Conclusion

The present study describes foliar phenology and nutrient dynamics in co occurring evergreen and deciduous species of Assam. The study explains the differences in the leaf traits, shoot growth patterns, xylem conductivity and varying nutrient demands and with dissimilar nutrient conservation adaptations among the species. Adaptation to a particular environment can be manifested in various ways at the species and community level by the complexity of interactions among various factors like climate, growth form, ecophysiology of species and leaf phenology, and nutrient resorption is one such adaptation. The following conclusion can be drawn from the present study:

1. Most of the studied species started leaf initiation during March-April and completed their leaf expansion well before rainy season. But in *Palaquium polyanthum, Dipterocarpus turbinatus, Litsea laeta, Podocarpus nerifolia* and *Syzygium oblatum* (evergreen species) leaf initiation started during May-June and completed leaf expansion during rainy season, leaf growth in these evergreen species were more synchronized with the rainy season.

2. Deciduous species were showing rapid shoot growth, leaf recruitment and leaf expansion and accomplished greater growth earlier in the season compared to evergreen species.

3. In the present study, the leaf pool size per mature shoot in deciduous species was higher (33.87 leaves per shoot) than the evergreen species (15.76 leaves per shoot) in contrast to the earlier studies of central Himalayan region. Though evergreen species retained leaves more than 1 year, the evergreen leaf
pool size was less than that of deciduous because leaf recruitment rate (new leaf no./shoot/month), leaf recruitment period (month) and shoot elongation (cm) were significantly greater for deciduous than that of evergreen species.

4. Leaf pool size was positively and significantly correlated with xylem conductance. The higher xylem conductance of deciduous species during rainy season may help deciduous species to accomplish faster growth and achieved greater leaf pool size.

5. In deciduous species of the present study, leaf shedding begins in the month of September – October with peak leaf fall during November – December and plants remain leafless during January – February. *Toona ciliata* remained leaf less for lesser period (26.8 days) as compared to other deciduous species.

6. Evergreen species seems more favourable in the study area (e.g *Dipterocarpus turbinatus*, *Mesua floribunda*, *Palaquium polyanthum*, etc.), with their longer leaf dry mass and leaf pool steady period, and their ability to retain leaves during the dry winter season which give them an advantage over the deciduous species, as they spend less on photosynthetic machinery and maintain growth during winter season which enable evergreen species to realize a higher growth.

7. The average leaf life span of evergreen species (328 ± 32 days) was significantly greater (P<0.05) than that of deciduous species (205 ± 16 days).

8. The life span of leaf for the canopy species (350 days) was found to be significantly longer than that of sub-canopy species (245 days).

9. SLM was higher in evergreen species (77.43 g/m²) than in deciduous species (48.43 g/m²).
10. The leaf dry mass loss was greater in deciduous species (31.74%) than in evergreen species (20.13%). Deciduous species showed retranslocation of their leaf mass in a faster and greater rate.

11. Nutrient concentrations were very high in young leaves but decreased rapidly during leaf expansion due to the dilution by increasing structural materials, and leaves with rapid growth (e.g. *Artocarpus chama*, *Gmelina arborea*, *Mesua floribunda*, *Macaranga peltata*, *Syzygium cumini*, etc.) showed more rapid dilution.

12. In the present study, the concentrations of nutrients in young leaves (at the time of leaf initiation) are higher in deciduous species (2.32, 0.25 and 1.53% respectively for NPK) than that of evergreen species (1.86, 0.18 and 1.24% respectively for NPK).

13. Foliar nutrient mass per leaf increased as dry mass increases then remained relatively stable and declined during senescence.

14. Some evergreen species, *Dipterocarpus turbinatus*, *Mesua floribunda*, *Palaquium polyanthum*, *Podocarpus nerifolia* and *Syzygium oblatum* started declined in their nutrient mass well before senescence when the leaves were still active and green. Their leaves seem to be acting as a buffer between the asynchrony of supply and demand of nutrients in plants, and supplying nutrients to those parts of the plant where demand is higher.

15. In the present study, the percentage of P (56.38%) resorption was greater than N (51.22%) and K (48.35%) resorption percent.

16. High nutrient resorption from senescing leaves was characteristic for most of the evergreen (*Mesua floribunda*, *Palaquium polyanthum*, *Podocarpus nerifolia*, *Litsea monopetala*, *Melastoma malabathricum* etc.) as well as
deciduous species (*Artocarpus chama, Lagerstroemia reginae, Oroxylum indicum, Terminalia bellirica, Toona ciliata* etc.). This shows that species from nutrient-poor sites (evergreens) have not adapted to low soil fertility by having only high nutrient resorption efficiency and there were no clear effect of nutrient availability in soil on nutrient resorption at the phenotypic level coexisting together.

17. $N_uR_{eff}$ (for N, P and K) had a strong relation with leaf dry mass loss.

18. $KR_{eff}$ show negative relation with leaf life span but N and P resorption efficiency did not show any relationship with leaf life span.

19. Leaf life span is also an important aspect for nutrient conservation mechanism, as leaf life span has a negative correlation with $N_uR_{pro}$ and a positive correlation with $PN_uM$, and $N_uR_{eff}$ is a compromise between these two components.

20. The evergreen species of the region reduces nutrient losses by synthesising leaves with low nutrient concentration and with longer life span, and they are well adapted with high $N_uR_{eff}$.

21. Deciduous species are also well adapted with their greater dry mass loss and higher $N_uR_{eff}$, and also with their greater nutrient concentration during leaf initiation time making them less dependent on the soil nutrient during their initial growing phase.

22. The RPM could be sufficient to support more than 50% of the peak leaf dry mass of a newly developing leaf in more than 50% of the studied species (i.e. in 13 plant species out of the 24 studied species), and the RNM and RKM could be able to support more than 50% of the peak leaf dry mass in 11 and 10 plant species respectively. Thus, present study indicates that resorbed NPK
could be a significant source of plant nutrient supply, likely to meet a significant proportion of the nutrient demand of the developing leaves in majority of the species studied.