

Whether optimum pollen germination and tube length attained in the same concentrations of the growth medium (Sucrose + Calcium chloride) by five cultivars of apocynaceae : Further evidence of a criticism of Banerji and Gangulee (1937), Brewbaker and Kwack (1963), Sudhakaran (1967-Ph.D. Thesis), Dharurkar (1971-Ph.D. Thesis), Nair, Nambudiri and Thomas (1973)*

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SUMMARY

Pollen of F-48 and F-72 series of pink-flowered cultivar of *Catharanthus roseus* failed to germinate in all the concentrations (1-1000 mg/ml) of calcium chloride.

Key words : Physiology of Pollen, Palylnology, Environmental Sciences

In recent years (Salgare, 1986) the importance of gaining a knowledge on the germination potential of pollen in the bud stage of floral development has been realized, because of its possible applications in pollen storage and its subsequent use in plant breeding programmes.

MATERIALS AND METHODS

Pollen of successive flowers (*viz.* F, F-24, F-48, F-72 series *i.e.* open flowers and the flower buds which require 24, 48, 72 hours to open respectively) of 5 cultivars of Apocynaceae *e.g.* red-, pink- and white-flowered cultivars of *Nerium odorum* Soland. and pink- and white-flowered cultivars of *Catharanthus roseus* (L.) G. Don. were collected soon after the dehiscence of anthers in the open flowers. Germination of pollen grains was studied by standing-drop technique in the optimum concentrations of sucrose which acts as control as well as in the optimum concentrations of sucrose supplemented with the wide range of concentrations (1, 5, 10, 20-20-100, 200-200-1000 mg/ml) of mineral (calcium chloride). The cultures then transferred to a moist filter chamber, stored at room temperature (28.3-31.5°C) having RH 66% and in diffuse laboratory light. The experiments were run in triplicate and average results were recorded. Observations on the germination of pollen and tube growth were recorded 24 hours after incubation. For each experiment a random count of 200 grains was made to determine the percentage

of pollen germination. For measurement of length of pollen tubes, 50 tubes were selected randomly and measured at a magnification of 100x.

RESULTS AND DISCUSSION

Banerji and Gangulee (1937) and Dharurkar (1971-Ph.D.Thesis) reported higher percentage of pollen germination than the pollen viability in *Eichhornia crassipes*. The present findings as well as the extensive work of Salgare (2006) disproved the findings of Banerji and Gangulee (1937) and Dharurkar (1971).

Salgare (1986, 2006) observed the germination of pollen of F-72 series of pink-flowered cultivar of *Catharanthus roseus* *in vitro* culture of sucrose. Trisa Palathingal (1990) stated that the pollen of F-72 series of pink-flowered cultivar of *C. roseus* failed to germinate in Brewbaker and Kwack's (1963) culture medium. This confirms that Brewbaker and Kwack's (1963) culture medium is not perfect.

Pollen of F-48 and F-72 series of pink-flowered cultivar of *C. roseus* failed to germinate in all the concentrations of calcium chloride, while none of the concentrations of the mineral could stimulate the germination of pollen of F-24 series of *C. roseus* (Table 1).

1-1000 mg/ml proved to be the widest range of concentrations of calcium chloride which stimulated the germination of pollen of Apocynaceae. An optimum concentration produced as high as 200.00% and as low as 13.64% stimulation in the germination of pollen of Apocynaceae (Table 1).

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Table 1 : Effect of calcium chloride on pollen germination and tube growth of successive flowers of five cultivars of Apocynaceae

Cultivars	Series	%PV	iocs		rcvs			pgtgstcv			
			SC	V/O	RCPG	RCTG	OCM	SPG	OCM	STG	V/O
<i>N. odorum</i>											
Pink-flowered	F	91±0.42	50	1.53	1-20	1-80	01	+181.25	01	+438.04	08.25
White-flowered	F	61±2.87	50	1.20	1-20	1-600	05	+200.00	20	+242.30	05.31
Red-flowered	F	61±3.17	20	1.50	1-60	1-1000	05	+013.64	10	+753.08	12.86
Red-flowered	F-24	61±3.17	20	4.41	1-1000	1-1000	05	+200.00	01	+293.33	08.43
<i>C. roseus</i>											
White-flowered	F	89±0.97	20	1.65	1-1000	1-1000	10	+186.96	05	+601.07	11.53
White-flowered	F-24	89±0.97	50	1.06	1-20	1-600	10	+005.17	05	+755.56	09.06
Pink-flowered	F	93. ±0.98	20	4.15	1-1000	1-80	20	+181.82	05	+289.47	09.65
Pink-flowered	F-24	93. ±0.98	50	1.96	Nil	1-20	01	-012.20	20	+281.56	09.42
Pink-flowered	F-48	93. ±0.98	50	0.09	Ng	Ng	Ng	Ng	Ng	Ng	Ng
Pink-flowered	F-72	93. ±0.98	80	0.08	Ng	Ng	Ng	Ng	Ng	Ng	Ng

iocs, in optimum concentrations of sucrose; OCM, optimum concentrations of mineral in mg/ml for germination of pollen and tube growth; pgtgocm, pollen germination and tube growth in optimum concentrations of mineral; PV, pollen viability; rcms, range of concentrations of mineral for stimulation of pollen germination and tube growth; RCPG, range of concentrations of mineral for stimulation of pollen germination; RCTG, range of concentrations of mineral for stimulation of pollen tube growth; SC, optimum concentrations of sucrose in %; SPG, stimulation in pollen germination in %; STG, stimulation in pollen tube growth (in mm) in %; V/O, *in vitro* tube length in compare to *in vivo* in%.

Pollen germination stimulation (in %) is in the following proportions in various floral series, F:F-24:F-48:F-72 for optimum concentrations of calcium chloride. 173.94±4.30:350.00±8.10:0:0 (Table 1)

This shows that calcium chloride produced maximum stimulation in the germination of pollen of F-24 series of Apocynaceae.

1-1000 mg/ml proved to be the widest range of concentrations of calcium chloride which stimulated the pollen tube growth of Apocynaceae (Table 1). An optimum concentration produced as high as 755.56% stimulation in the pollen tube growth of Apocynaceae.

Proportions of pollen tube growth stimulation produced by calcium chloride, in optimum concentration, among various floral series, F:F-24:F-48:F-72, are as under: 234.07±6.66:235.23±2.40:1295.24±6.20:0 (Table 1)

This shows that calcium chloride produced the maximum stimulation in the tube growth of F-48 series of Apocynaceae.

The tube length *in vitro* culture of calcium chloride (an optimum concentration) is 12.86% in F series of red-flowered *N. odorum* of the tube length found *in vitro* is the longest of all the cultivars investigated of Apocynaceae (Table 1).

Pollen germination and tube elongation are two distinct processes differing in their sensitivity to different concentrations of the mineral was confirmed with the present work (Table 1). Present findings are in agreement with those of (Salgare, 1986, 2006). Nair, Nambudiri and Thomas (1973) stated that it has been significant that the optimum percentage of germination and tube length were attained in the same growth medium. Present findings as well as the extensive work of Salgare (1986, 2006) confirmed that the observations of Nair, Nambudiri and Thomas (1973) are superficial and misleading.

It was the failure of Sudhakaran (1967) to trace out the branched pollen tubes and polysiphonous condition in *Vinca rosea* L. [*Catharanthus roseus* (L.) G. Don.].

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