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Impacts of Climate Warming on Plant Reproduction

Researchers have recently investigated the consequences of a warmer climate on the plant community. The results show that the timing of periodic events such as flowering is affected by warmer temperatures. As a consequence, new competitive relationships between plant species could arise, which in turn may diminish their reproductive capacity.

Climate change is widely demonstrated to impact the Earth's fauna and flora, in particular through the modification of animal habitats or by affecting temperature and water sensitive plants such as mountain plant species and vegetation. Recent observations have shown that besides these impacts, climate change induces temporal variations in periodic events in plants' life cycles. In the past 30-80 years, periodic events such as flowering, fruiting periods or leaf-fall have regularly arrived earlier in spring and been delayed in autumn.

In this regard, American researchers have recently studied the effect of a warmer climate on the periodic reproductive events of plants. To this end, they have investigated the responses of 12 prairie plants to one year of experimental climate with warmer temperatures and extra-precipitation - the likely climatic conditions of the future. Warmer temperatures were obtained using infrared heaters that did not provide light which might influence periodic events in plants. Extra precipitation was obtained by rainfall collection pans.

Experiments where precipitation was doubled did not affect plant phenology (i.e. the periodicity of events in the plants' life). On the contrary, the warming experiments showed that species flowering before peak summer temperatures advanced their reproductive cycle and that this cycle was delayed for species that started flowering after the peak.

The scientists note that this summer lengthening could promote the creation of new heat-tolerant species linked with a multiplication of non-native species. The authors also suggest that shortening the plant reproductive period may exert selective pressure for genetic changes and adaptive evolution. Conversely, a lengthening may be beneficial for species that need a longer development period but could also make them more vulnerable to future droughts and stresses.

Furthermore, the researchers suggest that by affecting plant species differently, climate change may affect the temporal overlap of reproductive stages between successively blooming species. As a result, their competitive relationships during reproduction could be altered. In addition, other studies indicate that competition for resources such as water, nutrients and light is particularly essential during the reproductive period. As a consequence, flower size, number and seed set could be affected, resulting in an alteration of a plant's reproductive capacities.

Overall, this study shows that warming induces phenological divergence, which could lead to the creation of new resistant species in mid-summer and could alter reproductive overlaps between species pairs. The authors further suggest that this phenology upset could create strong selection pressure on the plants themselves and also on predators. Overall, the results of this study provide new insights on how climate change may affect community organisation and may have far-reaching consequences for ecology and evolution.

Source: Rebecca A. Sherry et al. (2007) "Divergence of reproductive phenology under climate warming", PNAS 104(1):198-202.
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