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A model for the regulation of crown and root buds of leafy spurge

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A part of the tenacious vegetative character of leafy spurge is due to the production of numerous lateral root and crown buds. The regulation of the growth and development of these buds has been the primary interest of this investigator and after close to fifteen years of observation, research, and study of the related literature, a functional model is emerging which describes the role of internal and external factors, interacting to control the growth and development of these buds. An overview of seasonal changes, in relation to observable growth habit, along with experimental data, indicate classical apical bud dominance controls bud development in the spring through late summer.

In contrast to this type of summer growth habit, late in autumn, crown buds begin to elongate, and regulation of this growth and the cold hardening of the tissues comes from other mechanisms. The stimulus for this control consists, in part, of changes in the intensity, duration and quality of the day light. It appears that changes in the ratio of red to far red light is perceived by a phytochrome. Once activated, the phytochrome then is involved in cold hardening of the developing buds as well as the limitation of bud elongation. The later, is mediated by the phytochrome regulation of the conversion of inactive to active forms of gibberellic acid. The gibberellic acid in turn mediates the production of hydrolytic enzymes that control the reallocation of carbon and nitrogen reserves of the root during the winter, so that these elements and energy reserves are available to support new shoot growth early in the spring. Support of each component in this model will be presented as well as some additional parameters that may be involved. The role of temperature in this system has yet not been addressed.