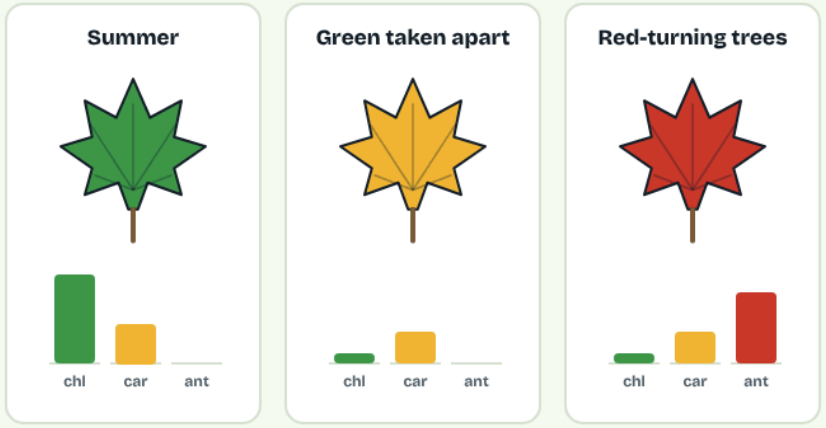
That is why

Why do leaves change color in the fall?

Trees break down green chlorophyll to save its nutrients; hidden yellows show through, and many make new red.

A Three pigments, three timings



green covers the yellow | yellow shows through | new red is made

Bar key: chl = chlorophyll (green), car = carotenoids (yellow), ant = anthocyanins (red).
Bar heights show the idea, not measurements.

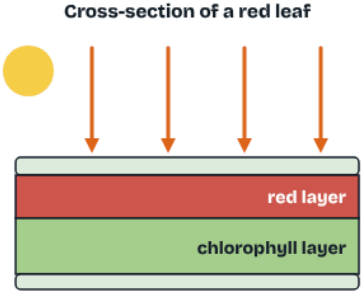
1 The trigger

Shorter days and falling temperatures start the change. Chlorophyll is broken into colorless pieces.

2 Saving the valuables

Nitrogen and phosphorus move back into the tree before the leaf falls, called nutrient resorption.

B Red as a sunscreen



Absorbs blue-green to orange light
(495 to 644 nm) before it reaches the chlorophyll

The dogwood test

Red-osier dogwood leaves turn red in the sun or yellow in the shade. After a blast of strong light, red leaves bounced back. Yellow leaves still had not recovered after 6 hours in the dark.

Feild, Lee & Holbrook, Plant Physiology, 2001

The red shades the leaf while the tree finishes saving its nutrients.

C Who turns red?

1 70% of species

At Harvard Forest, 62 of 89 woody species made red pigment in autumn.

2 Nitrogen-fixers: none

None of 81 species with nitrogen-fixing partners made red autumn pigment; 42% of the others did.

3 More autumn sun

Eastern North America gets more autumn sun than Europe, and more of its trees turn red.

Still debated: another idea says red warns insects the tree is a poor host.

Trees pack up the green before the leaves fall.

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