CHAPTER V
CONCLUSION

5.1 Floral morphology

Limnophila aromatica blooms with violet flowers, whereas *L. geoffrayi* exhibits color variation of dark violet, purplish pink, or white. These phenotypic forms could be resulted from self-pollination, which exhibited the recessive gene. Both species possess small tubular, bilaterally symmetrical flowers with hairy corollas, and the stamens and stigma arrangement promoting self-pollination. The dorsifixed anthers dehiscent longitudinally at the open floral stage, which is likely to be heat-induced. The stigma becomes receptive only when the flower is at the open stage. With respect to flower opening, *L. aromatica* blooms for a single day, while some *L. geoffrayi* flowers extend bloom duration for two days, which might be beneficial for visitors. This is the first report of floral opening patterns in *Limnophila*.

5.2 Breeding system

Breeding trials revealed *L. aromatica* may be self-incompatible, with no fruit set under any pollination treatment, even among clones, which indicates low genetic variability and the necessity for cross-clone reproduction from different genetics. On the other hand, *L. geoffrayi* is self-compatible, showing 100% fruit set through autogamy and natural pollination. Both species failed to achieve fruit set from emasculated flowers, confirming the absence of parthenogenesis. *L. geoffrayi* likely suffers from low genetic variability due to self-pollination, thus highlighting the need for population-based seed banking for conservation.

5.3 Pollination

From this study, the number of visitors to the flowers of *L. aromatica* was higher than *L. geoffrayi,* but lower diversity of visitor species than *L. geoffrayi*, possibly due to lower plant diversity in the cultivated plot of *L. aromatica*. Mainly, visitors were pollen-collecting solitary bees (Hymenoptera). Flower visitors of both species have Sorensen's similarity index is 0.5, with observations on *L. geoffrayi* due to its natural habitat. Bees visited flowers between 9:00 am and 4:00 pm, peaking around 11:00 am, coinciding with full bloom. They entered the flower via the upper corolla lobe, stepping on stamens and stigma, likely aiding pollination. Although *L. geoffrayi* is self-compatible and capable of autogamy, bee behavior suggests potential for cross-pollination because they took the pollens from different plant individuals. Autogamy may have evolved due to low pollinator availability.

5.4 Seed germination test

Limnophila geoffrayi produces small black seeds (ca. 0.35 mm long) with about 230 seeds per capsule. Germination tests over 0 and 12 months with five pre-treatments showed no significant differences in germination percentage (GP) or mean germination time (MGT), though seed storage significantly affected the germination index (GI). The highest germination (42.75%) was from seeds stored for 12 months without treatment. Non-storage seeds, GA_3 helped seeds germinate faster but did not improve overall, as no statistically significant germination rates. While seeds store for 12 months, GA_3 did not help seeds germinate faster compared with the control. Water soaking was ineffective. Results suggest *L. geoffrayi* seeds have dormancy and orthodox characteristics. Longer storage improved germination more than soaking seeds in various GA_3 and water, indicating storage alone was a better method to enhance germination. Further studies, like scarification, may help improve germination.

5.5 Effect of BAP on shoot generation of *Limnophila geoffrayi*

Nodal segments of *L. geoffrayi* showed 100% shoot regeneration in all media after 8 weeks. BAP-supplemented media significantly increased shoot growth compared to the control. The optimal concentration was 0.5 mg/l BAP, producing the longest shoots (3.38±0.48 cm), highest shoot number (46.80±9.94), and most leaves per shoot (16.93±2.31). Higher BAP concentrations reduced shoot quality. Root formation began within 8 weeks, but root data in BAP media were not recorded due to shoot clustering. The findings align with previous studies on *L. aromatica*, confirming that moderate BAP levels enhance shoot regeneration effectively.