Seed Dormancy

Seed dormancy is defined as the condition when mature, viable, imbibed, and healthy seed fail to germinate given suitable conditions. Dormancy is considered a mechanism that eliminates the risk of germination in the autumn after seed have been released from their cones. Seed dormancy is overcome through the technique of imbibition stratification (moist-chilling), which exposes the seed to cool (2–5°C) temperatures for a specific duration following the imbibition of the seed. Stratification terminates dormancy and enables the seed to achieve maximum germination in minimum time. Most seed are given at least a 24-hour soak, or imbibition period, to prepare them for stratification. The imbibition and stratification times used operationally for B.C. conifers are included in Appendix 3.

Seed dormancy can be of two types: physiological and physical. These two categories are not mutually exclusive and are often found together. In physical seed dormancy, the seed possesses anatomical features that either restrict the entry of substances such as water and oxygen or restrain the emergence of the radicle. The physical restraint of the seed coat accounts for the majority of the dormancy exhibited by some pines from the south-eastern United States[3]. The relative ease of germinating longleaf *versus* loblolly pine can be explained by the lack of a dense, stony layer that is characteristic of longleaf pine[5]. The seed coat thickness of ponderosa pine has also been shown to be a constraint to germination[4]. Compare the force required to cut a ponderosa pine seed *versus* a Douglas-fir seed and you will appreciate how much energy may be required to split the seed coat.

Physiological dormancy, also called embryo dormancy, is not well understood although it is widespread among conifers. One notable exception is western redcedar which does not have embryo dormancy. The cool moist conditions encountered by seed during the winter, or through stratification, cause biochemical changes within the seed that overcome the impediments to germination. Internal seed morphology changes substantially

following imbibition, but subsequent stratification does not show any morphological changes as changes at this stage are biochemical in nature (Figure 30).

Embryo dormancy is generally considered a balance of germination-inhibiting and -promoting hormones[20], although changes in tissue sensitivity to these hormones may be more important[48]. One of the initial changes caused by stratification is the removal of a block preventing lipid breakdown[36]. Western white pine is an example of a species displaying both physical and physiological dormancy. Physical dormancy is due to the megaspore cell wall restricting water uptake and physiological dormancy is substantiated by germination improvements following extended periods of stratification[22]. Although dormancy is mainly a species attribute, variability between seedlots is present and some seedlots may require special pretreatments. This may be the result of improper collection timing or it may occur in seedlots collected from the extremes of a species range.

For effective removal of physiological dormancy an optimal moisture content of between 30 and 35% exists[13]. For nursery operations, this moisture content is very practical as it coincides with the point at which the seed exhibits no excess moisture on the seed coat after internal components have imbibed moisture. This is essential for efficient sowing as the seed flows freely and can pass smoothly through mechanical sowing machines. The surface dry status of seed is easily observed for most species and is usually indicated by a lighter coloration of the seed coat (Figure 7, page 8).

Figure 30

A comparison of dry, imbibed and stratified seed of Douglas-fir in longitudinal section.