Winter "Purpling" In Pine Seedlings

Most nursery workers are familiar with the rather dramatic change in foliar color that occurs in some pine seedlings. Over the years, I have received several inquiries as to the cause and developed the following explanation:

Species Affected:
Jack pine *(Pinus banksiana)*
Lodgepole pine *(Pinus contorta)*
Ponderosa pine *(Pinus ponderosa)*
Scots pine *(Pinus sylvestris)*

Physiological Basis: "Purpling results from cessation of normal primary metabolism, especially protein synthesis, with diversion of the amino acid phenylalanine into secondary metabolites such as the phenylpropanoid anthocyanins via the enzyme phenylalanine ammonia lyase".

Translation: Purpling is caused by the accumulation of anthocyanin pigments in needle tissue. Anthocyanins are normally red but, when combined with the green of chlorophyll pigments, are modified to a purple color.

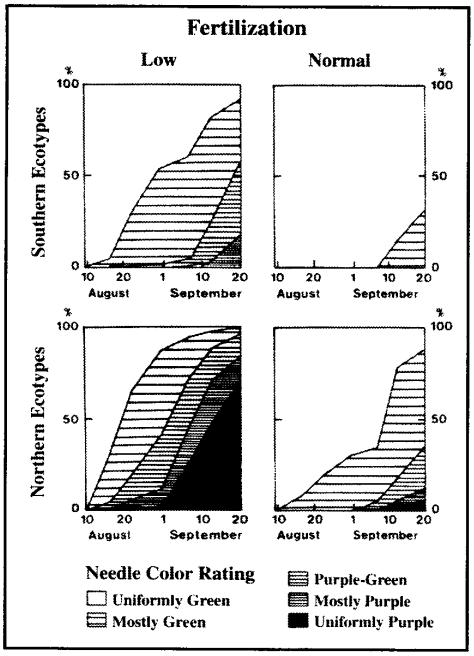

Figure 1 *- Winter purpling of Scots pine was related to both ecotype and fertilization level (Toivonen and others 1991)*

Implications:

1. Purpling is strongly controlled by seed source with northern sources turning purple earlier than those from further south (Figure 1).

2. Purpling is primarily induced by cold temperatures although a shortening photoperiod is also involved.

3. Mineral nutrient content is not a major factor because even healthy seedlings turn purple. However, low fertility, especially with nitrogen and phosphorus, will cause earlier and more intense coloration (Figure 1).

4. Although purpling is a visible indication of dormancy, it cannot be considered a direct indication of cold hardiness.

Conclusion: The ecological purpose of purpling in first-year pines is unknown but it remains an interesting phenomenon.

Sources:

Nozzolillo, C.; Isabelle, P.; Das, G. 1990. Seasonal changes in the phenolic constituents of jack pine seedlings *(Pinus banksiana)* in relation to the purpling phenomenon. Canadian Journal of Botany 68(9): 2010-

Toivonen, A.; Rikala, R.; Repo, T.; Smolander, H. 1991. Autumn coloration of first year *Pinus sylvestris* seedlings during frost hardening. Scandinavian Journal of Forest Research 6(1): 31-39.