PEG 6000 @ -1.5 MPa	5.41	5.25	5.33	1.00	3.67	2.33
T_2- 10±1^{0}C	O_1- Control	5.12	5.12	5.12	2.00	4.00	2.00
	O_2- PEG 6000 @ -1.5 MPa	5.12	5.26	5.19	1.67	3.00	2.33
	V x T				V x T		
	T_1- 25±1^{0}C	5.23	5.19	5.21	1.00	3.83	2.42
	T_2- 10±1^{0}C	5.12	5.19	5.16	1.83	3.50	2.67
	V x O				V x O		
	O_1- Control	5.08	5.12	5.10	1.50	4.00	2.75
	O_2- PEG 6000 @ -1.5 MPa	5.27	5.26	5.26	1.33	3.33	2.33
Mean		5.17	5.19	5.18	1.42	3.67	2.54
		S.Em±	CD (P=0.01)	CV (%)	S.Em±	CD (P=0.01)	CV (%)
V		0.040	NS		0.083	0.344	
T		0.040	NS		0.083	NS	
O		0.040	NS		0.083	0.344	
V x T		0.056	NS	2.65	0.118	NS	11.35
V x O		0.056	NS		0.118	NS	
T x O		0.056	NS		0.118	NS	
V x T x O		0.079	NS		0.167	NS	

NS: Non Significant

Table 2: First and final count germination as influenced by vigour levels, temperature and osmopriming in cucumber

Treatments		First count germination (%)			Final count germination (%)		
		High Vigour (V_1)	Low Vigour (V_2)	Mean	High Vigour (V_1)	Low Vigour (V_2)	Mean
T_1- 25±1^{0}C	O_1- Control	71.33	49.00	60.16	89.33	57.33	73.33
	O_2- PEG 6000 @ -1.5 MPa	81.33	67.33	74.33	92.00	70.00	81.00
T_2- 10±1^{0}C	O_1- Control	70.00	46.67	58.33	90.00	57.33	73.66
	O_2- PEG 6000 @ -1.5 MPa	82.00	66.67	74.33	88.67	70.33	79.50
	V x T				V x T		
	T_1- 25±1^{0}C	76.33	58.17	67.25	90.67	63.67	77.17
	T_2- 10±1^{0}C	76.00	56.67	66.33	89.33	63.83	76.58
	V x O				V x O		
	O_1- Control	70.67	47.83	59.25	89.67	57.33	73.50
	O_2- PEG 6000 @ -1.5 MPa	81.67	67.00	74.33	90.33	70.17	80.25
Mean		76.17	57.42	66.79	90.00	63.75	76.88
		S.Em±	CD (P=0.01)	CV (%)	S.Em±	CD (P=0.01)	CV (%)
V		0.814	3.36		0.537	2.22	
T		0.814	NS		0.537	NS	
O		0.814	3.36		0.537	2.22	
V x T		1.15	NS	4.22	0.759	3.12	2.41
V x O		1.15	4.75		0.759	3.12	
T x O		1.15	NS		0.759	3.12	
V x T x O		1.63	NS		1.074	4.43	

NS: Non Significant

First and final count germination (%)

The first count germination differed significantly due to the vigour levels, osmotica and the interactions of V x O. Among vigour levels, higher first count germination (76.17%) was registered in high vigour seeds and it was lower (57.42%) in low vigour seeds. Among osmotica, O_2 had recorded higher

(74.33%) first count germination and it was lower in O_1 (59.25%). Among the interactions of V x O, V_10_2 registered higher first count germination (81.67%) and it was lower (47.83%) in V_20_1. Further, the first count germination did not differ significantly due to temperature and other interactions of V x T, T x O and V x T x O.

The final count germination differed significantly due to the vigour levels, osmotica, interactions between V x O, V x T, T x O and V x T x O. Among vigour levels, higher final count germination (90.00%) was noticed in high vigour seeds and it was lower (63.75%) in low vigour seeds. Among osmotica, O_2 had witnessed higher (80.25%) final count germination and it was inferior in O_1 (73.50%). Among V x T interactions, V_1T_1 has shown higher (90.67%) final count germination, which was statistically on par with V_1T_2 (89.33%) and it was lower (63.67%) in V_2T_1. Among interactions of V x O, V_1O_2 had registered higher (90.33%) final count germination and it was lower (57.33%) in V_2O_1. Among interactions of T x O, T_1O_2 had shown higher (81%) final count germination which was on par with T_2O_2 (79.50%) but it was lower (73.33%) in T_1O_1, followed by T_2O_1 (73.66%). Further, the third order interactions of V x T x O also exhibited significant differences. Higher final count germination (92%) was obtained in $V_1T_1O_2$ but it was statistically on par with $V_1T_2O_1$ (90%), $V_1T_1O_1$ (89.33%), and $V_1T_2O_2$ (88.67%). But $V_2T_1O_1$ and $V_2T_1O_1$ recorded significantly lower final count germination (57.33%). On the other hand, the final count germination did not differ significantly due to temperature. Similarly, Bradford (1986) [4] reported that osmotic priming results in more rapid and uniform germination even in suboptimal temperatures. Further, Lima *et al*. (2010) [14] noticed increased germination due to osmopriming in cucumber seeds with PEG, -0.2 MPa, at different temperature like 15, 20, 25, 30 and 35^{0}C. Similarly, Liu *et al*. (1996) [15] reported improvement in the germination per cent (90 to 94.7%) in tomato seeds osmoconditioned with PEG-6000 solution at –1.0 MPa for 8 days. In pepper, osmoconditioning improved the performance of seed lots having a high percentage of viable seed compared to non viable seeds (Passam *et al*., 1997) [17].

Mean Germination Time (MGT) and speed of germination (BRI)

The mean germination time (MGT) differed significantly due to vigour levels and osmotica. Among the vigour levels, lower MGT (2.24 days) was registered in high vigour seeds and it was higher (3.03 days) in low vigour seeds. Among osmotica, O_2 recorded lower MGT (2.38 days) and it was higher in O_1 (2.89 days). The speed of germination estimated was based on Bartlet Rate Index (BRI) differed significantly due to vigour levels and osmotica. Among the vigour levels, higher BRI (0.514) was registered in high vigour seeds and it was lower (0.459) in low vigour seeds. Among osmotica, O_2 recorded higher (0.505) BRI and it was lower in O_1 (0.468). However, the BRI did not vary significantly due to temperature and the interactions of V x O, V x T, T x O and V x T x O.

Table 3: Mean germination time and speed of germination as influenced by vigour levels, temperature and osmopriming in cucumber

Treatments		Mean germination time (days)			Speed of germination (BRI)		
		High vigour (V_1)	Low Vigour (V_2)	Mean	High vigour (V_1)	Low Vigour (V_2)	Mean
T_1- 25±1 ^{0}C	O_1- Control	2.38	3.23	2.80	0.508	0.437	0.473
	O_2- PEG 6000 @ -1.5 MPa	1.84	2.75	2.29	0.541	0.470	0.506
T_2- 10±1 ^{0}C	O_1- Control	2.65	3.30	2.97	0.490	0.436	0.463
	O_2- PEG 6000 @ -1.5 MPa	2.11	2.84	2.47	0.516	0.491	0.504
	V x T				V x T		
	T_1- 25±1^{0}C	2.11	2.99	2.55	0.525	0.454	0.489
	T_2- 10±1^{0}C	2.38	3.07	2.72	0.503	0.464	0.483
	V x O				V x O		
	O_1- Control	2.52	3.26	2.89	0.499	0.436	0.468
	O_2- PEG 6000 @ -1.5 MPa	1.97	2.79	2.38	0.529	0.481	0.505
Mean		2.24	3.03	2.64	0.514	0.459	0.486
		S.Em±	CD(P=0.01)	CV (%)	S.Em±	CD (P=0.01)	CV (%)
V		0.054	0.224		0.003	0.011	
T		0.054	NS		0.003	NS	
O		0.054	0.224		0.003	0.011	
V x T		0.077	NS	4.14	0.004	NS	1.88
V x O		0.077	NS		0.004	NS	
T x O		0.077	NS		0.004	NS	
V x T x O		0.109	NS		0.005	NS	

NS: Non Significant

Mean seedling length (cm) and mean seedling dry weight (mg)

The mean seedling length (MSL) and mean seedling dry weight (MSDW) differed significantly due to vigour levels, osmoticum and interactions between V x T x O. Among vigour levels, higher (23.07 cm) MSL was registered in high vigour seeds and it was lower (21.10 cm) in low vigour seeds. Among osmotica, O_2 recorded higher MSL (23.84 cm) and it was lower in O_1 (20.33 cm). Further, among the third order interactions of V x T x O, $V_1T_1O_2$ had shown higher MSL (25.83 cm) but it was statistically on par with $V_2T_2O_2$ (25.33 cm) and $V_1T_2O_2$ (23.63 cm). The MSL was significantly lower $V_2T_2O_1$ and $V_2T_1O_1$ (18.38 cm and 20.10 cm, respectively). Further, the MSL did not differ significantly due to temperature and the interactions of V x O, V x T and T x O. Among vigour levels, higher MSDW (9.01 mg) was registered in high vigour seeds and it was lower (7.30 mg) in low vigour seeds. Among osmotica, O_2 recorded higher (9.39 mg) MSDW and it was lower in O_1 (6.91 mg). Further, among the third order interactions of V x T x O, $V_1T_2O_2$ had shown

higher MSDW (11.13 mg) and it was significantly lower (6.13 mg) in $V_2T_1O_1$. Further, the MSDW did not differ significantly due to temperature and the interactions of V x O, V x T and T x O.

Table 4: Mean seedling length and mean seedling dry weight as influenced by vigour levels, temperature and osmopriming in cucumber

Treatments		Mean seedling length (cm)			Mean seedling dry weight (mg)		
		High vigour (V_1)	Low Vigour (V_2)	Mean	High vigour (V_1)	Low Vigour (V_2)	Mean
T_1- 25±1^{0}C	O_1- Control	21.47	20.10	20.78	7.72	6.13	6.92
	O_2- PEG 6000 @ -1.5 MPa	25.83	20.37	23.10	9.73	8.75	9.24
T_2- 10±1^{0}C	O_1- Control	21.35	18.38	19.86	7.47	6.34	6.90
	O_2- PEG 6000 @ -1.5 MPa	23.63	25.53	24.58	11.13	7.96	9.54
	V x T				V x T		
	T_1- 25±1 ^{0}C	23.65	20.23	21.94	8.73	7.44	8.08
	T_2- 10±1 ^{0}C	22.49	21.96	22.23	9.30	7.15	8.22
	V x O				V x O		
	O_1- Control	21.41	19.24	20.33	7.59	6.24	6.91
	O_2- PEG 6000 @ -1.5 MPa	24.73	22.95	23.84	10.43	8.36	9.39
Mean		23.07	21.10	22.08	9.01	7.30	8.15
		S.Em±	CD (P=0.01)	CV (%)	S.Em±	CD (P=0.01)	CV (%)
V		0.418	1.76		0.110	0.46	
T		0.418	NS		0.110	NS	
O		0.418	1.76		0.110	0.46	
V x T		0.591	NS	6.55	0.156	NS	4.68
V x O		0.591	NS		0.156	NS	
T x O		0.591	NS		0.156	NS	
V x T x O		0.835	3.44		0.221	0.91	

NS: Non Significant

Seedling Vigour index-I (SVI-I) and Seedling Vigour index-II (SVI-II)

Significant variations were noticed in seedling vigour index-I (SVI-I) due to vigour levels, osmotica and interactions between V x T x O. Among the vigour levels, higher SVI-I (2077) was registered in high vigour seeds and it was lower (1354) in low vigour seeds. Among osmotica, O_2 had recorded higher (1920) SVI-I and it was lower in O_1 (1511). Further, among the third order interactions of V x T x O, $V_1T_1O_2$ had shown higher SVI-I (2375) which was statistically on par with $V_1T_2O_2$ (2095) and but it was lower in $V_2T_2O_1$ and $V_2T_1O_1$ (1053 and 1151, respectively). The SVI-I did not vary significantly due to temperature and the interactions between V x O, V x T and T x O.

Table 5: Seedling vigour index (SVI) -I and SVI-II as influenced by vigour levels, temperature and osmopriming in cucumber

Treatments		Seedling vigour index (SVI) - I			Seedling vigour index (SVI) - II		
		High vigour (V_1)	Low Vigour (V_2)	Mean	High vigour (V_1)	Low Vigour (V_2)	Mean
T_1	O_1	1918	1151	1538	689	351	520
	O_2	2375	1413	1894	895	606	751
T_2	O_1	1920	1053	1486	672	363	517
	O_2	2095	1797	1946	986	559	773
	V x T				V x T		
	T_1	2147	1282	1715	793	479	636
	T_2	2008	1426	1717	829	462	646
	V x O				V x O		
	O_1	1920	1103	1511	681	357	519
	O_2	2235	1605	1920	941	583	762
Mean		2077	1354	1716	811	470	641
		S.Em±	CD (P=0.01)	CV (%)	S.Em±	CD (P=0.01)	CV (%)
V		34.55	142		10.96	45	
T		34.55	NS		10.96	NS	
O		34.55	142		10.96	45	
V x T		48.86	NS	6.97	15.50	NS	5.92
V x O		48.86	NS		15.50	NS	
T x O		48.86	NS		15.50	NS	
V x T x O		69.10	285		21.92	90	

NS: Non Significant

Significant variations were noticed on seedling vigour index-II (SVI-II) due to vigour levels, osmotica and interactions between V x T x O. Among the vigour levels, higher SVI- II (811) was registered in high vigour seeds and it was lower (470) in low vigour seeds. Among osmotica, O_2 recorded higher SVI-II (762) and it was lower in O_1 (519). Further, among the third order interactions of V x T x O, $V_1T_2O_2$ showed higher SVI-II (986) and it was lowest in $V_2T_1O_1$ (351). These findings are similar to Panditha and Shantha Nagarajan (2000) [16], who reported that PEG priming of aged

tomato seeds improved seed germination by 10.7 per cent, speed of germination by 37.80 per cent and seedling vigour by 18.10 per cent over aged controls. They also concluded that hydro priming enhanced germination, speed of germination and seedling dry weight of aged seeds to a smaller extent as compared to osmopriming.

Conclusion

Osmopriming with PEG 6000 @ -1.5 Mpa has a positive effect on the enhancement of seeds germination, seedlings growth and various physiological attributes in cucumber, especially low vigour seeds have recorded 22.67 per cent increase in the final count germination in contrast to 2.90 per cent increase in high vigour seeds, in comparison with unprimed seeds. From the present study, PEG 6000 @ -1.5 Mpa is best suited for osmoconditioning at 25± 1^0C to improve seed physiological attributes in low vigour cucumber seeds.

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