

AGRI-FACTS

Practical Information for Alberta's Agriculture Industry

Revised May 2002

Agdex 275/07-1

Browning of Evergreens

In Alberta there many reasons why evergreen trees and shrubs turn color and sometimes die. Needles (leaves) will change color and drop off as they age naturally, or they may change color in winter. However, these evergreens may actually be injured by a number of causes:

- frost
- herbicides
- drought
- winter cold
- pruning
- salt
- animals
- pollution
- nutrient deficiencies

Needle discoloration can be a sign of a physiological disease or injury in evergreens like spruce, pine, cedar and juniper. Discoloration of evergreen needles is commonly caused by environmental conditions and not necessarily by insects or diseases.

Depending on the severity of damage and type of evergreen, portions of the plant or the entire specimen can turn yellow, brown, red-brown or reddish-purple. The color change is definite and sometimes quite spectacular. Premature needle or leaf drop often follows. Some types of injury result in whole or partial death of the plants.

The key to correct the diagnosis of evergreen browning is careful plant examination. Color change of the foliage may be the most obvious symptom; however, examination of the roots, branches or trunk may give clues as to the exact cause of the problem. Careful inspection of the plant's crown and the growing site may also be necessary to find the reason for the discoloration.

Here are descriptions of major types of evergreen browning and suggestions for prevention and remedial care.

Autumn needle shed

The loss of older interior needles in the fall is a natural process, which is often confused with injury, disease or insects. This process usually goes unnoticed since the needles on the inside of the conifer are concealed by the foliage on the exterior of the tree. Leaf drop on evergreens usually takes place gradually, but there are occasions when many leaves will discolour simultaneously, and the tree or shrub may appear to be dying.

The foliage throughout the interior portion of conifers turns yellow, then brown, and finally drops off. Entire bundles of pine needles will shed. Cedars (*Thuja* spp.) and some junipers have scale-like leaves covering branchlets instead of needles. Entire branchlets are dropped instead of single needles. The oldest, or innermost, needles of spruce and fir shed first; however, needle drop is not always restricted to the oldest needles.

Any factors that increase stress on evergreens will intensify autumn needle drop.

Some types of injury result in whole or partial death of the plants

Winter color

Some selections of Scots pine yellow naturally during the fall, but with the return of spring, they turn green again. Several juniper species turn purple or purple-brown as the temperatures drop in the fall.

Spring frost injury

New, elongated growth (candles) of spruce and pine may be severely injured or killed by late spring frosts. New evergreen growth is soft, and when frozen, it droops, turns brown and dies.

Frost damage to evergreens is rare and does not usually result in long-term damage; however, tree shape may be distorted, and corrective pruning will be required to re-establish leaders of older spruce and pine. The effects of a frost are usually not noticeable within a year or two.

Herbicide damage

Evergreens may be damaged by the improper or careless application of herbicides. Symptoms range from the minor distortion of needles and twigs to complete defoliation and rapid death.

Herbicidal injury is influenced by the following:

- type of chemical used
- application rate
- temperature
- wind

Two types of herbicides usually implicated in damage to evergreens (and other ornamentals) are growth-regulator herbicides, like 2,4-D, and soil sterilants or non-selective vegetation killers. Injury occurs from the direct contact of liquid or vapours with above-ground parts or through root absorption and translocation.

Growth-regulator herbicides like 2,4-D and MCPA cause curling of new needles and shoots as well as bud drop. Needles may become brown, and in severe cases, they may be shed. However, trees affected by this type of herbicide damage usually recover.

Evergreens are most sensitive in the spring when new shoots are growing rapidly. The plants become fairly resistant to growth-regulator herbicides once the annual growth has hardened off.

Pre-emergent herbicides and non-selective vegetation killers impede growth and cause discoloration of new and old needles. Affected trees may be completely discoloured, and the following year, new green growth will be produced at the tips, unless damage has been severe enough to kill the plant. If the dose is large enough, needles will drop, twigs and branches will die, and in some cases, the entire specimen will die.

Herbicide injury can be reduced or prevented by not applying lawn herbicides near or under ornamental plants. Preferably, winds should be light and blowing away from garden plants when applying these chemicals. Application should not be made during hot, still weather. Soil sterilants can be absorbed by wide-rooted ornamentals up to 30 metres away from the area of application, and therefore, these herbicides are not recommended for use in residential lots.

Drought damage

Drought stress can affect any evergreens when water supplies are severely limited and soil moisture is depleted. This stress may occur in shallow-rooted trees that have been well watered for a number of years and then neglected. Soil compaction, pavement and other obstructions may interfere with water penetration and increase stress.

Drought-stressed trees gradually turn yellowish-green, then light brown. Discoloration starts at the top and progresses downward, and from the outside in. Severely stressed trees will lose needles following the usual pattern.

Winter injury

Winter injury includes winter desiccation (drying), sunscald and cold-temperature damage. Springtime needle discoloration on previously healthy evergreens is often a symptom of some form of winter injury. Winter damage can adversely affect the appearance and growth of highly prized evergreens. Careful pruning will be required to restore their shape and form.

Winter damage has several symptoms, depending on the species of ever-green and the severity of the damage. Cedar leaf scales fade from green to light tan or reddish-brown. Needle tips of spruce and pine turn brown and become dry. Winter damage may occur on a few branches, at the tree top only, on one side only, or on the entire tree. Severe winter injury may cause the loss of most of the needles, and the plant can die.

Winter hardiness is influenced by a number of factors:

- plant variety
- soil drainage
- geographic location
- on-site location
- environmental conditions of the previous summer and fall

A warm fall followed by abnormally low temperatures in October or November may result in improperly hardened plants, which are susceptible to freezing injury. Late-season nitrogen application will delay fall maturity and will increase susceptibility to winter injury.

Winter drying of needles will occur in abnormally warm winters because moisture is continuously lost and cannot be replaced as the plants are dormant. On warm, sunny winter days, radiation from the sun or reflection from snow and light-coloured buildings can increase leaf temperatures to 20C° over air temperatures. The moisture

in the stems and branches becomes exhausted because of the increased loss triggered by the warmer temperatures.

Dry soils are more likely to predispose roots to damage than soils that contain a good moisture supply. Root injury may be worse during winters with little snowfall. Winter root damage may not be noticed until the following summer when the plants suddenly turn brown and die.

Reducing winter injury

Winter injury to evergreens can be minimized by using a few precautions:

- Use hardy plant varieties recommended for the specific horticultural zones of the province (see *Alberta Yards and Gardens What to Grow*, Agdex 200/32-1.)
- Avoid planting trees and shrubs near light-coloured or reflective structures. Damage is usually reduced in sites protected from the wind, especially in the chinook zone of southern Alberta.
- Do not apply nitrogen fertilizers to woody plant material between July and the time of leaf drop of deciduous trees.
- Water evergreens in the fall, after deciduous trees have lost their leaves, to ensure that the plants have sufficient moisture in the root zone to prevent freeze drying. Let a small stream of water flow under the drip line for several hours. Repeat this watering early in the spring, once the ground thaws. The importance of adequate fall watering cannot be overemphasized, since water applied in the fall is much more beneficial than any benefit of water applied in the winter.
- Evergreens on the south and west side of buildings, especially under an overhang, should be well-watered in the fall because they are very susceptible to winter injury.
- Erect canvas, burlap or slatted screens on the south and west sides of exposed small evergreens to prevent desiccation (drying). This protection will shade the plants and prevent excessive moisture loss by the wind. Screens should be about one foot away from the plant material.
- Wrapping evergreens with burlap or plastic is **not recommended** because on warm sunny days throughout the winter, the internal temperature will get too high. This high temperature may cause warmed tissue to be damaged by the severe cold that follows. Plants wrapped this way may also break dormancy too early in the spring.

Animal damage

Dog urine will turn the foliage of lower branches yellow, then dark brown or black. Juniper and cedars are especially susceptible to this type of damage.

Rabbits, mice, deer and porcupines will debark trees and branches. Deer also eat the foliage of coniferous trees, especially cedars, and disfigure them. The partial removal of bark can cause foliage to die on one side of a specimen. Complete girdling of the bark will kill trees. The foliage of trees debarked in summer suddenly turns brown. If rodents have fed on bark during the winter, foliage will turn yellow and brown the following spring.

Sap sucking birds peck holes in horizontal rows on the trunk and larger branches of trees. These holes will cause stress to the tree. Wounds from these sap sucking birds also provide entry points for disease.

Salt injury

There are two general types of salt injury:

- injury caused by direct contact from road salt
- injury from excessive salt in the soil

Salt water spray from roads will cause the needles to brown from the tips downward. Sprayed needles shed and the branches become barren and die. Salt spray damage, is restricted to only those parts of the tree actually sprayed. Such damage is more severe on the side closest to the road and to those branches above snow level. Browning becomes evident in late winter and intensifies with time. Salt injury can predispose trees to drought or cold-temperature injury.

Salt damage can be prevented by planting evergreens at least 10 m from salted roadways or by placing barriers around trees planted closer. Washing salt off trees in the spring may reduce the extent of injury to sprayed branches.

Salt in the soil retards growth, and if the salt level is too high, the soil becomes toxic and will damage or kill evergreens. Soils may be naturally salty or may have had salt levels increased artificially. Evergreens suffer from salt-induced browning in saline areas along sidewalks where salt is used to melt snow, around feedlots and near septic fields. Overapplication of fertilizer around trees can also cause salt damage.

Symptoms of salt toxicity include yellowing of the needle points that later turn reddish-brown or reddish-purple. Where soil salt levels are uniform, the entire tree is affected. Older, well established trees are affected in the same way as the younger ones.

Soil salt levels can be measured by an agricultural soil testing laboratory. Salinity is reported in the report as Electrical Conductivity (E.C.). Most evergreens will grow in soils with an E.C. of up to 4, but beyond that level their growth is severely affected. In areas known to be saline, plant salt-tolerant species of trees and shrubs.

Air pollution

Air pollutants may cause discoloration, dieback and premature defoliation; however, the exact diagnosis of air pollution may be difficult to make. Few cases of air pollution occur in Alberta because of the generally good air quality.

Symptoms of such pollution are narrow yellow bands on the needles and browning of needle tips. The browning spreads up from the band, and premature needle drop occurs. Air pollution can also cause depressed growth in some species. As with herbicide damage, each type of air pollutant produces a different set of symptoms on the plants.

Nutrient deficiencies

Iron chlorosis caused by iron deficiency is a common problem in irrigated areas or in alkaline soils (high pH) where iron is unavailable. Foliage on a branch, on part of the crown or more often the over entire crown will become distinctly yellow. The condition gets progressively worse over several years, and severe dieback may result.

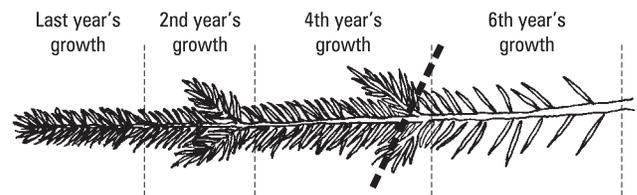
Iron chlorosis is readily counteracted with the application of chelated iron.

The absence of micronutrients will also cause needle browning and drop. Micronutrients are not deficient in most of Alberta's soils, and deficiency symptoms are rarely confirmed. The exact diagnosis of micronutrient deficiencies is difficult to make.

Pruning injury of new pine growth

The size, shape and foliage density of pine can be controlled by pruning off the tips of the new growth, or candles. If the candle tips are cut off with pruners, the new needles will turn brown at the tips where they are cut. This result can be prevented by pinching the stem off at the base of the needles. (See diagram.)

Picea (spruce)



Pinus (pine)

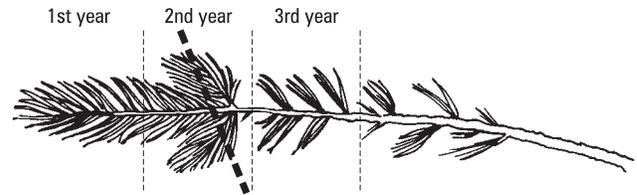


Figure 1. Pruning new growth on spruce and pine.

For more information:

Contact a certified arborist or your local garden centre