RISE IN FALL COLOUR AND FALL OF AUTUMN LEAVES: CONCEPTUAL CONCERN AT THE COUNTRY LEVEL - CANADA vs. INDIA

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Abstract

Fall colour is fantastic in Canada, while it is relatively unknown and insignificant in India. The underlying reasons are well researched in cold countries like Canada and USA but it has not attracted attention in India, as it is not that vibrant and is less conspicuous. The present study intends to demonstrate the overview of this unique autumn emblem of nature of two countries – Canada and India.

Keywords : fall colours, chlorophyll degradation, anthocyanin, carotenoids

In Canada

In Canada, different sites of fall colour interests like Mud Lake, Meech Lake, Gatineau Park, Urban and Suburban Ottawa were visited from time to time. It is felt that besides evergreen plants like pines, deciduous plants varieties like tree, bush, creepers, undergrowth etc., undergo changes in colour before falling of leaves. It is sometimes hard to differentiate whether they undertook the hue of colouration or the creepers climbing the trees. A close and concerned look into the colour leaves may reveal the truth. Sometimes a single tree may reveal different colours including the original green one. It is true that temperature, sunlight intensity, humidity percentage, climate condition, night length, etc., all play their role individually as well as in different combination. Close watch, keen interests, continued research may reveal the elementary reasons but apparently not the in depth internal biochemical, cellulo-molecular concrete picture of plant growth, ageing and foliage fall in autumn!!

We recommend visitors walk through the closed Cedar and Maple campgrounds to enjoy the beautiful maple trees in those areas. Visitors will enjoy the Lookout Trail as portions of the trail have Staghorn Sumac that will soon start to turn a beautiful vibrant red.

Take in the fall colours along the Cliff Top Trail with red, yellow, and brown leaves from Sugar Maple, White Birch and Red Oak trees. The observation platforms along this trail also provide great views of the changing leaves on the west side of the main campground area. The High Pines Trail and the Shield Trail are also great places to view fall colours.

The best place to experience the vibrant tones of maple, oak, poplar, birch, and tamarack trees is at the main day use/beach area, which provides views of the entire shoreline of Round Lake.

Lake Superior - Report Date : September 19, 2025

Dominant Colour : Red

Colour Change : 50 - Leaf Fall : 10

Best viewing : Spectacular views of Lake Superior's fall colours can be enjoyed by simply driving through the park along the Trans-Canada Highway or down Mijinemungshing Road. Crescent Lake Trail, Pinguisibi (Sand River) Trail, and the first portion of Towab Trail to Burnt Rock Pool offer accessible yet stunning hiking through maple studded forests. For those up for more challenging hiking, Orphan Lake Trail, and Peat Mountain Trail deliver breathtaking views overlooking rolling hills of colour. The Nokomis Trail, a moderate hike, provides views of the transition between the brilliant reds and oranges of the Great Lakes-St. Lawrence Forest and the golden hues of the boreal forest. Crescent Lake, Mijinemungshing Lake, and Rabbit Blanket Lake are especially beautiful routes for fall paddling. Visitors should note that given the size and forest diversity of the park, colour change can vary greatly between the north and south ends of Lake Superior Provincial Park.

Pancake Bay - Report Date : September 19, 2025

Dominant Colour : Green

Colour Change : 30 - Leaf Fall : 10

Best viewing : Hike to the Edmund Fitzgerald Lookout for a spectacular view of the area's fall colours and Lake Superior beyond! Those looking for a more challenging hike can complete the Pancake Falls or Tower Trail hikes to experience the fall colours from below the canopy! Trails are accessible from the trailhead on Lookout Trail Road on the north side of Highway 17.

In India

While not as universal as in temperate zones, these changes occur in India's Himalayan foothills and other regions with distinct dry/cold seasons, affecting deciduous trees like Oak, Maple, and Sal, which shed leaves in autumn/dry season.

India's fall colors, while less widespread than in North America, offer stunning displays of reds, golds, and oranges, particularly in Himalayan regions like **Kashmir (Chinar trees)**, Himachal Pradesh (Manali, Kheerganga), and Uttarakhand, as well as in South India's hill stations like **Coorg**, during the September-November season, transforming landscapes with fiery foliage and crisp air.

Best Regions and Destinations for Fall Colours in India

- **Kashmir:** Famous for its fiery red Chinar trees, creating a magical landscape, especially around Dal Lake and Mughal Gardens.
- **Himachal Pradesh:** Spots like Manali, Shimla, and the Kheerganga Trek offer vibrant reds, yellows, and browns from maple, oak, and birch.
- **Uttarakhand:** Places like Mussoorie and Dharamshala also provide beautiful autumnal scenery.
- **South India:** Hill stations like Coorg (Karnataka) and Munnar (Kerala) feature coffee plantations and tea gardens turning golden in the autumn light.
- **Northeast India:** Ziro Valley (Arunachal Pradesh) and Shillong (Meghalaya) offer unique autumn experiences with lush rice fields and pine forests.
- **Ladakh:** Transforms into a golden paradise with clear blue skies and shimmering poplar trees.

Autumn leaves change color in India, especially in Himalayan regions, due to shorter days and cooler temperatures causing chlorophyll breakdown, revealing hidden yellow/orange carotenoids, while some trees create red/purple anthocyanins as a protective sunscreen, allowing trees to conserve nutrients for dry or cold spells before shedding leaves, a survival strategy for deciduous plants (Sen and Mukherji 1998, 1999).

Trees whose leaves change colour in India

Chinar tree *(Platanus orientalis)* leaves in autumn transform from deep green to stunning shades of **crimson, blood-red, fiery orange, and brilliant gold/yellow**, creating a breathtaking natural spectacle across Kashmir, with fallen leaves blanketing gardens in colorful carpets. This vibrant display, known as *Harud*, happens as chlorophyll breaks down, revealing underlying pigments and forming new red ones, making it a prime attraction from mid-September to October.

Terminalia catappa (Indian Almond) leaves turn vibrant autumn colors, transitioning from green to shades of **red, copper, gold, and yellow** before falling, a process often occurring twice a year during dry seasons, creating beautiful displays against blue skies. These leaves, which are leathery and dark green when mature, become papery and develop intense red and orange hues as part of their natural shedding cycle, offering both aesthetic appeal and medicinal properties (Ramanan *et al.*, 2024)

The Science behind the Fall Colours

- **Chlorophyll's Role:** Leaves are green because of chlorophyll, essential for photosynthesis
- **Daylight & Temperature Changes:** In autumn, less sunlight and cooler temperatures signal trees to slow food production and prepare for winter/dry periods.

- **Chlorophyll Breaks Down:** The tree reabsorbs nutrients from the leaves, and chlorophyll disappears first.
- **Revealing Other Pigments:**

  Yellows & Oranges: Carotenoids are always in the leaf but masked by green; they become visible as chlorophyll fades.

  Yellow and red autumn leaves are typical of many temperate/boreal woody plants. Since the 19th century, it has been either considered the non-functional outcome of chlorophyll degradation that unmasks the pre-existing yellow and red pigments or that the *de novo* synthesis of red anthocyanins in autumn leaves indicated that it should have a physiological function, although it was commonly ignored (Lev-Yadun, 2022). Defending free amino acids and various other resources released especially following the breakdown of the photosynthetic system, and mobilizing them for storage in other organs before leaf fall, is the cornerstone of both the physiological and anti-herbivory hypotheses about the functions of yellow and red autumn leaf colouration.

  Reds & Purples: Anthocyanins are newly made in autumn, often when it's bright and cold, acting as a sunscreen to protect the leaf and help recycle nutrients.

  Anthocyanins may be physiologically important in aging leaves in two ways. First, anthocyanins are very strong anti-oxidants (Sen and Mukherji 2000). There is growing evidence for the nutritional importance of anthocyanins in diet in slowing the onset of some symptoms of aging.

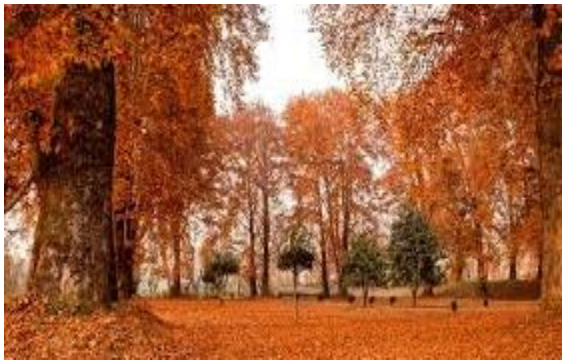
  Secondly, anthocyanins act as a sunscreen, protecting chloroplasts that are vulnerable as they take the chlorophyll molecules apart under autumn conditions of cold temperatures and bright sunlight (Lee, 2002). The pay-off for the plant is that this protection could increase the efficiency of resorbing the nitrogen that is released from the breakdown of chlorophyll and the enzymes of photosynthesis, taking it from the leaves and putting it back into the branches and trunk to be used the next spring.
  https://harvardforest.fas.harvard.edu/education-opportunities/classic-outreach-resources/autumn-foliage-color/leaf-science/leaf-bio-significance/

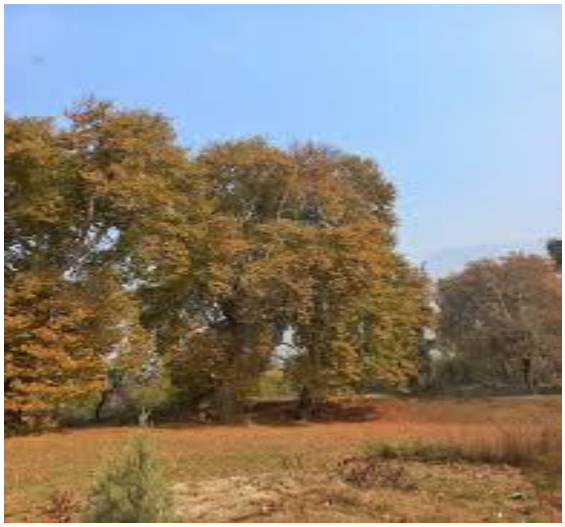
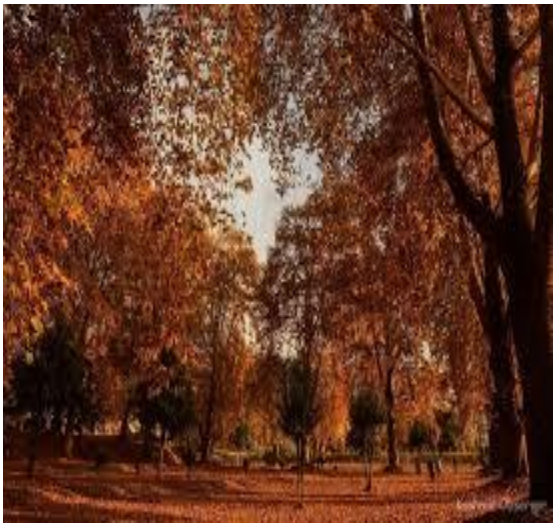
- **Browns:** Tannins cause the final brownish colors before leaves drop.

Why Trees Do This:

- **Energy Conservation:** Shedding leaves reduces water loss and energy expenditure during harsh, dry, or cold seasons.
- **Nutrient Recycling:** Breaking down chlorophyll allows trees to store valuable nutrients in their trunk and roots for spring growth.

Fall Colours in Canada



Fall Colours in India

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