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EFFECT OF TEMPERATURE AND LIGHT CONDITIONS ON IN-VITRO POLLEN GERMINATION AND POLLEN TUBE GROWTH IN *PONGAMIA GLABRA,* VERT

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ABSTRACT

The present study evaluated the effect of four different temperatures (10, 20, 30 and 40°C) on pollen germination and length of pollen tube growth under in-vitro conditions was investigated in Pongamia glabra, Vert. The temperature showed a significant effect on in vitro pollen germination. The highest pollen germination was determined at a temperature of 30°C (63.71%), somewhat lower at 20°C (49.3%) and the lowest at 10°C (31.59 %). Effect oftemperature significantly more pronounced on the length of pollen tube. Pollen tube length was higher at the temperatures of 30 and 27°C and was optimal for pollen germination and pollen tube growth. Effect of different light conditions on pollen germination and on length of pollen tube in Pongamia glabra was evaluated. Under different light conditions red light showed better effect on pollen germination and on pollen tube growth.

KEYWORDS: *BK: Brewbaker and Kwack's medium;TTC: Triphenyl tetrazolium chloride.*

INTRODUCTION

Pongamia glabra, Vert. Vern. name Karanj belongs to family Leguminosae sub family papillionaceae is a tree reaching 40-60 ft height; It is used against rheumatism;the oil is also used in soaps. The plant is indigenous to India and cultivated for fibre and for green manure in many states like M.P. Punjab, Maharashtra. The fibre has fair demand from overseas countries and large proportion of it is exported out of India. The crop thrives best in tropical and subtropical climate. The androecium of *Pongamia glabra* are monoadalphous; filaments long and anthers are basifixed. Germination is the first morphogenetic event in the pollen towards fulfilling its ultimate function of discharge of male gamete in the embryo sac. Stigma provides a suitable site for pollen germination. However, studies on in-vivo are not easily feasible because of the complication involve in pistillate tissue. Therefore, the present investigation aimed to study the effect of different temperatures and different light conditions on in-vitro pollen germination in *Pongamia glabra.*

MATERIAL AND METHODS:

The pollen is subjected to viability test with TTC reagent (Triphenyl tetrazolium chloride), I_2KI and acetocarmine stains and the mean value of 10 fields are noted.In vitro pollen germination studied were carried out using mature anther dissected out from the fresh flower of *Pongamia glabra.*In this experiment Brewbaker's and Kwack medium BK medium Boric acid 100 mg l, calcium nitrate 300 mg l, magnesiumsulphateacid200 mg l, potassiumnitrate100 mg l(Brewbaker& Kwack, 1963) was used for culture of pollen.The medium of Brew-baker and Kwack (1963) is one of the most popular for pollen tube culture. Brewbaker and Kwack (1963) tested the pollen of several hundred species, First mount a drop of medium in the cavity of a slide. Dissect fresh pollen from anther and mix in drop of medium. Place the slides in petri

dish on moistened filter paper and cover with lid. Slides were incubated at different temperature and different light conditions. After incubation period drop of cotton blue was added to medium containing pollen grain for germination. Count the number of germinated pollen grains. Note abnormalities and record them, calculate the percent of pollen germination, Length of pollen tube was measured by ocular micrometry and observations were recorded in the observation table.Measurements of pollen tube length were recorded directly by an ocular micrometer fitted to the eyepiece of the microscope. Mean pollen tube length was calculated as the average length of 20 pollen tubes. For each condition ten fields were observed, percentage of pollen germination was calculated by counting germinated pollen grains divided by total number of pollen grains into hundred. This process repeated under different conditions such as light and temperature.

Table No.I. Effect of different temperatures on pollen germination and on length of pollen tube in *Pongamia glabra*.
Germination time: 2 hrs. Relative Humidity: 100%

Sr. No.	Temperature condition	Percentage of pollen germination	Average pollen tube length (µm)
1	Control 27 ^{O}C	88.4%	102.21
2	10^{0}C	31.59 %	62.51
3	20^{0}C	49.3%	74.15
4	30^{0}C	63.71%	85.19
5	40^{0}C	40.54%	52.82

Table No. II. Effect of different light intensity on pollen germination and on length of pollen tube in *Pongamia glabra*
Germination time: 2 hrs. Relative Humidity: 100%

Sr. No.	Light condition	Percentage of pollen germination	Average pollen tube length (µm)
2	Dark	58.2%	68.8
3	Red	80%	75.6
4	Normal	78.05%	90.9

RESULT AND DISCUSSION:

Pollen viability and fertility was calculated by staining method. Pollen grains from fresh flowers of *Pongamia glabra* which shows just anthesis were stained in I_2KI, Acetocarmine, and T.T.C reagent. The analysis total percentage of viability showed in I_2KI was 94%, in acetocarmine it was 96%while in T.T.C reagent it was 76% at 27^{o}c of room temperature by maintaining hundred percent humidity.

The result of pollen viability test given in table number I shows 88.4% germination of pollens of *Pongamia glabra,* Vert. But the germination percentage under different temperature and light condition shows different views (Table I- II). Under different temperature conditions the maximum pollen germination was under 30^{0}C. The germination percentage of pollen under 20^{0}Cwas less than those pollen germination under 30^{0}C temperature. Secondly the percentage of pollen germination at 10^{0}C also less than the 20^{0}C and 30^{0}C temperature condition. (Table I).It was seen that the average pollen tube length was greater in pollen germination under 30^{0}C temperature. The pollen germination under 20^{0}C temperature had an average pollen tube length which is more than the pollen tube germination at 10^{0}C temperature.Lowest value of pollen tube length was noticed under 50^{0}C temperature pollen germination condition.Pollen tube lengths similar to those recorded in the present study were reported for several crops when pollen was grown on artificial media, 1800 µm for corn (Binelli *et al.*, 1985), 450–1400 µm for peanuts (Kakani *et al.*, 2002) Previous studies on pollen germination shown that carbohydrates are responsible for pollen

development and, especially, pollen cytoplasmic carbohydrates and sucrose are involved in protecting pollen viability during exposure and dispersal (Pacini *et al*., 1996) and for pollen germination, simple sugars are the primary substrates (Stanley, 1971). In pepper plants, exposure to high temperature (32/26 °C) for 8 d resulted in pollen germination of 6 % and shorter pollen tubes compared with maximum pollen germination of 25 % obtained at normal temperature (28/22 °C) (Aloni *et al*., 2001).In contrast, a decrease in starch and sugar concentration was recorded in tomato pollen grown under high temperature conditions (Pressman *et al*., 2002).In light condition the maximum germination was obtained under red light. The germination percentage of pollen under dark light was less than those pollen germination under red light. Secondly the percentage of pollen germination under normal light was greater than the germination under dark light but less than red light condition (Table II).It was seen that the average pollen tube length was greater in pollen germination at normal light condition. The pollen germination under red light had an average pollen tube length more than the pollen germination in dark condition.Abnormalities such as bursting; polysiphonism are noticed more or less in all conditions of temperature and different light conditions of light and control conditions. Above results suggest that temperature light plays significant role on pollen germination and growth of pollen tube in *Pongamia glabra*, Vent. under in vitro condition.

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