

Putative biotic drivers of plant seasonal phenology: herbivory and pathogens as selective forces, with special reference to deciduousness

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April 12, 2021

Abstract

Plant phenology is manifested in the seasonal timing of flowering and vegetative processes, but also has ontogenetic aspects. The adaptive basis of seasonal phenology has been considered mainly in terms of climatic drivers. However, some biotic factors as likely evolutionary influences on plants' phenology appear to have been under-researched. Several specific cases of putative biotic factors driving plant phenology are outlined, involving both herbivores and pathogens. These illustrate the diversity of likely interactions rather than any systematic coverage or review. Emphasis is on woody perennials, in which phenology is often most multi-faceted and complicated by the ontogenetic aspect. The timing and duration of shoot flushing may in at least some cases contribute to defences against herbivores, largely through brief periods of 'predator satiation' when plant tissues have highest food value. However, the complete seasonal leaf fall that characterizes deciduous plants may be a very important defence against some pathogens. Whether biotic influences drive acquisition or 'biotic lock-in' of deciduousness is considered. In one case; of leaf rusts in poplars, countervailing influences of the rusts and climate suggest lock-in. Often, however, biotic and environmental influences likely reinforce each other. Wide re-examination of plant phenology, accommodating the roles of biotic factors and their interplays with environments as additional adaptive drivers, is advocated, towards developing and applying hypotheses that are observationally or experimentally testable.

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