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MAINTENANCE OF POLLEN GERMINATION CAPACITY OF *GLYCINE MAX* (L.) Merr., (PAPILIONACEAE)

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Abstract

Pollen germination and viability of *Glycine max* L., (family Papilionaceae) was examined up to 48 weeks in different concentrations of sucrose and boric acid solutions. Viability under storage was determined by storing pollen in different conditions in a refrigerator (4ºC), freezer (-20ºC, -30ºC), freeze drier (-60ºC), in vacuum and in organic solvents. Pollen stored at low temperature showed better germination percentage compared to pollen stored at 4ºC and fresh. Freeze dried pollen (-60ºC) showed the highest germination percentage.

Introduction

Pollen storage is useful for breeding programmes, genetic conservation and artificial pollination. Longevity of pollen, defined as the period of time over which the pollen retains its viability, i.e. germinability and fertilization ability, varies greatly with plant species and storage conditions (Hanna & Towill, 1995; Dafni & Firmage, 2000). Mostly binucleate pollen can be stored for long periods of time without loss of viability (Hanna & Towill, 1995) as compared to trinucleate pollen. Pollen stored at low temperature presented germination capacity better than high temperature (Stanley & Linskens, 1974). Pollen grains of tomato stored in open air lose half of their original germination capacity within 2 days at 25 °C and within 5 days at 6 °C (Abdul-Baki, 1992), while pollen stored at –20 °C under dry conditions retain viability for greater than three years (Hanna & Towill, 1995). According to Aslantus & Pirlak (2002), the germination capacity of strawberry pollen increased in low temperature. There are several reports on pollen germination and viability of different taxa with varied aims and objective like, (Nair & Singh, 1972, King, 1961, Mayer *et al.*, 1988, Shivanna & Rangaswamy, 1992, Taylor & Hepler, 1997, Thomas, 2000, Candace & Maureen, 2003). Storage of pollen in vacuum and in organic solvents has also been reported by different workers such as Datta & Chaudhary (1965), Iwanomi (1971), Hanson & Campbell (1972), Khan & Perveen (2008, 2009). Present investigation is the first attempt to analyze storage conditions of *Glycine max* L., No reports are available on maintenance and germination capacity of stored pollen of this economically important plant from Pakistan.

Materials and Methods

During the peak of flowering period of *Glycine max* L., polliniferous material were collected in large quantity from cultivated fields and green house. Fresh pollen were systematically subjected to preliminary viability tests (Alexander, 1969). 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. Pollen grains must produce tubes equal to at least twice the diameter of pollen grains to be counted as germinated pollen while burst pollen were not counted as germinated pollen. The viability of stored pollen was assessed in terms of percent germination. The pollen grains slides were also prepared for light (LM) and scanning (SEM) microscopy using the standard methods of Erdtman (1952). For light microscopy the pollen grains were mounted in unstained glycerin jelly and observations were made with a Nikon type-2 microscope.

Result and Discussion

Pollen viability of *Glycine max* L., has been examined up to 48 weeks in different conditions as refrigerator, freezer, freeze drier, vacuum and in organic solvents. Pollen stored at – 60ºC in freeze drier showed the better germination percentage in (30%, 40%) solutions in first 4 -12 weeks, but after that germination percentage decreased slowly. This method seems to have more potential to maintain viability compared to other conditions. Similarly, pollen stored in freezer at -20ºC and -30ºC showed good germination but as the time passed the germination percentage gradually decreased and after 48 weeks the germination was 60% and 53.50 % respectively (Table 1). The germination percentages at 4ºC and fresh pollen were almost same in first week. Pollen stored at 4ºC showed above 85% germination in early weeks but then germination decreased rapidly and after 48 weeks germination was 46.10%. Pollen were treated in vacuum over silica jel, this condition showed good germination up to 14 hours but decreased at the end, germination was higher as compared to organic solvents.

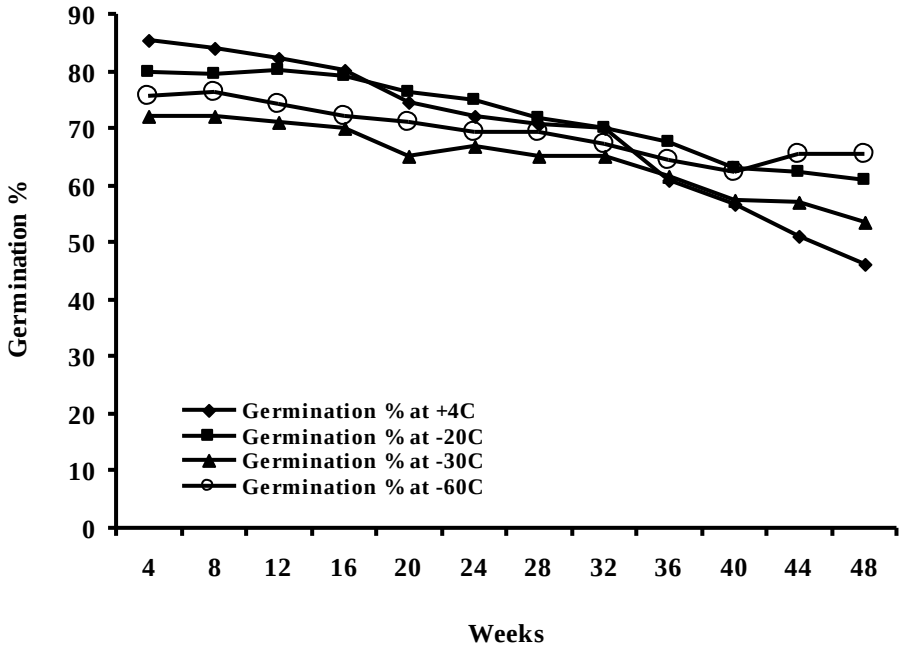

Table 1. Germination capacity of stored pollen of *Glycine max* L., (Papilonaceae) at different temperature and humidity conditions in sucrose and boric acid solutions.

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Weeks	Germination % at 4ºC	Solution (%)	Germination % at -20ºC	Solution (%)	Germination % at -30ºC	Solution (%)	Germination % at -60ºC	Solution (%)
4	85. 56	30	80.00	40	72.00	40	75.50	40
8	84.00	30	79.60	60	72.10	30	76.40	30
12	82.30	30	80.10	30	71.20	30	74.20	40
16	80.30	30	79.20	30	70.00	30	72.20	40
20	74.5 0	30	76.40	30	65.00	30	71.20	40
24	72.00	30	74.90	30	67.00	30	69.50	30
28	70.70	20	71.70	30	65.00	40	69.50	30
32	69.90	30	70.00	40	65.10	50	67.10	30
36	61.00	30	67.60	30	61.50	30	64.30	30
40	56.60	30	63.20	30	57.50	40	62.40	40
44	51.00	30	62.20	30	57.00	40	65.60	40
48	46.10	20	60.96	20	53.50	30	65.60	40

Conclusion

Temperature and humidity are the major influencing factors in pollen behavior of different conditions. Pollen stored at -60ºC showed better result and pollen showed 65% viability after storing for 48 weeks. The most important factors for successful pollen conservation are storage temperature and moisture content of material; lowering both tend to increase the period of viability. Long-term storage has been achieved in many taxa by freeze-drying method, (Khan & Perveen, 2006, 2008, 2009).

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