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GERMINATION CAPACITY OF STORED POLLEN OF *SOLANUM MELONGENA* L., (SOLANACEAE) AND THEIR MAINTENANCE

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Abstract

Present investigations pertain to germination and viability of *Solanum melongena* L., (Solanaceae) pollens up to 48 weeks. Pollen germination was made by the hanging drop technique in different concentration of sucrose and boric acid solutions (10%-100%). Viability under storage was determined by storing pollen in different conditions, like refrigerator, freezer, in vacuum over silica gel and in organic solvents (Acetone, Benzene, and Choloroform). Pollen stored at low temperature (-30°C, -20°C) showed better germination percentage compared to pollen stored at +4°C and fresh. Freeze dried pollen (-60°C) showed the best of germination. The study indicates that 30% and 40% solutions favoured pollen germination. Benzene showed more germination than acetone and chloroform.

Introduction

Recently pollen physiology especially germination and viability has received considerable attention for its application in plant breeding, conservation, adaptation and understanding of physiological behavior of fertilizing pollen grains. There are several reports on pollen germination and viability from different taxa (Nair & Singh, 1972; Vijay, 1972; Kapoor, 1976; Zeng-Yu Wang *et al*., 2004).

Pollen grains of angiosperm can be classified into two groups, binucleate and trinucleate. The later one lose viability very rapidly & can hardly germinate on artificial media. Pollen has considerable potential to achieve genetic transformation. There are some critical external factors which affects the maintenance of pollen germination capacity eg., relative humidity (RH), and temperature surrounding pollen. (King 1961, Gill *et al*., 1992, Malik & Thind, 1992; Shivanna & Ranaswamy, 1992). Pollen grains of different plants require varying range of growth media like water, sugar solution, inorganic salts and vitamins for successful germination. Pollen stored at low temperature presented germination capacity better than high temperature (Stanley & Linskens 1974.)

It has been widely acknowledged that temperature and relative humidity of the storage environment are two important factors which profoundly influence the viability of stored pollen. Piney & Polito (1990) reported that the germination of Olive pollen improved markedly in storage condition. Thomas (2000) studied pollen germination of 40 plant species on sucrose gelatin and on onion epidermis. According to Aslantus & Pirlak (2002) the germination capacity of strawberry pollen increase in low temperature.

The present study is the first attempt to analyze storage condition and viability test method of *Solanum melongena* L. No reports are available on maintenance and germination capacity of stored pollen of this economically important plant.

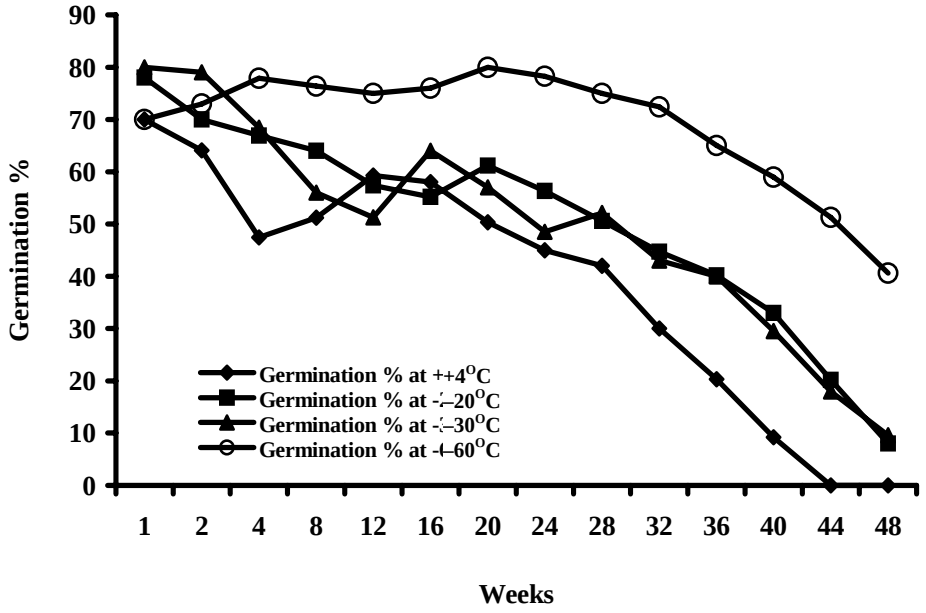

Fig. 1. Germination percentage of stored pollen of *Solanum melongena* L., (Solanaceae) at different temperatures upto 48 weeks.

Material and Methods

Methodology: A polliniferous material of brinjal was collected from cultivated fields and plants growing in green house in large quantity during the peak of flowering period of species. Fresh pollen was systematically subjected to preliminary viability tests (Alexander, 1996). Pollen culture media was prepared using Brewbaker & Kwack (1963) techniques. Pollen grains equal to at least twice the diameter of pollen grains counted as germinated, burst pollen grains were not counted as germinated. The viability of stored pollen was assessed in terms of percentage germination. The stored pollen was germinated in a humidity chamber in different solutions. The germination was determined after 3-6 hrs of incubation. The hanging drop technique used for culturing pollen grains in liquid media culture was stored at room temperature. The pollen grains slides were also prepared for light (LM) using (Erdtman, 1952) procedure. For light microscopy pollen grains were mounted in unstained glycerin jelly and observation were made with a Nikon type-2 microscope. The measurements are based on 15 readings.

Results and Discussions

Germination capacity of stored pollen of *Solanum melongena* L., was been examined for 48 weeks in different conditions as refrigerator, freezer, vacum and in organic solvents. Pollen stored in freezer (-30°C, -20°C) showed better germination percentage as compared to pollen stored at +4°C and in organic solvents (Fig. 1 and Table 1). Fresh and +4°C showed more or less equal germination percentage. At +4°C the germination capacity decreased as compared to germination at freezer where the germination was reasonably high after 24 weeks (Table 1). The freeze-drying condition seems to be the best method where the germination increase after 48 weeks is upto 40.6% (Table 1).

Table 1. Germination capacity of stored pollen of *Solanum melongena* L. (Solanaceae) at different temperature and humidity conditions in sucrose and boric acid solutions.

Weeks	Germination % at +4°C	% Solutions	Germination % at - 20°C	% solutions	Germination % at -30°C	% Solutions	Germination % at -60°C	% Solutions
1	70.0	20	78.0	30	80.0	30	70.0	40
2	64.1	20	70.0	30	79.0	30	73.0	40
4	47.4	30	66.9	50	68.4	40	77.9	30
8	51.2	20	64.0	60	56.0	30	76.4	30
12	59.3	30	57.4	30	51.3	30	75.0	40
16	58.0	30	55.2	30	64.0	70	76.0	40
20	50.3	40	61.2	30	57.0	30	80.0	50
24	45.0	40	56.3	30	48.5	30	78.3	40
28	42.0	20	50.6	30	52.1	40	75.0	30
32	30.0	30	44.7	40	43.0	50	72.4	30
36	20.3	30	40.2	30	40.0	30	65.0	30
40	9.2	30	33.0	30	29.5	40	59.0	40
44	--	--	20.2	30	18.0	40	51.3	40
48	--	--	8.0	20	9.6	40	40.6	60

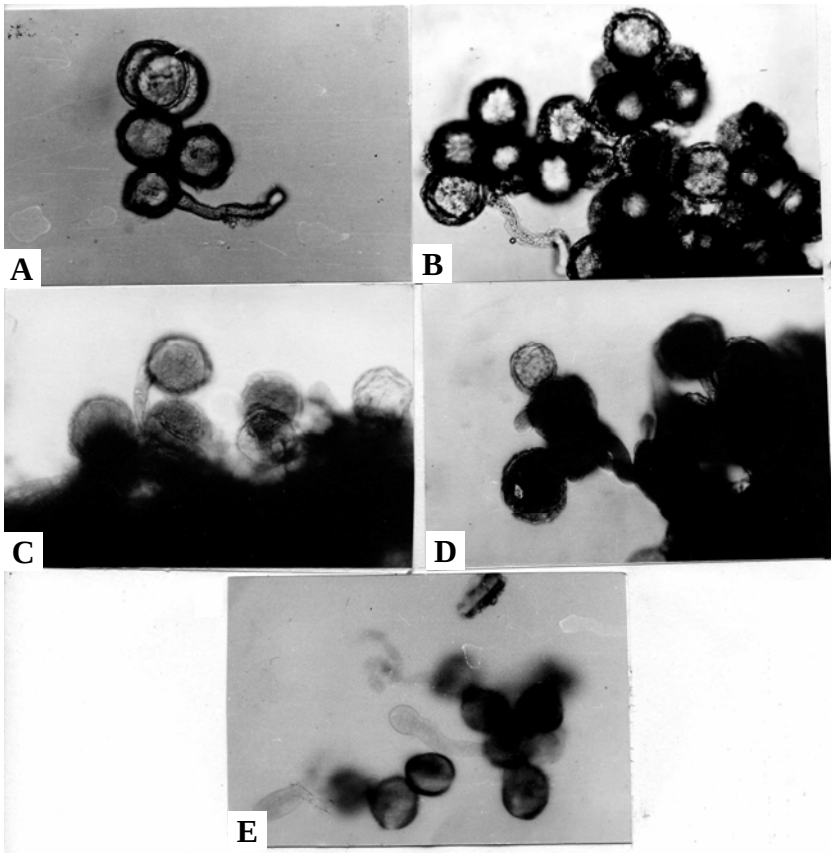

Fig. 2. All sections are from germinated pollen of *Solanum melongena* (LM).
A = Germinated pollen storage at +4°C after 24 weeks, B = Germinated pollen storage at -20°C after 40 weeks, C = Germinated pollen storage at -30°C after 20 weeks, D = Germinated pollen storage at -60°C after 48 weeks

In organic solvents pollen grains were treated from 1-24 hrs and then stored at +4°C. Benzene showed the best of germination as compared to acetone and chloroform in which pollen lost viability after 6-9 hrs. Benzene showed better germination up to 21 hrs. In vacuum pollen was treated over silica jell for 1-24 hrs and then germinated. This condition showed reasonable germination up to 18 hrs and then lost the viability.

The controlled temperature and humidity conditions were found to be effective in prolonging pollen viability in *Solanum melongena* L (Figs. 1&2), although the extent of prolongation was highly variable between the different storing conditions. Germination percentage was maximum in freeze-dried pollen (Figs. 1&2). Conclusively temperature and humidity are the major influencing factors in the pollen behavior of different conditions.

Acknowledgement

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References

Aslantus, R. and L. Pirlak. (2002). Storage of strawberry pollen. IV International symposium strawberry pollen. (Eds.): Hietaranta, M.M.Linn., Palonen & Parikka, *P. Acta Horticultureae*, 2: 567.

Alexander, M.P. 1996. Different staining of aborted and non aborted pollen. *Stain Trchnology*, 44: 117-122.

Brewbaker, J.L. and B.H. Kwack. 1963. The essential role of calcium ion in pollen tube growth. Amer. *J. Bot*., 50: 859-865.

Thomas, C.J.R. (2000). Studies on pollen germination of 40 plant species on sucrose gelatin & on Onion epidermis, Quekett. *Journal of Microscope*, 38L 463-472.

Erdtman, G. 1952. Pollen morphology and plant taxonomy of Angiosperms. In: *Introduction to Palynology*, 1: Almquist and Wiksell, Stockholm.

Gill, M.S. Neelam and C.P. Malik. 1992. Pollen biotechnology storage and viability. In: *Pollen Physiology and Biotechnology*. (Ed.): C.P. Malik. Today and tomorrow's Printer and Publisher, New Delhi, India.

Kapoor, S.K. 1976. Pollen germination in some Cucurbits. *J. Palyn*., 12:(1&2): 87-93.

King. J.R. 1961. The freeze drying of pollen. *Economic Botany*, 15: 91-98.

Malik, C.P. and S.K. Thind. 1992. Pollen biotechnology and fertilization engineering in crop improvement. In: *Pollen Physiology and Biotechnology*. (Ed.): C.P Malik. New Delhi, India.

Nair, Singh, B.V. 1972. Pollen germination studies in some legumes. *J. Palyn*., 8: 63-68.

Pinney, K. and V.S. Polito. 1990. Olive pollen storage and in vitro germination. In: *International Symposium on Olive Growing*. (Eds.): L. Rallo, J.M. Caballero and R.S. Rscabar. ISHS Acta Horticulture: 286. Vol 1.

Shivanna, K.R. and N.S. Rangaswamy. 1992. *Pollen biology*. A laboratory manual. New Delhi. India.

Stanley, R.G. and H.F. Linskens. 1974. Pollen biology, biochemistry and management. Springer, Verlag Berlin, Heidelberg, New York.

Vijay, O.P. 1972. Effect of different media on the pollen germination & growth of Cucumber pollen (*Cucumis sativa* L.). *Proc. Third. Int. Symp. Sub. Trop. & Trop. Hort*., Bangalore.

Zeng-Yu Wang, Yaxin Ge, Megann Scott, and German Spangenberg. 2004. Viability & longevity of pollen from transgenic and non transgenic tall fescue (*Festuca arundinacea*) (Poaceae) plants. *Am. J. Bot*. 91: 523-530.

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