Autumn color: Handicap signal to Leaf peeping

Come summer, we are enchanted with the flowering burst in evergreen and deciduous trees - a very known phenomenon everywhere especially in tropics. But, hold on, leaves are not far behind. They have their turn in autumn, when, temperate countries in the northern and southern hemispheres witness the riot of colors in deciduous trees before annual leaf fall. This is also a popular event fondly known as autumn color, autumn foliage, fall color or fall foliage. The coloration is an adaptation for the approaching winter period when there is a limitation in photoperiod and a decrease in temperature, which are not favorable for plants' profound activities. So, if spoken in biological terms, there is a slowdown in photosynthesis, gradual degradation of chlorophyll and releasing of other pigments, thus, there are leaves with different colors.

This purely physiological event has many takers. For instance, leaf color acts as a signal for the availability of fruit (fruit flag), or conversion of light into heat (leaf warming), or enhancing parasite visibility (anti-camouflage) or supporting mutualism among plant-aphids-ants (tri-trophic mutualism), and so on. Interestingly, leaf color also flaunts signals for some special guests. Coevolution theory suggests that leaf color acts as a deterrent for specific aphids; intense the color is stronger the resistance against colonization. But, on the flip side, the plant has to pay for it. Here it is a loss of photosynthesis, nutrients and energy consumption in pigment synthesis thus making the plant handicap to some extent in terms of fitness. This cost-benefit relationship mimics the famous 'handicap signal' in the animal world where one has to compromise its fitness for long term survival benefits.

Far from academic interest, leaf coloration fetches a huge chunk of money. In the northern countries, a special sect of tourism is in fad known as "Leaf pepping" where tourists are directed towards the places where leaf coloration at its peak in the season. However, changing climatic patterns is affecting this coloring event and leaves reported to remain green for a longer period than earlier. So, the autumn color is not only a sheer visual treat but the beauty with locked-in mysteries of nature.

Source: Hamilton W.D and Brown S.P. (2001) Autumn tree colours as a handicap signals. Proceedings of Royal Society London B 268: 1489-1493
Archetii M. (2009) Classification of hypotheses on the evolution of autumn colours. Oikos 118:323-333.
Image: Rajasri Ray

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