A Comprehensive Investigation of Pollen Grains from Rosa indica Cultivars

D. Swapna [1], Dr. A. Vijaya Bhasker Reddy [2]

[1] D. Swapna Research Scholar, Department of Botany, Osmania University, Hyderabad

daramswapna123@gmail.com

[2,] Dr. A. Vijaya Bhasker Reddy Assistant professor, Department of Botany, Osmania University, Hyderabad

avijayabhaskerreddy@gmail.com

ABSTRACT:

This research presents a meticulous analysis of pollen grains obtained from various Rosa indica cultivars, encompassing 50 distinct species within the Rosaceae family. The study includes comprehensive descriptions of pollen grain characteristics, such as size, shape, and ornamentation, with accompanying imagery captured using light microscopy.

INTRODUCTION

Palynology, a crucial branch of botanical science, facilitates the exploration of pollen grains and spores, encompassing their morphological features and dispersal mechanisms. Each plant's pollen grains possess unique attributes closely tied to their genetic divergence from other species (Ghendov-Mosanu et al., 2020). Variations in pollen grain characteristics are apparent across different genera and species, with notable distinctions observed between monocots and dicots (van der Wolf et al., 2022).

Rosa indica, a member of the Rosaceae family, exhibits significant genetic and physiological diversity, with approximately 91 genera within this family. Various studies have delved into the morphological and growth characteristics of Rosa indica (Al-Yasi et al., 2020). However, this paper focuses on a comprehensive palynological analysis of 50 Rosa indica cultivars.

MATERIALS AND METHODS

This study encompassed 50 *Rosa indica* cultivars, and meticulous records were maintained for each specimen. The collected specimens were preserved as herbarium samples, following standard procedures, and named using a specific coding system. Pollen grains were extracted from mature flowers of the cultivars while preserving their unique characteristics (Amina et al., 2020).

Subsequently, the pollen grains were air-dried, labeled, and stored in containers to ensure their quality and viability. The acetolysis method was employed to process the pollen grains and prepare permanent slides. These slides were examined using a microscope, and the pollen characteristics were recorded for each cultivar.

RESULTS AND DISCUSSION

A total of 50 species from Rosa indica were collected, all belonging to different genera. The pollen grains from these cultivars exhibited tricolporate characteristics with varying sizes. For instance:

RICV 1: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter of ± 8.62-11.04 µm, an equatorial axis diameter of ± 30-50 µm, and a ± 2.41 µm thick exine with psilate ornamentation.

RICV 2: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 6.58-10.38 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 3: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 10.5 -12.5 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 1.41 µm thick exine with psilate ornamentation.

RICV 4: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 10 -12 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 2.61 µm thick exine with psilate ornamentation.

RICV 5: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 8 -12 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.31 µm thick exine with psilate ornamentation.

RICV 6: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 6 -12 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 7: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 11.5 -12.5 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 8: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 23.26-25.77 µm, diameter of equatorial axis diameter of ± 90-150 µm, and

a ± 4.35 µm thick exine with psilate ornamentation.

RICV 9: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 8.36-10.26 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 6.21 µm thick exine with psilate ornamentation.

RICV 10: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 6.63-11.04 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 6.21 µm thick exine with psilate ornamentation.

RICV 11: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 23.08893- 26.77572 µm, diameter of equatorial axis diameter of ± 90-150 µm, and a± 4.125865 µm thick exine with psilate ornamentation.

RICV 12: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 6.96-12.73 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 13: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 6.25-11.02 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.88-3.38 µm thick

exine with psilate ornamentation.

RICV 14: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is ± 6.08-11.23 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 3.62 µm thick exine with psilate ornamentation.

RICV 15: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 23.97-24.42 µm, diameter of equatorial axis diameter of ± 90-150 µm, and a ± 5.91 µm thick exine with psilate ornamentation.

RICV 16: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 7.12-11.26 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.67 µm thick exine with psilate ornamentation.

RICV 17: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 8.46-12.81µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 18: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 8.83-10.12 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 4.67-4.27 µm thick exine with psilate ornamentation.

RICV 19: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 6.66-11.03 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 5.33-5.55 µm thick exine with psilate ornamentation.

RICV 20: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 7.36-10.86 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 21: Pollen grains are tricolporate with a spheroidal prolate shape,a polar axis diameter is± 7.05-11.24 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.25-4.94 µm thick exine with psilate ornamentation.

RICV 22: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 7.98-11.64 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 6.21 µm thick exine with psilate ornamentation.

RICV 23: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 7.98-11.64 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 6.23 µm thick exine with psilate ornamentation.

RICV 24: Pollen grains are tricolporate

with a spheroidal prolate shape, a polar axis diameter is± 22.13-25.30 µm, diameter of equatorial axis diameter of ± 90-150 µm, and a ± 4.00 µm thick exine with psilate ornamentation.

RICV 25: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 12-18 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 26: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 7.05-11.37 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 27: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 7.86-12.60 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 5.44-5.10 µm thick exine with psilate ornamentation.

RICV 28: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 10 -12 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 2.61 µm thick exine with psilate ornamentation.

RICV 29: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis

diameter is± 8.98-12.66µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 3.28-3.14 µm thick exine with psilate ornamentation.

RICV 30: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 22.56-24.25 µm, diameter of equatorial axis diameter of ± 90-150 µm, and a ± 4.34 µm thick exine with psilate ornamentation.

RICV 31: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 10-12 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 32: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 18.98-10.70 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41 µm thick exine with psilate ornamentation.

RICV 33: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 22.12-26.64 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 4.83 µm thick exine with psilate ornamentation.

RICV 34: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 10-12 µm, diameter of

equatorial axis diameter of ± 30-50 µm, and a ± 2.61 µm thick exine with psilate ornamentation.

RICV 35: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 8.49-12.92 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 4.37 µm thick exine with psilate ornamentation.
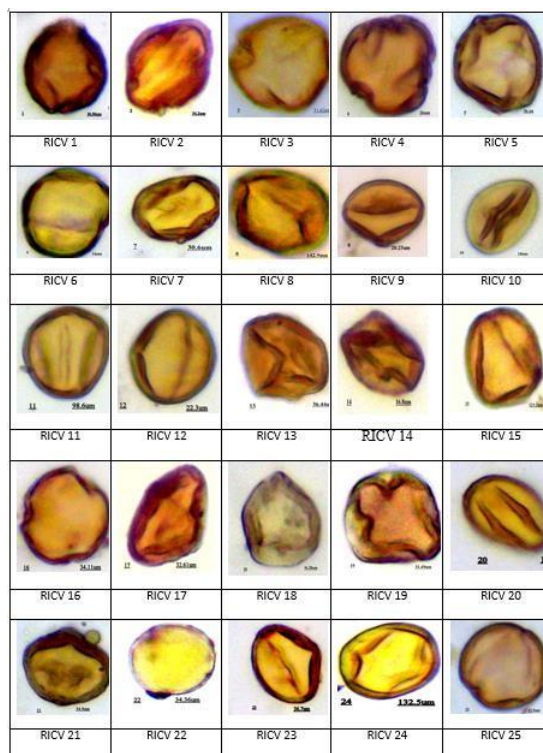

Fig.1. Palynological Observation for RICV 1- RICV 25.

RICV 36: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± ±8.49-12.92 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41µm thick exine with psilate ornamentation.

RICV 37: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 32.71-42.27 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41µm thick exine with psilate ornamentation.

RICV 38: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 22.93-24.53 µm, diameter of equatorial axis diameter of ± 90-150 µm, and a ± 4.08µm thick exine with psilate ornamentation.

RICV 39: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 7.18-10.50 µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 6.21µm thick exine with psilate ornamentation.

RICV 40: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 7.81-11.69 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 5.70-5.95µm thick exine with psilate ornamentation.

RICV 41: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 8.01-11.45 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 2.41µm thick exine with psilate ornamentation.

RICV 42: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 21.07-25.22 µm, diameter of equatorial axis diameter of ± 90-150 µm, and a ± 4.44 µm thick exine with psilate ornamentation.

RICV 43: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 16-22 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41µm thick exine with psilate ornamentation.

RICV 44: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 31.67-40.69 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 2.6µm thick exine with psilate ornamentation.
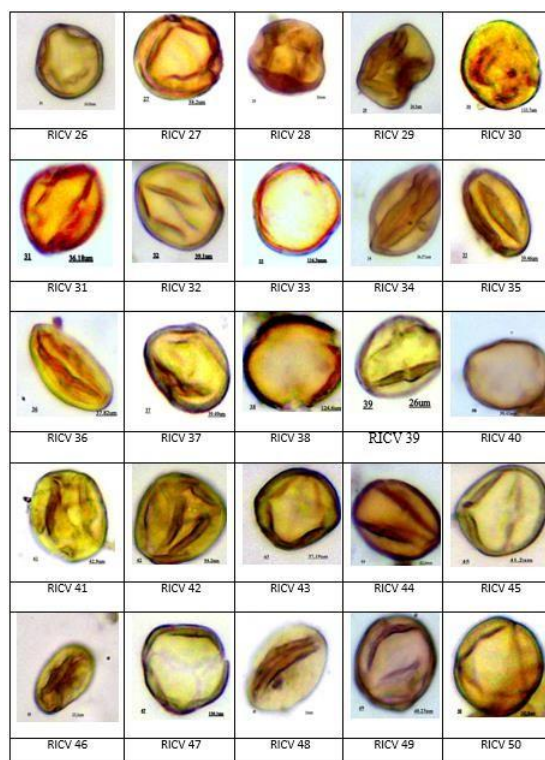
Fig.2. Palynological Observation for RICV 26 - RICV 50.

RICV 45: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 6-12 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 3.41µm thick exine with psilate ornamentation.

RICV 46: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 10-12 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 2.6µm thick exine with psilate ornamentation.

RICV 47: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 21.86-25.65 µm, diameter of equatorial axis diameter of ± 90-150 µm, and a ± 4.03µm thick exine with psilate ornamentation.

RICV 48: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 7.74-12.68µm, diameter of equatorial axis diameter of ± 10-30 µm, and a ± 4.21µm thick exine with psilate ornamentation.

RICV 49: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 8.49-11.72 µm, diameter of equatorial axis diameter of ± 30-50 µm, and a ± 6.21µm thick exine

with psilate ornamentation.

RICV 50: Pollen grains are tricolporate with a spheroidal prolate shape, a polar axis diameter is± 20.59-24.67 µm, diameter of equatorial axis diameter of ± 90-150 µm, and a ± 4.47µm thick exine with psilate ornamentation.

CONCLUSION

This research successfully examined 50 diverse Rosa indica cultivars, revealing that the pollen grains across these cultivars share a spherical nature while exhibiting variations in size. Most of the pollen grains displayed psilate ornamentation. These findings hold significant implications for future technological advancements and economic studies within this field.

ACKNOWLEDGEMENT

REFERENCES

[1] Ghendov-Mosanu, A., Cristea, E., Patras, A., Sturza, R., & Nikolaou, M. (2020). Rose hips, a valuable source of antioxidants to improve gingerbread characteristics. *Molecules*, 25(23), 5659.

[2] Van der Wolf, J., Kastelein, P., Poleij, L., Krijger, M., Mendes, O., Sedighian, N. & Kurm, V. (2022). Factors influencing

Ralstonia pseudosolanacearum infection incidence and disease development in rose plants. *Plant Pathology*, 71(7), 1619-1632.

[3] Wang, X. Q., Zeng, Z. L., Shi, Z. M., Wang, J. H., & Huang, W. (2023). Variation in photosynthetic efficiency under fluctuating light between rose cultivars and its potential for improving dynamic photosynthesis. *Plants*, 12(5), 1186.

[4] Al-Yasi, H., Attia, H., Alamer, K., Hassan, F., Ali, E., Elshazly, S. ...& Hessini, K. (2020). Impact of drought on growth, photosynthesis, osmotic adjustment, and cell wall elasticity in Damask rose. *Plant Physiology and Biochemistry*, 150, 133-139.

[5] Amina, H., Ahmad, M., Bhatti, G. R., Zafar, M., Sultana, S., Butt, M. A. ...& Ashfaq, S. (2020). Microscopic investigation of pollen morphology of Brassicaceae from Central Punjab- Pakistan. *Microscopy Research and Technique*, 83(4), 446-45