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POLLEN GERMINATION CAPACITY OF TWO CULTIVATED SPECIES (*JASMINUM SAMBUC* (L.) AIT. AND *NYCANTHES ARBOR-TRISTIS* L.) OF FAMILY OLEACEAE

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Abstract

Pollen germination and viability of two species viz., *Jasminum sambuc* (L.) Ait., and *Nycanthes arbor-tristis* L. of the family Oleaceae were examined . Viability was determined on the basis of germination ability of pollen on sucrose medium with boric acid solution up to 48 weeks. Stored pollen were germinated under different conditions (+4°C), (-20°C, -30°C), (-60°C), vacuum chamber and organic solvents. Pollen stored at low temperature -60°C showed better germination as compared to pollen stored at +4°C and fresh. Among two species *Jasminum sambac* (L.) Ait. showed much better germination percentage at -60°C (40.60%) whereas, *Nycanthes arbor-tristis* L., showed 37.0% germination after 48 weeks of storage. Pollen stored over silica jel under vacuum of both the species showed good germination as compared to organic solvents.

Introduction

Pollen storage is a good conservation tool and time saving technique in hybridization and crops improvement programs (Towill, 2004). Germination capability of pollen is related to cultivars, nutrition conditions and environmental factors (Polat & Pirlack, 1999; Dafni & Firmago, 2000; Kelen & Demitas, 2003). Pollen viability is strongly influenced by temperature, moisture, genotypic differences, plant vigor and physiological stage and flower age. Different nutrition conditions and germination method for many plant species and varieties were used by researchers (Kelen & Demitas, 2003). Pollen of different plants requires varying range of growth media like water, sugar solution, inorganic salts and vitamins for successful germination. Temperature is a basic factor in the control of the environmental conditions and influences pollen germination and longevity in stored pollen (Kelen *et al*., 1996). Towill (2004) suggested that low moisture content, within limits and lowering the storage temperature increase the pollen viability in stored pollen. Several researchers have studied the pollen viability and pollen germination of different taxa in different storage conditions such as liquid nitrogen (-196°C), refrigerator (+4°C), freezer (different minus temperatures), freeze dried and organic solvents (Nair & Singh, 1972; Hanson & Campbell, 1972; Shivanna & Rangaswamy, 1992; Kopp *et al*., 2000; Pansonen *et al*., 2001; Kenta *et al*., 2002; Perveen & Khan, 2009; Khan & Perveen, 2009; Khan & Perveen, 2010; Perveen & Ali, 2010; Perveen & Ali, 2011).

Present investigation is undertaken to examine the pollen viability and germination of two important ornamental species belonging to Oleaceae viz., *Jasminum sambuc* and *Nyctanthes arbor-tristris* in storage condition. Both these species are cultivated in number of tropical and subtropical countries including Pakistan for their beautiful flowers.

Material and Methods

During the flowering period of *Jasminum sambuc* and *Nycanthes arbor-tritis* flowers were collected in large quantity from cultivated fields. They were placed in paper bags and transferred to the laboratory. Anthers were separated and placed in petri dishes for the release of pollen. Pollen gathered and their germination and tube growth rate were tested immediately according to the method of Alexander (1969) and then stored for 48 weeks at +4°C, -20°C, -30°C, -60°C vacuum chamber and organic solvents. Pollen culture media were prepared according to standard method of Brewbaker & Kwack (1963). The germination was scored after 3-6 hours of incubation at room temperature in humid chambers using different solutions. 100 pollen per slide and 10 slides per plant and total 100 plants from different cultivated fields were studied. Pollen produced pollen tube and grew at least twice the diameter of pollen were counted as germinated. The viability of stored pollen was assessed in terms of percent germination.

Results and Discussion

In the present investigation an attempt has been made to compare the pollen germination capacity of two cultivated species belonging to family Oleaceae viz. *Jasminum sambuc* (L.) Ait. and *Nycanthes arbor-tristris* L. Pollen stored up to 48 weeks in different conditions i.e., refrigerator, freezer, freeze drier, vacuum and organic solvents. Among two species *Jasminum sambuc* showed good germination percentage after 4 weeks of storage at all conditions (Table 1). Pollen stored at low temperature freeze drier showed the better germination percentage in first 4-28 weeks, but after that germination percentage was decreased slowly. Lora *et al*., (2006) examined the storage of Cherimoya (*Annona cherimola*) pollen at low temperature and demonstrated that the germination was progressively reduced with storage time and reached minimum after three months of storage. Our findings are also in agreement with that of Lora et al. (2006). Pollen stored at -20°C and -30°C showed good germination but as the time proceed and the germination percentage gradually decreased and after 48 weeks the germination was 21% and 27.10% in *Jasminum sambuc.* (Table 1 and Fig. 2).

Table. 1. Germination capacity of stored pollen grains of *Jasminum sumbac* (Oleaceae) at different temperature in sucrose and boric acid solutions.

Period in week	Different temperature							
	% Of germination at 4°C	% Of solutions	% Of germination at -20°C	% Of solutions	% Of germination at -30°C	% Of solutions	% Of germination at -60°C	% Of solutions
4	39.20	30	51.00	30	50.00	30	59.00	30
8	37.10	30	50.10	30	48.10	30	59.00	30
12	35.30	30	46.90	30	46.00	30	58.10	30
16	32.10	30	43.00	30	44.30	30	56.00	30
20	29.40	30	41.20	30	44.00	30	55.40	30
24	27.10	30	38.10	30	42.00	30	53.60	30
28	25.10	30	35.00	30	40.60	30	54.90	30
32	23.50	30	32.40	30	36.60	30	47.00	30
36	21.00	30	29.70	30	35.00	30	45.10	30
40	20.60	30	25.40	30	31.30	30	43.60	30
44	17.10	30	23.60	30	28.60	30	42.00	30
48	13.10	30	21.60	30	27.10	30	40.60	30

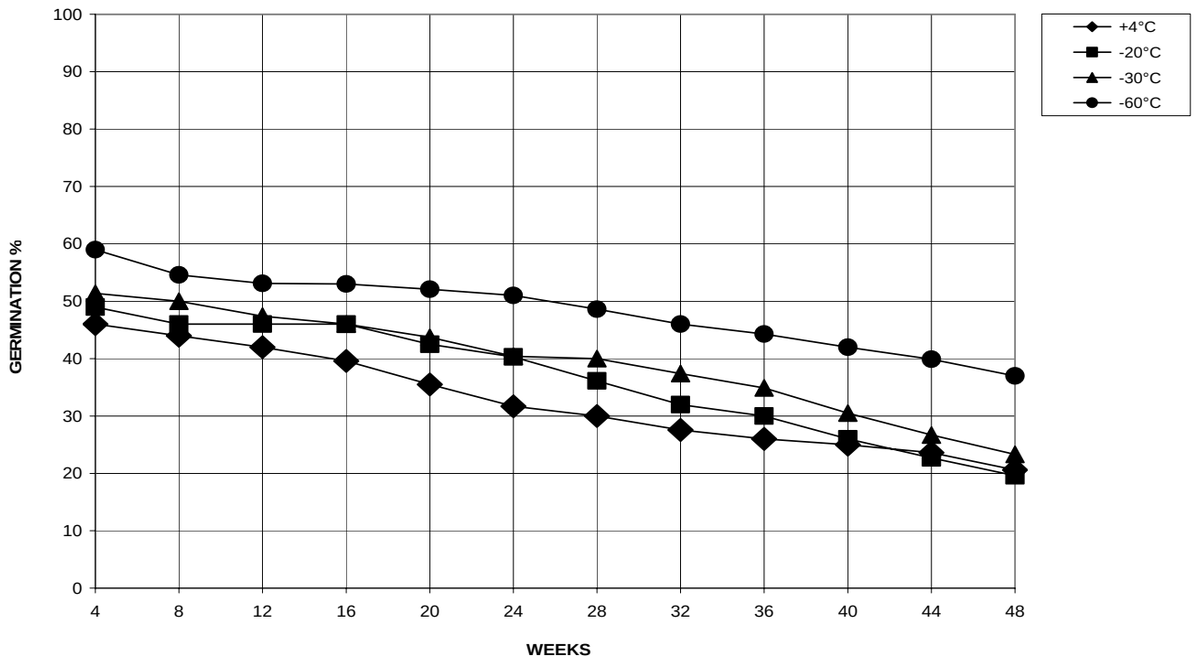

Fig. 1. Germination rate of stored *Nycanthes arbor-tristis* pollen over 48 weeks.

Maximum pollen germination was observed 59% at -60°C while minimum was observed 46% at 4°C in 4 weeks stored pollen of *Nycanthus arbor-tristis*. Percentage of pollen germination decreased with increasing storage time. The germination percentage at 4°C and fresh pollen was almost same in first week i.e., 46% and 45.3% respectively. Pollen stored at +4°C showed 39.20% germination in early weeks but then germination decreased rapidly and after 48 weeks, germination was 13.10%. Between 40 and 44 weeks germination percentage fell to almost half of the maximum value (Table 2 and Fig. 1). Differences observed in *invitro* pollen germination was due to the results of complex interaction between morphology and physiology of pollen and components used in the culture medium (Gwata *et al*., 2003). Kakani *et al*., (2005) showed that the variations in *In vitro* germination and pollen tube growth due to the variations in the varieties of the plant species.

Souza-Lang & Pinto Junior (1997) revealed that the highest pollen germination of *Araucaria angustifolia* in medium without sugar but our result showed that highest germinatioin percentage in the medium containing sucrose. However, pollen did not germinate in a high concentration of sucrose, which confirms the Premachardra *et al*., (1992) hypothesis i.e., when concentration of sucrose increases in the medium, the concentration of carbon is also increased which inhibit the pollen germination.

Table 2. Germination capacity of stored pollen grains of *Nycanthes arbor-tristis* (Oleaceae) at different temperature in sucrose and boric acid solutions.

Period in week	Different temperature							
	% Of germination at 4°C	% Of solutions	% Of germination at -20°C	% Of solutions	% Of germination at -30°C	% Of solutions	% Of germination at -60°C	% Of solutions
4	46.00	30	49.00	30	51.40	30	59.00	30
8	44.00	30	46.00	30	50.00	30	54.60	30
12	42.00	30	48.00	30	47.40	30	53.10	30
16	39.60	30	46.00	30	46.00	30	53.00	30
20	35.50	30	42.50	30	43.70	30	52.10	30
24	31.70	30	40.30	30	40.40	30	51.00	30
28	30.00	30	36.10	30	40.00	30	48.60	30
32	27.56	30	32.00	30	37.40	30	46.00	30
36	26.00	30	30.00	30	34.90	30	44.30	30
40	25.00	30	26.00	30	30.50	30	42.00	30
44	23.60	30	22.70	30	26.7 0	30	39.90	30
48	20.60	30	19.60	30	23.30	30	37.00	30

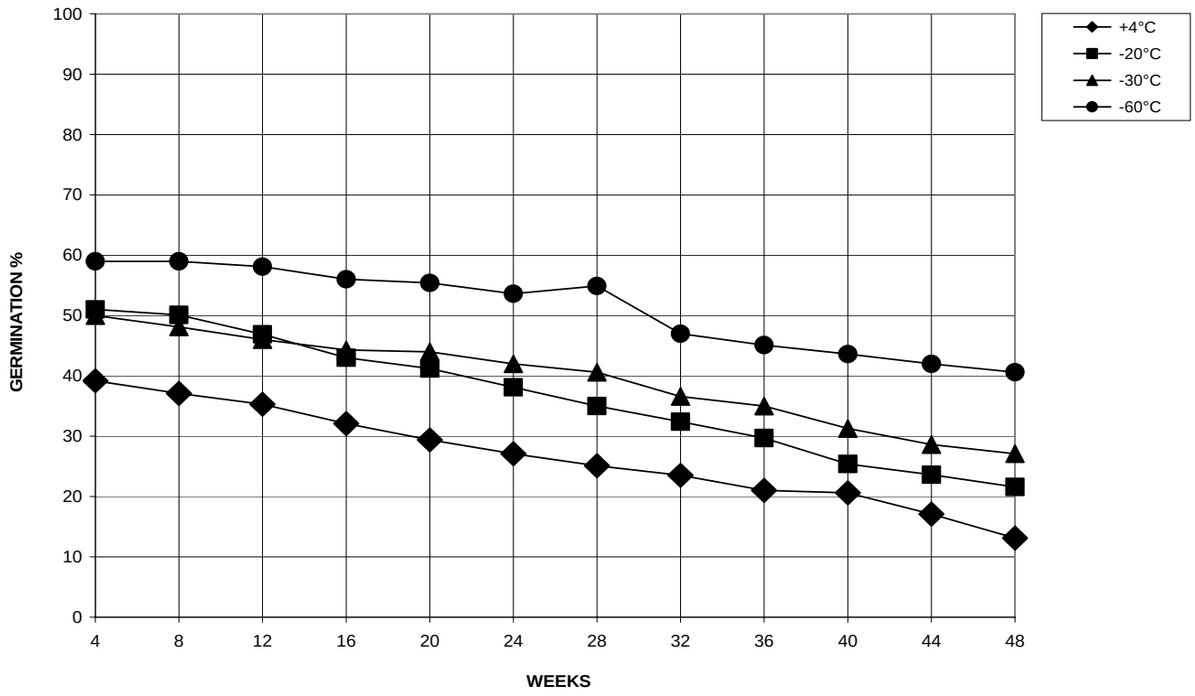

Fig. 2. Germination rate of stored *Jasminum sambuc* pollen over 48 weeks.

Pollen germination was also observed by soaking the pollen in the solvent benzene, acetone and chloroform. Among these benzene showed better germination percentage than other solvents. Ikada & Numata (1998) also reported benzene was the most effective solvent for pollen storage of *Chrysanthemum*.

Present findings are also in agreement with that of Udomedee *et al*., (2003). Who has also reported that the pollen stored at low temperature showed better germination results in *Cercuma*. The pollen of *Jasminum sambuc* and *Nycanthes arbor-tristis* stored at -60°C showed better results and had a viability up to 40.60% after storing 48 weeks. In the remaining condition germination percentage was very low after 48 weeks of storage (Tables 1 & 2).

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