RESEARCH ARTICLE

INFLUENCE OF SEED STORAGE CONDITION ON SEED MOISTURE CONTENT AND GERMINATION IN *IMPATIENS TALBOTII* HOOK.

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Abstract: Lesser known species *Impatiens talbotii* is a rare, endangered endemic ephemeral restricted to the northern part of central Western Ghats. Life of *I. talbotii* will terminate within six months. In the present study, species is studied to understand its seed viability upon storage which will accounts in species conservation. Seeds were stored at four different relative humidity regimes in two different temperatures. Study revealed that there was a gradual decrease in seed moisture as well germination attributes in all the storage condition upon storage period. Seeds stored under ambient humidity at cold temperature maintained reliable moisture content and germination till the end of storage period. Significantly high germination per cent, rate of germination, seedling length and seedling vigour index was observed in seeds stored in cold temperature than the seeds stored in ambient temperature. Higher germination of 83 per cent was observed in seeds stored at ambient RH under cold temperature and least germination of 3 per cent was observed in seeds stored at 90-95 % RH under ambient temperature after 30 days of storage. After 180 days of storage the high vigour of 1890 was observed in ambient RH under cold storage and low vigour of 83 was noticed in seeds stored at 90-95% RH under ambient temperature. Seed storage at ambient humidity in cold storage is best storage condition to *Impatiens talbotii* for long term storage.

Keyword: *Impatiens talbotii*, Relative humidity, Moisture content, Temperature

INTRODUCTION

Impatiens talbotii is an ephemeral herbaceous plant under the family Balsaminaceae. Genus *Impatiens* produces beautiful ornamental flowers which play an important role in the ecosystem as a nectar producing plants for several butterflies, bees, moths *etc*. Balsaminaceae is one of the largest groups among flowering plants comprising more than 1000 species in the world and in India the genus is represented by more than 209 species of which 148 are endemic (Vivekananthan *et al*., 1997). Of the total species, about 106 species are in peninsular India, of which 103 spp. are endemic and confined to Western Ghats. Considering its high endemism, restricted to narrow habitats and also severe threat for its survival, many *Impatienses* of Western Ghats has been categorized for their threat status as per IUCN Red List Categories and Criteria. About 51 per cent of the total species in Western Ghats are categorized as threatened, 40 species fall under the category of critically endangered, about 33 endangered and 16 are under vulnerable status (Bhaskar, 2006). The genus *Impatiens* is distributed throughout the wet tropical and sub-tropical regions of Asia and Africa, while few species are recorded from the temperate regions of Asia, Europe and North America (Ganesh *et al*., 2007).

Impatiens talbotii is a typical endemic balsam plant distributed in a narrow belt of Western Ghats and reported only from Uttara Kannada and Shimoga districts of Karnataka. *Impatiens talbotii* was first recorded by Hooker in 1906 based on Talbot's collection from Devimane ghat in Uttara Kannada District (Jyosna *et al*., 2009). As per the Red Data Book of Indian plants, it is a rare endemic species and endangered according to IUCN threat status. *Impatiens* is commonly grown in moist grounds with partial shade in large groups and appears in either sides of the steep path. Most of them are terrestrial and few are epiphytic. All *Impatiens* are annuals usually appear in the monsoon except *I. balsamina* which is a perennial and produce their beautiful flowers and seeds throughout the year. However; it is cultivated in the gardens as an ornamental plant. Plant appears in the month of June and flowers during July to September. The growth ceases during October and thereafter it terminates its life cycle.

Lack of knowledge of seed biology and seed handling techniques and other important aspects includes population dynamics; reproductive ability and their fitness of organisms are hard to conserve them from the risk of extinction. The main intention of this attempt is to understand the storability and retention of moisture, eventually helps in conservation of rare and endangered ephemeral *Impatiens talbotii.*

Since the life of a seed largely revolves around its moisture contents it is necessary to dry seeds to safe moisture content. However, moisture content depends upon storage length and storage structure. Relative humidity and temperature are the most important factors determining the storage life of seed. Storage is the preservation of viable seeds from the time of collection until they are required for sowing (Holmes and Buszewicz, 1958). Successful long-term storage also depends on storage conditions and treatment and quality of the seed. Storage of seed is advantageous for reforestation programs, research and genetic conservation. Maintaining the initial genetic and physiological quality of seed is one objective of storage.

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MATERIAL AND METHODS

The present experiment was carried out in Forest Biology and Tree Improvement laboratory, College of Forestry Sirsi, Uttara Kannada District of Karnataka during the year 2016 17. Plants are spread in groups in and around temple, bus stand, market places, abandoned paddy fields, undergrowth of arecanut plantations, along the road sides, garbage dumping areas *etc*. Seeds were collected from in and around Sirsi town.

One season old seeds were stored under two different storage temperatures (Ambient and cold condition) and four different relative humidity regimes viz., 0, 45-50, 90-95 and control). Seeds were stored under different RH regime in both temperatures. To maintain 0% RH throughout the storage period, the special storage chamber was maintained by using silica gel in desiccators. Silica gel was filled below the perforated plate in desiccators and seeds were kept on the plate. For 45- 50 % RH the special storage chamber was maintained by using $Ca\ (NO_3)_2\ 4H_2O$ in desiccators. 90-95% RH maintained throughout the storage period in storage chamber was maintained by using $CuSO_4\ 5H_2O$ in desiccators. Saturated solution of $Ca\ (NO_3)_2\ 4H_2O$ and $CuSO_4\ 5H_2O$ was filled below the perforated plate to maintain 40-45% and 90-95 % RH respectively (Plate 1). Seed were stored at laboratory where ambient RH was maintained. The experiment was laid out in Factorial Complete Randomized Design (FCRD) with three replications. Seeds were stored in all RH regimes throughout the storage period. 300 seeds were drawn from each storage condition at 30 days of interval for six months. Moisture per cent was calculated and set of seed was sown for germination from all the storage condition in each interval. The experiment was laid out in Factorial Complete Randomized Design (FCRD). Form each storage condition seeds were sown for germination in three replications and seeds were used for moisture per cent estimation in three replications in all the intervals. Seed germination and seedling quality parameters were recorded and calculated (Anon., 1996).

RESULTS AND DISCUSSION

Seeds are living creatures and keeping them viable over the long term requires adjusting storage moisture and temperature appropriately. The level of dryness and coldness depends mostly on the longevity that required and the investment in infrastructure that is affordable. Relative humidity and temperature are the most important factors determining the storage life of seeds. Thus the maintenance of seed moisture content during storage is function of relative humidity and storage temperature. Conserving the seeds as germplasm is very important in conservation of rare and endangered species. Though *I.talbotii* is an endangered and endemic plant, it is necessary to preserve the plants propagules for the enhanced establishment.

There was significant difference in seed moisture content due to the storage temperature during storage. Initially the seed moisture content was 13.1 per cent (Table-1). Among the storage temperatures, seeds stored at ambient temperature retained more moisture content of 13.79 compare to the cold storage after 30 days of storage. The seed moisture content significantly varied throughout the storage. There was significant and greater reduction in moisture content (5.5%) after 90 days of storage under ambient temperature over the cold storage. Seeds stored under cold temperature significantly retained the high moisture content and gradual reduction in moisture content taken place during the storage. This may be due to the higher desiccation of seed moisture in ambient temperature. In cold storage seeds were exposed to lower temperature hence the amount of seed moisture desiccation is less. Similar results are corroborate with findings of Singh *et al.* (1997) in *Azadirachta indica.*

Significant differences in seed moisture content due to the different relative humidity levels during storage. Among the four levels RH, seed stored under 90-95 % RH retained high moisture content of 18.25 per cent compare to the other RH levels after 30 and 60 days of storage. Significant reduction in seed moisture content after 90 days of storage under 90-95% RH (9.76%) over the other RH levels. Seeds stored under 0%, 45-50% and ambient RH significantly retained the moisture content and gradual reduction in moisture content occur till 150 days after storage. Constant maintenance of moisture content was observed in seeds stored under 45-50% RH and ambient RH after 180 days of storage (17.13% and 11.37% respectively). In general, irrespective of storage period, decrease in moisture content was observed with decrease in the RH levels.

Seeds stored at 90-95% RH under ambient temperature retained high moisture content of 20.33 and 27.99 per cent after 30 and 60 days of storage respectively. There was greater reduction to 6.60 % from the 10.87% in seed moisture content was observed in seeds stored in 0% RH under ambient temperature. Seeds stored at 45- 50% RH and ambient RH under both ambient temperature and cold temperature retained the moisture content and gradual reduction in seed moisture content noticed throughout the storage. The seeds stored at 90-95% RH under ambient temperature were completely deteriorated after 60 days of storage. (Fig. 1 and 2).

There was significant difference in germination percentage due to the temperature during storage (Table 2). Among the storage temperatures seeds stored at cold temperature recorded high germination of 41 per cent after 30 days of storage over the seeds stored at ambient temperature. The same trend was continued throughout the storage period; 32, 27, 20, 19 and 15 per cent germination was observed in 60, 90, 120, 150 and 180 days after storage respectively in cold temperature. Whereas seed stored under ambient temperature, 24, 11, 8, 6, 4 and 3 per cent germination was observed in 30, 60, 90, 120, 150 and 180 days after storage respectively. The greater decline to 11 per cent germination after 60 days of storage from the 24 per cent germination at 30 days of storage was observed in seeds stores under ambient temperature. There was significant and gradual decrease in germination per cent in seeds stored under cold temperature. Significantly high germination per cent, rate of germination, mean daily germination, was observed in seeds stored in cold temperature than the seeds stored in ambient temperature. In conformity, Guedes *et al*., 2012, reported in *Tabebuia caraiba* Mart. seeds stored at cold temperature showed significantly higher results in seeds moisture, percentage of emergence and emergence rate over all other storage environment in all the storage period.

Seeds stored at ambient RH recorded high germination of 62 per cent and the lowest germination was recorded in seeds stored at 90-95% RH after 30 days of storage. The greater reduction in germination was observed in seed stored at 0% RH i.e., reduced to 8 per cent after 60 days of storage from the 28 per cent germination at 30 days after storage. There was no germination was observed in seeds stored at 90-95% RH after 120 days of storage. Significant and gradual reduction in seed germination was observed in seeds stores at ambient RH. In general, storage period increases, decline in seed germination was observed in all the RH levels.

Significantly higher germination of 83 per cent was observed in seeds stored at ambient RH under cold temperature and least germination of 3 per cent was observed in seeds stored at 90-95 % RH under ambient temperature after 30 days of storage. Greater reduction in germination was observed in seeds stored at 0% RH under both the temperature after 60 days of storage. After 90 days of storage there was no germination of seed found in seeds stored at 0% RH under both the temperatures. Similarly there was no germination was observed in seeds stored at 90-95% RH under cold storage. Significant and gradual reduction in germination percent was observed in seeds stored at ambient RH under cold storage.

There was significant difference in rate of germination due to the temperature during seed storage. Among the storage temperatures, high rate of germination (1.28) was found in seeds stored under cold temperature after 30 days of storage over the ambient temperature. Significant difference was observed in rate of germination due to the different relative humidity regimes during the seed storage. The high rate of germination (1.60) was observed in seeds stored at ambient RH after 30 days of storage over the other RH levels (Table-3). Among all the storage conditions seed stored at ambient RH under cold temperature recorded high rate of germination (2.53) over the other storage condition. Seed stored at 0 % RH under both the temperature, great reduction of germination rate was observed after 60 days of storage. There was significant and gradual decrease in rate of germination was observed in seeds stored at ambient RH under cold storage.

Among the storage temperatures, seed stored at cold temperature recorded maximum seedling length of 32.08 cm after 30 days of storage compare to the cold storage (23.75 cm). There was significant and greater reduction of seedling length after 90 days of storage was observed under ambient temperature over the cold storage. The cold storage recorded reduced seedling length compared to room temperature. These results are in conformity with findings of Bhardwaj *et al*., (2014) in *Rheum austral*.

Seedling length varied significantly due to the different relative humidity levels during seed storage (Table-4). Among the RH levels, seed stored at ambient RH recorded maximum seedling length of 36.17 cm after 30 days of storage compared to other RH levels. There was significant and greater reduction of seedling length after 90 days of storage at 90-95% RH. Seeds stored at ambient and 45-50% RH showed significant and gradual reduction of seedling length over the storage period. In general, as the storage period advancement, decrease in seedling length was noticed in all the RH levels.

The interaction of storage temperatures and RH levels showed significant differences for seedling length during storage. Among all the storage conditions, seeds stored at ambient RH under cold temperature recorded maximum seedling length of 42.33 cm after 30 days of storage over the other storage condition. There was significant and gradual decrease in seedling length was observed in all the storage condition. In general, decreased seedling length was observed with increase in storage period.

Seeds stored at cold temperature recorded high seedling vigour of 1450 after 30 days of storage compare to the cold storage (638)(Fig.3). Reduction in seedling vigour after 90 days of storage was observed under ambient temperature over the cold storage. Seeds stored under cold temperature showed significant and gradual reduction of seedling vigour over the storage period. As advancement in the storage period, decline in seedling vigour was observed in both the storage temperatures. Among the RH levels, seed stored at ambient RH recorded high seedling vigour of 2210 after 30 days of storage compare to other RH levels. There was significant and higher reduction of seedling vigour after 90 days of storage at 0% RH (reduced to 199 after 60 days of seedling storage from 790 at 30 days after storage). Seeds stored at ambient RH showed significant and gradual reduction of seedling vigour over the storage period. The slow loss of viability under cold condition may possibly due to reduced rate of metabolic activities and inactivation of enzymes at low temperature thus helping to retain viability. Considerably low germination per cent, mean daily germination, seedling length and seedling vigour was observed in seeds stored in ambient temperature with different relative humidity. This may be due the fluctuating external environment. This fluctuation affects the seed quality as well it cause deterioration of seed (Pradhan and Badola., 2012).

The interaction of storage temperatures and RH levels found significant for seedling vigour. Among all the storage conditions, seeds stored at ambient RH under cold temperature recorded high vigour (3375) after 30 days of storage over the other storage condition. After 180 days of storage the high vigour of 1890 was observed in ambient RH under cold storage and low vigour of 83 was noticed in seeds stored at 90-95% RH under ambient temperature. There was significant and gradual decrease in seedling vigour was observed in all the storage condition.

Table 1. Influence of temperature and relative humidity on seed moisture content during storage in *Impatiens talbotii*

Storage condition	**Moisture content (%)**					
	30 DAS	**60 DAS**	**90 DAS**	**120 DAS**	**150 DAS**	**180 DAS**
Factor I : Storage Temperature (A)						
A_1 (Ambient temparature)	13.79 (21.80)	13.35 (21.43)	5.52 (13.59)	4.94 (12.89)	4.38 (12.07)	4.20 (11.83)
A_2 (Cold temperature)	13.57 (21.61)	12.37 (20.59)	11.57 (19.89)	10.1 (18.55)	9.76 (18.20)	9.14 (17.60)
S. Em. ±	**0.06**	**0.29**	**0.31**	**0.12**	**0.11**	**0.14**
C. D. @ 1%	**0.18**	**0.87**	**0.93**	**0.36**	**0.33**	**0.43**
Factor II : Relative Humidity (B)						
B_1 (at 0 % RH)	10.68 (19.08)	7.65 (16.06)	6.94 (15.27)	5.9 (14.03)	5.40 (13.44)	4.71 (12.53)
B_2 (at 45-50% RH)	14.16 (22.10)	10.75 (19.14)	8.79 (17.25)	8.12 (16.55)	7.38 (15.77)	17.13 (15.49)
B_3(at 90-95 % RH)	18.25 (25.29)	22.78 (28.51)	9.76 (18.21)	8.08 (16.52)	7.90 (16.32)	7.83 (16.25)
B_4(at ambient RH)	11.63 (19.94)	10.27 (18.69)	8.68 (17.14)	8.12 (16.55)	7.58 (15.98)	11.37 (19.70)
S. Em. ±	**0.08**	**0.41**	**0.44**	**0.17**	**0.15**	**0.20**
C.D. @ 1%	**0.25**	**1.23**	**1.32**	**0.51**	**0.46**	**0.60**
Interaction (A × B)						
A_1B_1	10.87 (19.25)	6.60 (14.88)	5.89 (14.05)	4.63 (12.43)	3.77 (11.19)	3.40 (10.63)
A_1B_2	12.78 (20.94)	9.47 (17.92)	7.85 (16.27)	7.43 (15.82)	6.40 (14.65)	6.33 (14.58)
A_1B_3	20.23 (26.73)	-	-	-	-	-
A_1B_4	11.28 (19.63)	9.37 (17.82)	8.33 (16.78)	7.83 (16.25)	7.33 (15.71)	7.07 (15.42)
A_2B_1	10.49 (18.90)	8.71 (17.17)	7.99 (16.42)	7.12 (15.47)	7.03 (15.38)	6.01 (14.20)
A_2B_2	15.53 (23.21)	12.04 (20.30)	9.73 (18.18)	8.80 (17.26)	8.37 (16.81)	7.93 (16.36)
A_2B_3	16.27 (23.79)	17.57 (24.78)	19.53 (26.22)	16.17 (23.71)	15.80 (23.42)	15.67 (23.32)
A_2B_4	11.97 (20.24)	11.17 (19.52)	9.03 (17.49)	8.40 (16.85)	7.83 (16.25)	6.95 (15.28)
S. Em. ±	**0.12**	**0.58**	**0.62**	**0.24**	**0.22**	**0.28**
C.D. @ 1%	**0.36**	**1.75**	**1.86**	**0.73**	**0.65**	**0.85**

***figures in parentheses indicate arc sine values , **DAS – Days after Storage**

Table 2. Influence of temperature and relative humidity on germination percentage during storage in *Impatiens talbotii*

Storage condition	**Germination percentage**					
	30 DAS	**60 DAS**	**90 DAS**	**120 DAS**	**150 DAS**	**180 DAS**
Factor I : Storage Temperature (A)						
A_1 (Ambient temperature)	24 (29.28)	11 (20.05)	08 (15.89)	06 (13.98)	04 (12.13)	03 (9.69)
A_2 (Cold temperature)	41 (39.72)	32 (34.30)	27 (31.20)	20 (26.74)	19 (25.78)	15 (23.12)
S. Em. ±	**2.46**	**0.89**	**1.71**	**0.90**	**0.67**	**0.82**
C. D. @ 1%	**7.44**	**2.69**	**5.18**	**2.71**	**2.21**	**2.49**
Factor II : Relative Humidity (B)						
B_1 (at 0 % RH)	28 (32.16)	08 (15.89)	00 (0.00)	00 (0.00)	00 (0.00)	00 (0.00)
B_2 (at 45-50% RH)	27 (31.09)	18 (24.73)	14 (22.11)	08 (15.89)	05 (12.25)	02 (7.42)
B_3 (at 90-95 % RH)	13 (20.70)	08 (16.07)	04 (11.78)	00 (0.00)	00 (0.00)	00 (0.00)
B_4(at ambient RH)	62 (51.94)	54 (47.49)	50 (45.19)	45 (41.94)	42 (40.49)	35 (36.17)
S. Em. ±	**3.48**	**1.26**	**2.42**	**1.27**	**0.67**	**1.16**
C. D. @ 1%	**10.52**	**3.80**	**7.33**	**3.84**	**2.21**	**3.52**
Interaction (A × B)						
A_1B_1	28 (31.16)	5 (12.92)	00 (0.00)	00 (0.00)	00 (0.00)	00 (0.00)
A_1B_2	23 (28.88)	12 (19.98)	07 (15.34)	7 (14.97)	3 (10.51)	00 (0.00)
A_1B_3	03 (10.51)	-	-	-	-	-
A_1B_4	41 (39.62)	30 (33.42)	23 (28.66)	17 (24.10)	14 (22.24)	11 (19.67)
A_2B_1	28 (32.16)	10 (18.43)	00 (0.00)	00 (0.00)	00 (0.00)	00 (0.00)
A_2B_2	30 (33.21)	23 (28.88)	21 (27.51)	08 (16.78)	06 (13.78)	03 (10.51)
A_2B_3	22 (27.74)	15 (23.05)	08 (16.78)	00 (0.00)	00 (0.00)	00 (0.00)
A_2B_4	83 (65.90)	78 (62.26)	78 (61.80)	73 (58.48)	70 (56.79)	58 (49.80)
S. Em. ±	**4.92**	**1.78**	**3.43**	**1.80**	**0.94**	**1.65**
C. D. @ 1%	**14.88**	**5.37**	**10.37**	**5.43**	**3.12**	**4.98**

***figures in parentheses indicate arc sine values, **DAS – Days after Storage**

Table 3. Influence of temperature and relative humidity on germination rate in *Impatiens talbotii*

Storage condition	**Germination Rate**					
	30 DAS	**60 DAS**	**90 DAS**	**120 DAS**	**150 DAS**	**180 DAS**
Factor I : Storage Temperature (A)						
A_1 (Ambient temperature)	0.57	0.36	0.30	0.23	0.11	0.05
A_2 (Cold temperature)	1.28	0.99	0.80	0.58	0.49	0.39
S. Em. ±	**0.13**	**0.09**	**0.12**	**0.08**	**0.03**	**0.03**
C. D. @ 1%	**0.40**	**0.28**	**0.35**	**0.23**	**0.08**	**0.08**
Factor II : Relative Humidity (B)						
B_1 (at 0 % RH)	0.19	0.29	0.00	0.00	0.00	0.00
B_2 (at 45-50% RH)	0.80	0.70	0.60	0.53	0.27	0.14
B_3 (at 90-95 %	0.38	0.32	0.23	0.00	0.00	0.00

RH)						
B_4(at ambient RH)	1.60	1.39	1.30	1.10	0.93	0.74
S. Em. ±	**0.19**	**0.13**	**0.16**	**0.11**	**0.04**	**0.04**
C. D. @ 1%	**0.56**	**0.40**	**0.49**	**0.33**	**0.12**	**0.11**
Interaction (A × B)						
A_1B_1	0.74	0.20	0.00	0.00	0.0	0.00
A_1B_2	0.82	0.62	0.59	0.53	0.1	0.00
A_1B_3	0.04	-	-	-	-	-
A_1B_4	0.67	0.62	0.60	0.40	0.3	0.22
A_2B_1	1.08	0.38	0.00	0.00	0.0	0.00
A_2B_2	0.79	0.77	0.73	0.52	0.4	0.28
A_2B_3	0.71	0.65	0.46	0.00	0.0	0.00
A_2B_4	2.53	2.16	1.99	1.80	1.5	1.26
S. Em. ±	**0.26**	**0.19**	**0.23**	**0.15**	**0.06**	**0.05**
C. D. @ 1%	**0.79**	**0.57**	**0.70**	**0.47**	**0.17**	**0.16**

****DAS – Days after Storage**

Table 4. Influence of storage temperature, relative humidity and storage period on seedling length in *Impatiens talbotii*

Storage condition	**Seedling Length (cm)**					
	30 DAS	**60 DAS**	**90 DAS**	**120 DAS**	**150 DAS**	**180 DAS**
Factor I : Storage Temperature (A)						
A_1 (Ambient temperature)	23.75	21.50	12.29	12.49	12.92	6.33
A_2 (Cold temperature)	32.08	30.75	21.69	15.35	14.62	14.09
S. Em. ±	**1.57**	**0.43**	**0.31**	**0.21**	**0.26**	**0.24**
C. D. @ 1%	**4.76**	**1.30**	**0.99**	**0.63**	**0.79**	**0.71**
Factor II : Relative Humidity (B)						
B_1 (at 0 % RH)	27.50	26.33	0.00	0.00	0.00	0.00
B_2 (at 45-50% RH)	27.67	29.00	24.68	25.30	24.78	11.95
B_3 (at 90-95 % RH)	20.33	13.50	11.53	0.00	0.00	0.00
B_4(at ambient RH)	36.17	35.67	31.75	30.38	30.28	28.88
S. Em. ±	**2.23**	**0.61**	**0.43**	**0.29**	**0.37**	**0.33**
C. D. @ 1%	**6.72**	**1.83**	**1.31**	**0.89**	**1.12**	**1.00**
Interaction (A × B)						
A_1B_1	30.00	26.33	0.00	0.00	0.00	0.00
A_1B_2	26.67	28.33	23.00	24.13	25.37	0.00
A_1B_3	25.00	-	-	-	-	-
A_1B_4	31.00	30.33	26.17	25.83	26.3	25.30
A_2B_1	25.00	26.33	0.00	0.00	0.00	0.00
A_2B_2	28.67	29.67	26.37	26.46	24.20	23.90
A_2B_3	32.33	27.00	23.07	0.00	0.00	0.00
A_2B_4	42.33	40.00	37.33	34.93	34.27	32.46
S. Em. ±	**3.15**	**0.86**	**0.61**	**0.45**	**0.53**	**0.47**
C. D. @ 1%	**9.52**	**2.59**	**1.86**	**1.29**	**1.59**	**1.42**

Table 5. Influence of storage temperature, relative humidity and storage period on seedling vigour in *Impatiens talbotii*

Storage condition	**Seedling vigour**					
	30 DAS	**60 DAS**	**90 DAS**	**120 DAS**	**150 DAS**	**180 DAS**
Factor I : Storage Temperature (A)						
A_1 (Ambient temperature)	638	354	191	141	116	71

A_2 (Cold temperature)	1450	1127	918	689	636	492
S.Em. ±	**58.37**	**43.49**	**48.40**	**29.06**	**45.51**	**24.05**
C. D. @ 1%	**176.50**	**131.52**	**146.34**	**87.86**	**137.62**	**72.72**
Factor II : Relative Humidity (B)						
B_1 (at 0 % RH)	790	199	000	000	000	000
B_2 (at 45-50% RH)	786	514	362	189	111	39
B_3 (at 90-95 % RH)	389	207	105	000	000	000
B_4(at ambient RH)	2210	2044	1751	1484	1393	1089
S.Em. ±	**82.55**	**61.51**	**68.44**	**41.09**	**64.36**	**34.01**
C. D. @ 1%	**249.61**	**186.00**	**206.95**	**124.25**	**194.62**	**102.84**
Interaction (A × B)						
A_1B_1	900	133	000	000	000	000
A_1B_2	522	332	160	160	86	000
A_1B_3	83	-	-	-	-	-
A_1B_4	1045	951	603	429	378	288
A_2B_1	680	264	000	000	000	000
A_2B_2	1050	695	564	219	136	78
A_2B_3	695	413	210	000	000	000
A_2B_4	3375	3136	2900	2539	2407	1891
S.Em. ±	**116.74**	**86.99**	**96.79**	**58.11**	**91.02**	**48.10**
C. D. @ 1%	**352.99**	**263.09**	**292.68**	**175.72**	**275.23**	**145.43**

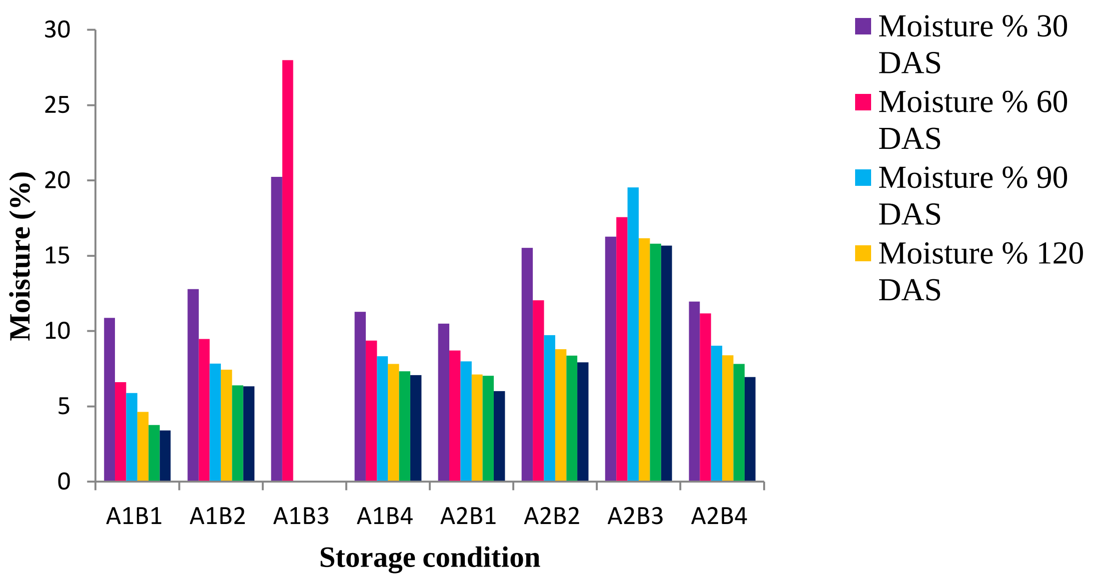

Fig.1 Trend of moisture content under storage temperature and relative humidity regime for six months storage in *Impatiens talbotii*

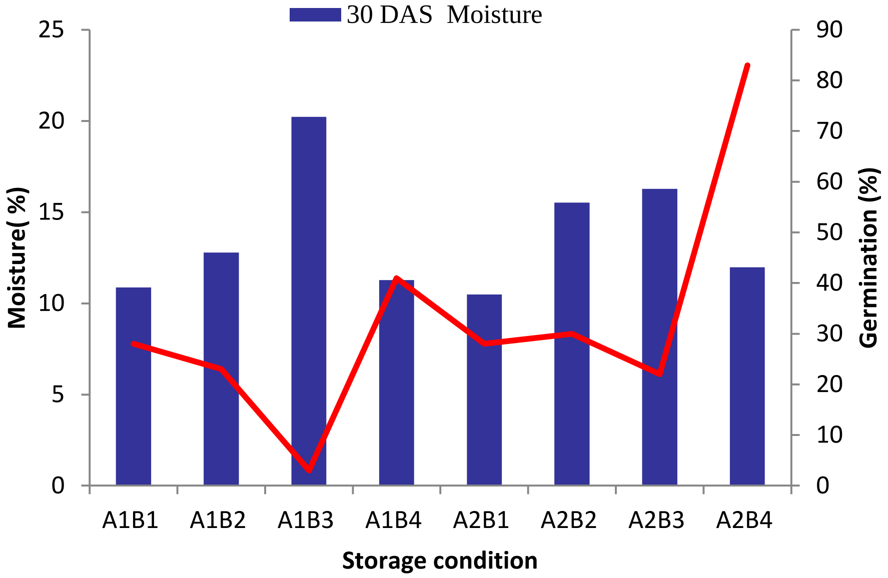

Fig.2 Relationship between moisture per cent and germination per cent after 30 days of storage in *I.talbotii*

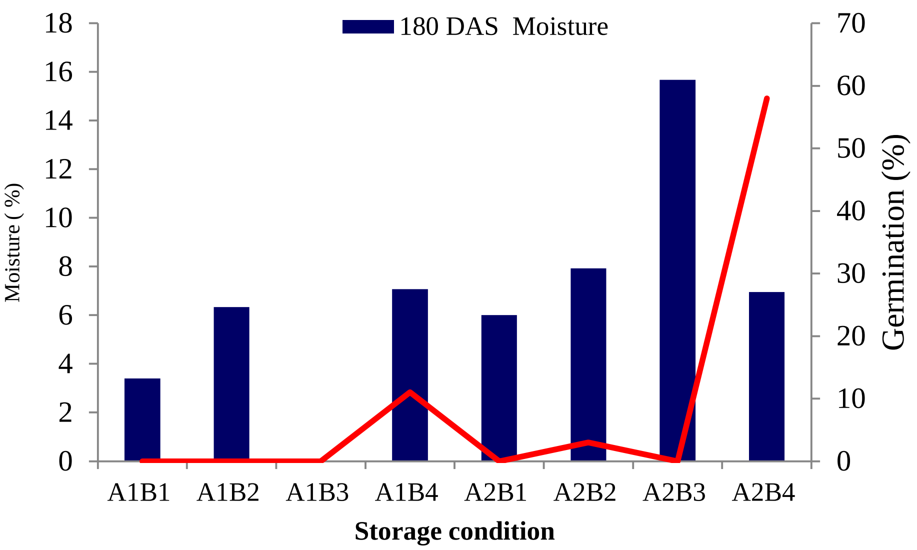

Fig. 3 Relationship between moisture per cent and germination per cent after 180 days of storage in *Impatiens talbotii*

CONCLUSION

Moisture content of the seed was greatly influenced by the storage condition during the storage mainly, temperature and relative humidity. Seeds stored at cold temperature retained the higher moisture content throughout storage period (13.57 % and 9.14 % moisture content at the end of 30 and 180 days after storage respectively) than the seeds stored at cold temperature. Seeds stored at 90-95%t RH under cold temperature retained significantly high moisture content throughout the storage period (15 % moisture content at the end of the 180 days of storage) over the other RH levels. There was significant difference in germination attributes due to the storage condition. Low temperature recorded maximum germination percent high rate of germination, higher seedling length and seedling vigour index after 30 days of storage. Seeds stored at ambient temperature under cold storage exhibited high germination (83%) and seed quality attributes over the other storage condition after 30 days of storage and reduced to 58 per cent at the end of 180 days after storage. In general, there was significant and gradual decrease in seed germination and quality was observed in all the storage condition with high RH level. The results of present investigation may be helpful in seed germplasm conservation of rare and endangered *I.talbotii* for longer period.

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