

# This Week's Citation Classic®

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Eagles C F & Wareing P F. The role of growth substances in the regulation of bud dormancy. *Physiol. Plant.* 17:697-709, 1964.  
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Regulation of bud dormancy in woody plants by an interaction of endogenous inhibitors and promoters was indicated by experiments with *Betula pubescens* and *Acer pseudoplatanus*. Resting buds were induced in actively growing birch plants by application of an inhibitor extract. [The SCI® indicates that this paper has been cited in over 125 publications since 1964.]

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This paper reports some of the experiments of a PhD thesis initiated and supervised by P.F. Wareing. The study resulted from Wareing's interest in photoperiodic responses of woody plants in relation to dormancy and the role of growth regulators. This interest was pursued by graduate students under his supervision at Manchester during the early 1950s.<sup>1</sup> When he moved to Aberystwyth as professor and head of the Botany Department in 1958, he quickly established a large research school to work on hormone physiology. I was fortunate to be a member of this active and stimulating group, on an SRC studentship. A major effort was being made in several laboratories during the late 1950s and early 1960s to purify and identify the active component of the  $\beta$ -inhibitor complex. These experiments on seasonal changes and interactions of endogenous growth inhibitors and promoters in relation to dormancy were complementary to this effort at Aberystwyth.<sup>2</sup>

Although the laboratory was well equipped for these studies of plant hormone physiology as carried out in 1959-1962, the techniques of extraction, purification, and identification were inevitably crude by modern standards. Solvent partitioning, paper chromatography, and bioassay techniques were the routine methods available.

For this reason, the extracts from birch leaves that were used in the induction of resting buds were rather crude and contained phenolic compounds. Their growth-inhibitory activity was identified by the wheat coleoptile-section assay.

Since we proposed a role in dormancy regulation for these inhibitory substances, it was essential to test their effect on the induction of resting buds in actively growing plants. Test plants were grown in 14.5-hr daylengths to enhance the effect of the extract. The choice of this daylength, slightly longer than that required to maintain active growth of controls, may have been an important factor in the successful induction of resting buds. Subsequent attempts in longer daylengths have been unsuccessful. A further factor, contributing fortuitously to the success, may have been the crude state of the extract, since the effect has not been repeated with more highly purified extracts. Sceptics suggested that the effects were due to toxicity. However, the effect of the extract was reversed by application of gibberellic acid.

Shortly after the completion of these experiments, abscisic acid (ABA) was identified as a component of the  $\beta$ -inhibitor complex. This led to a change in the emphasis of hormone physiology, since ABA is present in actively growing tissues, and the interest in endogenous dormancy-inducing agents did not persist. This rendered obsolete our proposal<sup>3</sup> for the term "dormin" to distinguish inhibitors that function in dormancy induction.

I left this field of research in 1962, but Wareing remained very active with a large research school until his retirement in 1981. He was elected a Fellow of the Royal Society in 1969 for his distinguished work in hormone physiology.

Although Wareing published other papers that were more important for the progress of hormone physiology, our cited paper was the first report of the induction of resting buds by plant extracts. The topic of hormones and dormancy was reviewed in 1971 and 1983 by Wareing.<sup>4,5</sup>

1. Phillips I D J & Wareing P F. Studies in dormancy of sycamore. II. The effect of daylength on the natural growth-inhibitor content of the shoot. *J. Exp. Bot.* 10:504-14, 1959. (Cited 55 times.)
2. Robinson P M, Wareing P F & Thomas T H. Isolation of the inhibitor varying with photoperiod in *Acer pseudoplatanus*. *Nature* 199:875-6, 1963.
3. Eagles C F & Wareing P F. Experimental induction of dormancy in *Betula pubescens*. *Nature* 199:874-5, 1963. (Cited 85 times.)
4. Wareing P F & Saunders P F. Hormones and dormancy. *Annu. Rev. Plant Physiol.* 22:261-88, 1971. (Cited 210 times.)
5. Wareing P F & Phillips I D J. Abscisic acid in bud dormancy and apical dominance. (Addicott F T, ed.) *Abscisic acid*. New York: Praeger, 1983. p. 301-29.