www.ijarp.com ISSN 2456-9992 Page: 01-06

International Journal Advanced Research Publications

Research Article

Volume: 02
Issue: 01

EVALUATION OF POLLEN VIABILITY IN SELECTED ANGIOSPERMIC PLANTS OF AKOT REGION, MAHARASHTRA, INDIA USING IODINE–POTASSIUM IODIDE STAINING

***Mr.Bharat R. Nagare**

Assistant Professor Department of Botany, Shri Shivaji Arts, Commerce and Science College, Akot. Dist. Akola, Maharashtra.444101

Article Received: 22 November 2025, Article Revised: 12 December 2025, Published on: 01 January 2026

***Corresponding Author: Mr.Bharat R. Nagare**

Assistant Professor Department of Botany, Shri Shivaji Arts, Commerce and Science College, Akot. Dist. Akola, Maharashtra.444101.

DOI: https://doi-doi.org/101555/ijarp.5510

ABSTRACT

Pollen viability is an essential parameter influencing reproductive success and genetic stability in angiospermic plants. The present investigation evaluates in-vitro pollen viability of selected angiospermic species from the Akot region of Akola district, Maharashtra, India, using the iodine–potassium iodide (IKI) staining technique. A total of 49 angiospermic species belonging to different families were examined under light microscopy. Viable pollen grains were identified by dark staining due to starch content. The results revealed pronounced interspecific variation in pollen viability, ranging from 18.18% to 99.22%. Statistical analysis showed a mean pollen viability of 70.11% with a standard deviation of 19.42, indicating wide reproductive variability. The study provides baseline reproductive data of regional flora and contributes to plant reproductive biology, conservation strategies, and breeding programs.

KEYWORDS: Angiosperms, pollen viability, IKI staining, reproductive biology, Akot region, Maharashtra

INTRODUCTION

Angiosperms represent the most diverse and evolutionarily advanced group of plants, characterized by a wide range of floral forms and reproductive adaptations (Stebbins, 1974). Successful sexual reproduction in flowering plants depends largely on pollen viability, as pollen grains function as male gametophytes responsible for fertilization. Pollen viability refers to the physiological capability of pollen grains to germinate and fertilize the ovule

(Dafni & Firmage, 2000). It is influenced by genetic constitution, environmental conditions, and plant health. In tropical and semi-arid regions like Maharashtra, factors such as temperature, humidity, and seasonal stress significantly affect pollen fertility (Shivanna & Rangaswamy, 1992). Among several techniques used for assessing pollen viability, iodine–potassium iodide (IKI) staining is widely adopted due to its simplicity, rapidity, and cost-effectiveness (Erdtman, 1960). However, systematic pollen viability studies on angiosperms from the Akot region are limited. Hence, the present study was undertaken to evaluate pollen viability in selected angiospermic plants using the IKI staining method.

MATERIALS AND METHODS

Study Area

The study was conducted in the Akot region of Akola district, Maharashtra, India. The region experiences a tropical semi-arid climate with moderate rainfall and seasonal temperature variation.

Plant Material

A total of 49 angiospermic species, including ornamental, cultivated, and wild plants, were selected. Fresh flowers at anthesis were collected during January to March from healthy plants.

IKI Staining Method

Pollen viability was assessed using the iodine–potassium iodide staining method following standard procedures (Erdtman, 1960; Shivanna & Rangaswamy, 1992). The IKI solution was prepared by dissolving 0.5 g iodine and 1 g potassium iodide in 100 ml distilled water. Pollen grains were stained and observed under a light microscope after 5–10 minutes. Darkly stained pollen grains were considered viable.

Calculation of Pollen Viability

$$Pollen\ Viability\ (\%) = \frac{Total\ number\ of\ pollen\ grains}{Number\ of\ viable\ pollen\ grains} \times 100$$

RESULTS

Table 1. Alphabetical list of selected angiospermic plants with their families and pollen viability (%)

Sr. No.	Plant Species (A–Z)	Family	Pollen Viability (%)
1	*Allamanda blanchetii*	Apocynaceae	88.89
2	*Allium cepa*	Amaryllidaceae	94.53

3	*Arabian jasmine*	Oleaceae	73.33
4	*Argemone mexicana*	Papaveraceae	91.66
5	*Asystasia gangetica*	Acanthaceae	83.33
6	*Azadirachta indica*	Meliaceae	66.66
7	*Barleria prionitis*	Acanthaceae	80.00
8	*Bougainvillea*	Nyctaginaceae	75.00
9	*Brassica rapa*	Brassicaceae	40.00
10	*Callistemon*	Myrtaceae	62.50
11	*Catharanthus roseus*	Apocynaceae	33.33
12	*Chrysanthemum*	Asteraceae	60.00
13	*Cleome gynandra*	Capparaceae	76.92
14	*Clitoria ternatea*	Fabaceae	80.00
15	*Combretum indicum*	Combretaceae	62.50
16	*Crinum asiaticum*	Amaryllidaceae	75.00
17	*Crossandra infundibuliformis*	Acanthaceae	44.44
18	*Datura stramonium*	Solanaceae	80.00
19	*Dianthus chinensis*	Caryophyllaceae	50.00
20	*Hibiscus rosa-sinensis*	Malvaceae	50.00
21	*Hippeastrum striatum*	Amaryllidaceae	66.66
22	*Ipomoea carnea*	Convolvulaceae	85.71
23	*Ipomoea obscura*	Convolvulaceae	50.00
24	*Ixora coccinea*	Rubiaceae	29.41
25	*Jasminum sambac*	Oleaceae	25.00
26	*Kalanchoe blossfeldiana*	Crassulaceae	90.00
27	*Lantana camara*	Verbenaceae	26.92
28	*Lemon* (Citrus limon*)*	Rutaceae	90.62
29	*Luffa operculata*	Cucurbitaceae	50.00
30	*Nerium oleander*	Apocynaceae	42.85
31	*Nicotiana tabacum*	Solanaceae	89.23
32	*Passiflora incarnata*	Passifloraceae	89.47
33	*Pentas lanceolata*	Rubiaceae	50.00
34	*Plumeria alba*	Apocynaceae	80.00
35	*Portulaca grandiflora*	Portulacaceae	18.18
36	*Pseuderanthemum*	Acanthaceae	96.66
37	*Punica granatum*	Punicaceae	99.22
38	*Rosa indica*	Rosaceae	77.77
39	*Ruellia brevifolia*	Acanthaceae	71.42
0	*Ruellia simplex*	Acanthaceae	50.00
41	*Russelia equisetiformis*	Plantaginaceae	86.00
42	*Salvia splendens*	Lamiaceae	66.66
43	*Senna occidentalis*	Fabaceae	66.67
44	*Spathodea campanulata*	Bignoniaceae	81.81
45	*Tabernaemontana divaricata*	Apocynaceae	66.66
46	*Tecoma capensis*	Bignoniaceae	76.92
47	*Terminalia catappa*	Combretaceae	93.18
48	*Thevetia peruviana*	Apocynaceae	66.66
49	*White jasmine*	Oleaceae	90.00

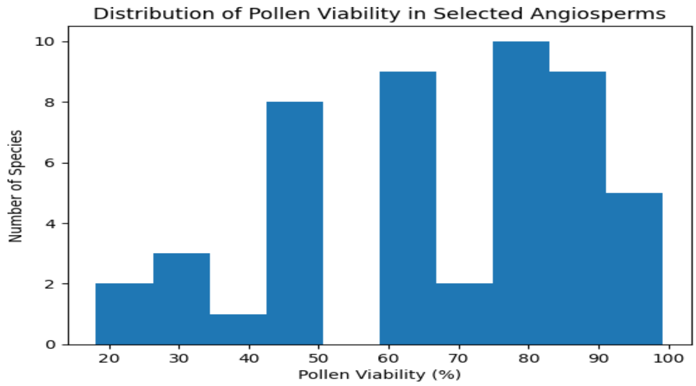


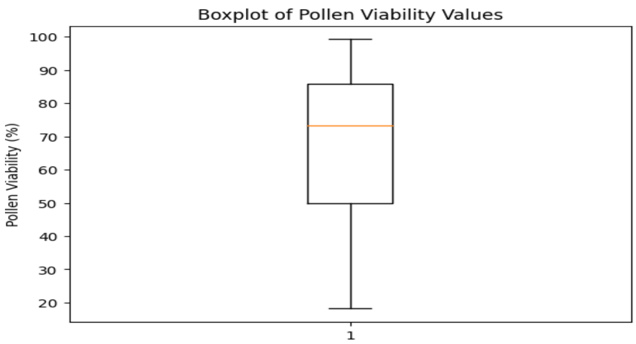
Figure 1.”

“The distribution of pollen viability among selected angiospermic plants is illustrated in

Statistical Analysis

Table 2. Descriptive statistics of pollen viability (%)

Parameter	**Value**
Minimum	18.18
Maximum	99.22
Mean	70.11
Median	73.33
Standard Deviation	19.42
Variance	377.10
Coefficient of Variation (%)	27.7



“The boxplot representation (Figure 2) highlights the wide interspecific variation in pollen viability.”

DISCUSSION

The assessment of pollen viability is a fundamental aspect of plant reproductive biology, as it directly influences fertilization success, seed formation, and population persistence. In the present study, considerable interspecific variation in pollen viability was recorded among the selected angiospermic plants of the Akot region, Maharashtra. The pollen viability values ranged from as low as 18.18% in *Portulaca grandiflora* to as high as 99.22% in *Punica granatum*, indicating wide reproductive diversity among taxa.

Species exhibiting high pollen viability, such as *Punica granatum*, *Allium cepa*, *Terminalia catappa*, and *Pseuderanthemum*, are likely to possess genetically stable meiotic processes and efficient pollen development mechanisms. High pollen viability in these species suggests greater reproductive fitness and adaptability under the prevailing semi-arid climatic conditions of the study region. Similar observations have been reported for tropical angiosperms in earlier studies conducted in different parts of India (Shivanna & Rangaswamy, 1992; Kumar & Singh, 2015). Moderate pollen viability values observed in species such as *Hibiscus rosa-sinensis*, *Dianthus chinensis*, and *Salvia splendens* may indicate partial pollen sterility or sensitivity to environmental fluctuations. In semi-arid regions, factors such as high temperature, moisture stress, and nutrient limitation can adversely affect pollen development and starch accumulation, thereby reducing viability (Dafni & Firmage, 2000). Low pollen viability recorded in species like *Portulaca grandiflora*, *Jasminum sambac*, and *Lantana camara* could be attributed to genetic abnormalities, physiological stress, or species-specific reproductive constraints. Reduced starch content in pollen grains, as indicated by poor IKI staining, suggests limited energy reserves required for pollen tube growth and fertilization. Similar reductions in pollen fertility under stressful environmental conditions have been reported by Sharma and Koul (1984). Statistical analysis further supports the biological interpretation of the data. The high standard deviation (19.42) and coefficient of variation (27.7%) indicate substantial heterogeneity in pollen viability among species. The boxplot (Figure 2) demonstrates the presence of both lower-end and upper-end extremes, confirming wide reproductive variability. The histogram (Figure 1) shows that a majority of species fall within the 60–80% viability range, suggesting that most angiosperms in the Akot region possess moderate to high reproductive potential. Although the IKI staining method does not directly assess pollen germination, it remains a reliable preliminary technique for evaluating pollen fertility based on starch content (Erdtman, 1960). Therefore, the present study provides meaningful insights into reproductive biology and establishes a baseline for future pollen germination and molecular studies.

CONCLUSION

The present investigation clearly demonstrates significant interspecific variation in pollen viability among selected angiospermic plants of the Akot region, Maharashtra. The iodine–potassium iodide staining method proved to be a simple, rapid, and effective technique for assessing pollen viability and reproductive potential.

High pollen viability observed in several species indicates efficient reproductive mechanisms and better adaptation to semi-arid environmental conditions, whereas reduced viability in certain taxa highlights possible genetic or ecological constraints. Statistical analysis confirmed wide variability in pollen fertility, emphasizing the importance of species-specific reproductive strategies.

The findings of this study provide valuable baseline data on pollen viability of regional flora, which can be utilized in plant breeding programs, conservation planning, and ecological assessment. The study also contributes to the understanding of reproductive fitness of angiosperms in tropical semi-arid ecosystems. Future research incorporating pollen germination assays, environmental stress analysis, and molecular approaches is recommended for a comprehensive evaluation of plant reproductive success.

ACKNOWLEDGEMENT

The author acknowledges the Department of Botany, Shri Shivaji Arts, Commerce and Science College, Akot, for laboratory facilities and support.

CONFLICT OF INTEREST

The author declares no conflict of interest.

REFERENCES

1. Dafni, A., & Firmage, D. (2000). Pollen viability and longevity. *Plant Systematics and Evolution*, 222, 113–132.
2. Erdtman, G. (1960). The acetolysis method. *Svensk Botanisk Tidskrift*, 54, 561–564.
3. Shivanna, K. R., & Rangaswamy, N. S. (1992). *Pollen Biology: A Laboratory Manual*. Narosa Publishing House, New Delhi.
4. Nair, P. K. K. (1970). *Pollen Morphology of Angiosperms*. Scholar Publishing House, New Delhi.
5. Sharma, N., & Koul, K. K. (1984). Pollen fertility studies in angiosperms. *Journal of Palynology*, 20, 45–52.
6. Stebbins, G. L. (1974). *Flowering Plants: Evolution Above the Species Level*. Harvard University Press.