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Dormancy

It is not uncommon for organisms to enter a dormant state in response to unfavourable environmental conditions - animals hibernate, bacteria form dormant spores and amoebae produce cysts (Sussex, 1978). Similarly, in areas of the world that are subjected to harsh winter conditions, woody plants and trees must protect themselves to ensure their survival until the warmer spring approaches. Plants achieve this by entering a state of dormancy where growth is terminated and metabolic activity reduced. Shoot dormancy is described as "a temporary suspension of visible growth of any plant structure containing a meristem" (Lang *et al*., 1987). Much confusion in this area of research can be attributed to authors employing different terminology and Lang *et al*. (1985) and Lang *et al*. (1987) attempted to standardise dormancy terminology. It is now widely recognised that three distinct types of dormancy exist - ecodormancy, paradormancy and endodormancy. Lang *et al*. (1987) listed 12 terms that have been used to describe ecodormancy, nine terms for paradormancy and 33 terms to describe endodormancy. This thesis will utilise the terminology adopted by Lang *et al*. (1987). Plants enter ecodormancy as a result of being exposed to unfavourable environmental conditions such as extremes of temperature, drought and nutrient stress (Lang *et al*., 1987). If conditions alter to favour plant growth, ecodormancy may be suspended, but the longer a plant is in an ecodormant state the harder it is for environmental conditions to reverse the dormancy. Paradormancy is regulated by physiological factors within the plant e.g. apical dominance (Lang *et al*., 1985). Tinklin and Schwabe (1970) stated that lateral buds of *R. nigrum* failed to break due to the terminal bud releasing an inhibitory substance, suggested to be abscisic acid (ABA). Apical buds also receive a greater proportion of nutrients than lateral buds (Crabbé and Barnola, 1996). As with ecodormancy, when the trigger for growth suspension is removed, e.g. the terminal bud, growth is promoted and lateral buds develop into vegetative shoots (Tinklin and Schwabe, 1970).

Endodormancy, regulated by physiological factors within the bud, is often preceded by eco- or paradormancy and is broken by the bud receiving a specific environmental stimulus, most commonly chilling (Crabbé and Barnola, 1996). Other environmental factors e.g. photoperiod, may act as a partial substitute if chilling is lacking, but if the chilling requirement is not fulfilled, detrimental effects on bud burst and flowering become apparent (Campbell and Sugano, 1975). Very little research has concentrated on root dormancy. O'Hare and Turnbull (2004) reported root activity in *Litchi chinensis* whilst the shoot was in a dormant state, but as the ambient temperature fell the rate of root growth decreased. Roots of conifers are thought to become ecodormant during the winter in response to low soil temperature (Bigras, 1996). If roots do not enter endodormancy it would explain why root growth continues after shoot growth has been suspended in autumn and recommences before bud burst occurs in spring. Without the need to fulfill a chilling requirement the only constraint to root growth would be unfavourable environmental conditions.

Can you identify where paragraphs could go?