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Broadening of host plant range by Psyche butterflies (*Leptosis nina*) through coevolutionary interactions

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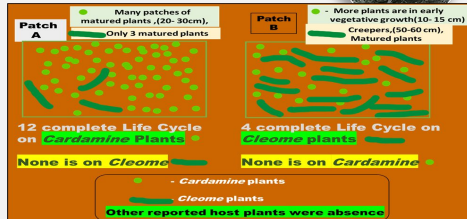
Introduction

We present the findings of our study investigating the broadening of the host range of the Psyche butterfly (*Leptosis nina*). *Cleome* (Clemnaceae), *Creteva* and *Capparis* sp. (Capparidaceae) have previously been reported as host plants for Psyche butterfly (Agarwala B.K., 2014) but *Cardamine* was recently observed to host all stages of the life cycle of Psyche butterfly. *Cardamine* is a member of Brassicaceae, a family closely related to Capparidaceae.

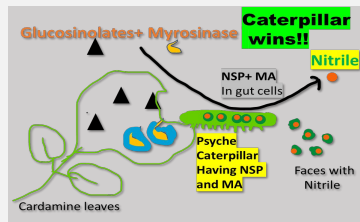
Plants and butterflies have coevolved for their survival. Mentioned plants are known for protecting themselves from herbivores using the glucosinolate-myrosinase system (Wittstock U. et al., 2014). They produce secondary metabolite, glucosinolates, as attractants. Plant tissues get damaged when caterpillars feed on the leaves. On damage, the released glucosinolates are converted into isothiocyanates in presence of an enzyme myrosinase. Isothiocyanates are toxic to most insects including butterfly caterpillars.

However, Psyche caterpillars are able to feed and survive on plants producing glucosinolates as they have evolved gut proteins - Nitrile Specifier Proteins (NSP) and Major Allergens (MA) which breakdown glucosinolates into non toxic nitrile, instead of toxic isothiocyanates. (Wittstock U. et al., 2014)

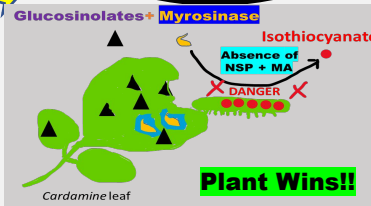
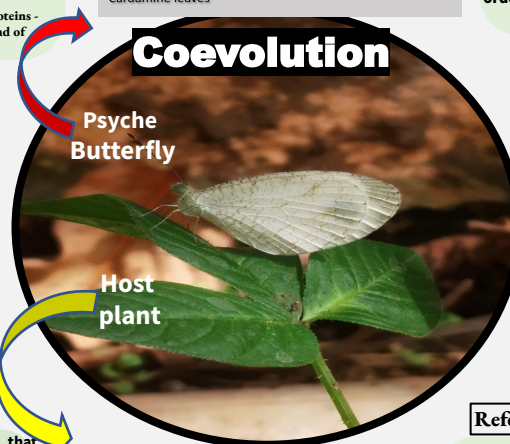
Preliminary work



Our observations indicated that Psyche butterfly does not exhibit any preference between *Cleome* and *Cardamine* plants. On the basis of availability of host plants, Psyche lays eggs on plants which are more abundant. We found Psyche ovipositing on the more abundant *Cardamine*. Hence, our preliminary work correlates with Patch Dynamics Hypothesis (Thompson, 1988).



Coevolution

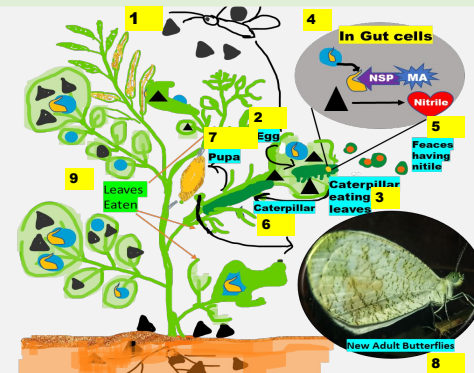


Conclusion

Our findings suggest that the Psyche butterfly has evolved to complete its life cycle on all plants that produce glucosinolates.

Psyche butterflies belong to the Pierinae subfamily. NSP appears to have evolved via gene duplication and neofunctionalization from a 3-domain MA present only in Pierinae butterflies (Okamura, Yu, 2022).

Therefore, all other representatives of Pierinae can be pests of plants belongs to Brassicales order which are known to use glucosinolates-myrosinase system of defense.



References

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