ENVIRONMENT

The battle of the Plants

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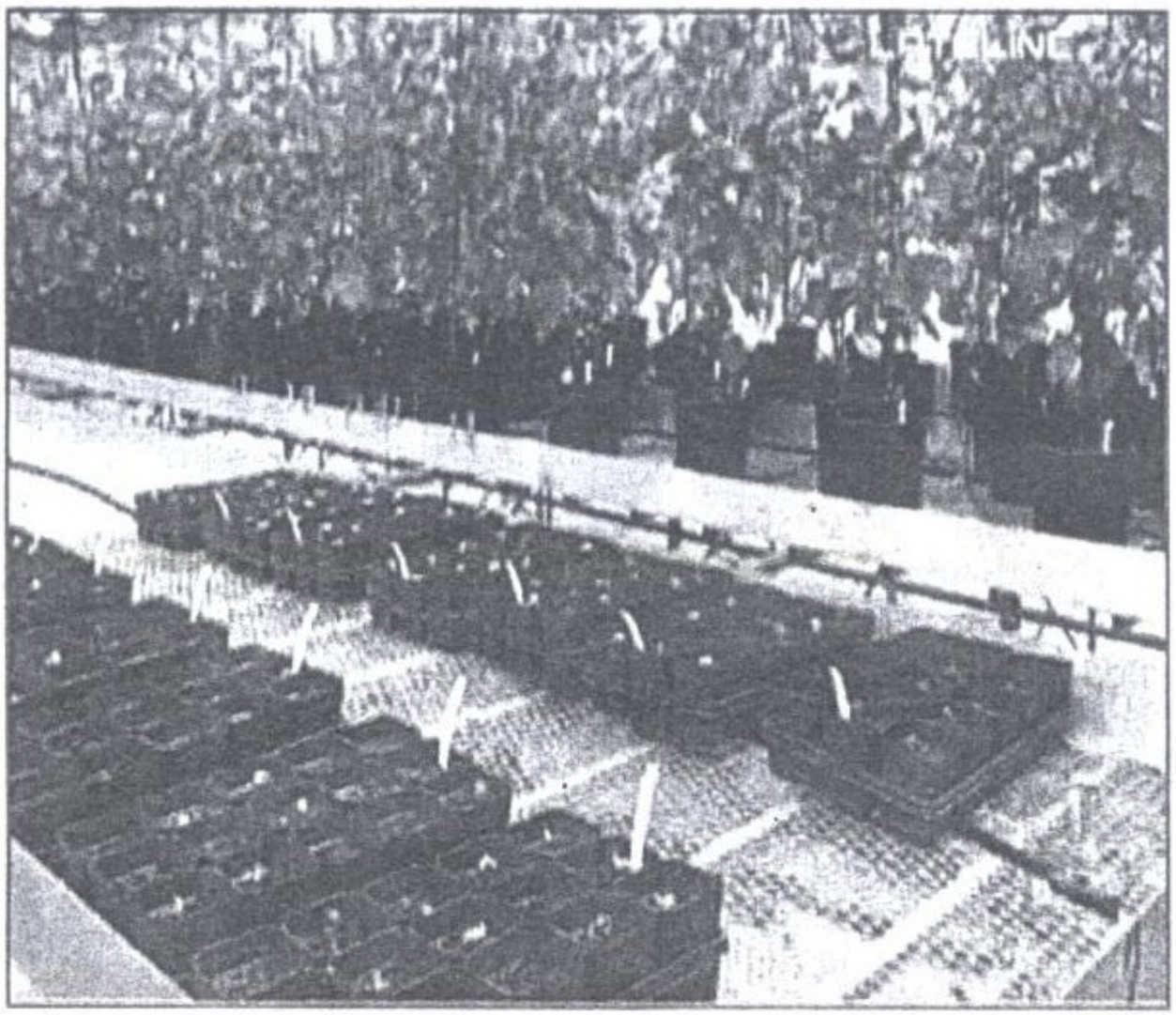
WHEN it comes to plants, most people view them as stationary and boring organisms, but what you might not be aware of is that plants do interact with each other.

These interactions can be better understood if we placed them into three categories, competition, parasitism and commensalism.

Plants compete with each other for biological and non-biological resources. In terms of the latter, most plants compete for light. After all, without light they would have no energy to photosynthesize and grow and develop. To get as much light as possible, some plant species like trees, grow as tall as they can so that they form the canopy layer of the forest, while others termed emergents, grow above this layer and literally stand a head above the rest, so that they capture the maximum amount of light available. Other plants utilize different methods of gathering light, for instance growing huge leaves, so that there is more surface area available to capture what little sunlight manages to penetrate through to the forest floor.

Then there are other plant species that thrive in shady conditions. So that in a forest there are plant species adapted to gathering energy at different intensities; plants overcome this by developing deep tap roots to access underground water sources or a dense network of fibrous roots to capture water under the surface. However, in rainforests there is a hard layer of soil so that most of the water is trapped close to the surface so that trees with tap roots are not common in these ecosystems.

Plants also compete for nutrients, in particular phosphorous. So that some plants develop quite extensive root systems in order to ensure an adequate supply of this nutrient. Another vital nutrient is nitrogen and some species have special modifications to acquire nutrients such as legumes which have nodules containing nitrogen-fixing bacteria. In these structures the bacteria converts nitrogen gas into ammonia and then to amino acids which are needed to make proteins, DNA, hormones, vitamins and the molecule ATP (adenosine triphosphate) which is used to store energy.



Some plant species gain an advantage over their competitors through the use of chemicals. This method is referred to as allelopathy and occurs when an organism releases biochemicals that affect the growth, reproduction and survival of other organisms. For example, a species might release a chemical that affects the uptake of nutrients from the soil by other species. However, it's constant supply of nutrients means that it will get larger and reproduce and eventually dominate the area.

Plants also compete for a suitable habitat to occupy with adequate amounts of light, water and nutrients just to name a few requirements. Of course various habitats, not all of these requirements are constantly available at optimum levels. So to deal with this, different species have adapted themselves to varying levels of these requirements. Therefore the competition for these resources is reduced as the resources are partitioned into segments of differing intensities referred to as niches, and each niche is dominated by a different species. This is better understood if we look at the niches that are present in a gap in the forest caused by a tree fall; this opens up the arena for plants as it frees up resources like light, space, nutrients and water. However, not all of the area in this gap is the same. The area along the edge of the gap is exposed to low light and low humidity; therefore, plants that occupy this area have large leaves. The area in the centre of the gap is exposed to a lot of light and high humidity. Therefore, plants that have small leaves and grow fast as well as fruit and flower fast will occupy this niche.

Some biotic resources that plants compete for, include dispersers of their genetic material in the form of pollen or seeds. In order to attract animals to act as dispersers, some plant species offer rewards, such as nectar to attract animals like bees, butterflies and hummingbirds to transfer their pollen. When seeds develop they will also need to be dispersed. To attract seed dispersers the seeds should be encased in a sweet fleshy pulp to attract animals. The seeds should also be small enough to be swallowed so that they are dispersed far from the parent plant when the animal defecates. This prevents against competition for resources between the parent and offspring plant. Another strategy for acquiring pollen and seed dispersers is to stagger the flowering and fruiting times during the year to prevent against competition.

Plants can also parasitise another plant, so that one organism benefits while the other referred to as the host derives no benefit or dies. The Strangler Fig (Ficus spp.) is a good example of parasitism, flowers in the canopy and dispersed by birds and germinates on the branches of trees which eventually send roots down to the forest floor. When these roots reach the forest floor they thicken and join together so that they form a cage around the host tree. Therefore, the vine competes with the host tree for nutrients and suffocates the tree as it cannot grow outwards. Eventually, the roots of the fig form a hollow cylinder around the host and the host dies in the centre leaving the fig as a free-standing tree.

The final type of interaction plants can engage in among themselves is commensalism. This term simply means a relationship where one species benefits while the other neither benefits nor loses. An example of such a relationship is between larger plants like trees which provide a habitat for smaller plants like epiphytes, which do not take nutrients from the tree but need their branches for physical support. The epiphytes obtain their nutrients from leaf litter and water that is trapped in the moss bed on the tree branches and from humidity in the air. The only disadvantage of this relationship is that when the epiphyte load becomes great, the weight on the branch will cause it to break. Another example of this relationship is larger plants that provide shade to understory plants or smaller trees, for example Immortelle trees (Erythrina glauca) used to shade cocoa trees.

So we can see that although stationary organisms, plants do engage in biotic interactions with other plants that are competitive, commensal and parasitic in nature. However, what is admirable is that plants develop intricate physical and chemical means of getting their way in these relationships.