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Insect-Plant Interaction and Population Dynamics Model

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For the last 100 years, men experienced enormous changes in culture, science and politics, not to mention environment. Problems in ecosystem caused by environmental changes were such as 1) Pollution caused by Industrialization, 2) Overuse of fertilizers and pesticides, 3) Exponential growth of human population, and 4) Landscape changes due to urbanization. These changes were human-induced, yet not being able to control them. The environmental changes were slow to be noticed at first, but by now threatening our own survival. Studies on such changes and their impact on natural ecosystem are gaining more and more attention, as time goes by. Effect of environmental changes on Insect-plant interaction is reviewed to find out how these changes act on the ecosystem equilibrium. Insect is a key player on Earth Ecosystem for the following reasons : - Primary consumer - Sensitive to environmental changes, versatile adaptability- Occupies 70% of all known species- Inhabits in almost all environmental conditions- Plants (25%) and herbivorous insects (35%) comprises the basis of Earth Ecosystem Structure.Population Dynamics Model on insect-plant ecosystem is set up. Tripartite relationship among soil nitrogen concentration (human-induced independent variable), host plant, and insect community associated with it was studied. A simple model of one host plant (*Rumex obtusifolius*) and 5 insect species (*Gastrophysa viridula, Aphis rumicis, Philaenus spumarius, Pegomyia nigritarsis, Apion*sp.) was designed. Each insect species has different feeding strategy on host plant. The Field Station Plot was created for the study. It is situated at the south end of the campus of Lancaster university (SD57054852). It is 10m x 10m, and divided into 1m x 1m subplots. Thirty two subplots were chosen by a random design. Each *R. obtusifolius* plant was planted into a 4 litre pot. These pots were then sunk with the lip at ground level in the centre of each subplot. The existing vegetation was cut down to the ground, and then allowed to grow back around the newly established *R. obtusifolius* pots. The survey was carried out from 27 May to 9 September at an interval of a week. The insect populations came from natural infestations from surrounding vegetation. No insects were introduced into the Field Station Plot. The categories of each species were subdivided into life-stages if possible. Only adults were recorded in Apion species, since the recording of stem-boring larvae would be impractical without destroying the plants. The numbers of insects on each plant were surveyed by direct observation between 12:00 and 15:00 on each survey day.The insects at the Field Station Plot showed time-shifts in the establishments of the population. *P. nigritarsis* had a peak density on late May. *Apion* species had peak densities on either late May or on August periods. *P. spumarius* had a peak density on June, whereas *A. rumicis* had a peak density on mid July period. *G. viridula* showed a peak density on June to July period. These findings can be summarised as below in time sequence from May to September;*P. nigritarsis / Apion species ? P. spumarius ? G. viridula ?A. rumicis ? P. nigritarsis / Apion* species.The differences in the pattern of time-shifts may be related to the allocation and the distribution of resources by the host-plant, as well as weather conditions. The results also showed that the increased soil nitrogen concentration first changed the leaf nitrogen concentration, followed by increased growth of the host plant. The insect community has the similar dynamic patterns between the control and experimental sites. However, depending on the foraging strategy, each insect species responded differently to the increased leaf nitrogen concentration. It suggests that the existing equilibrium among the insect species on the host plant can easily be destroyed by a relatively minor changes in habitat condition. Together with the changes in Nitrogen concentration on leaves of *Rumex obtusifolius*, this study suggests the break of synchronization on insect community structure. Further studies on the related field are being carried out by many ecologists now. This kind of studies on community structure needs a long-term observation which is essential to monitor changes in population dynamics. Long term ecological researches on such ecosystem would unveil the detailed mechanism underneath and show the ways to forecast the future changes in ecosystem structure.