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Lower temperature in winter can promote spring phenology in some ornamental plants

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The process of plants in temperate regions is usually stimulated by three external factors: chilling temperature, forcing temperature and photoperiod. Increasing forcing temperature can accelerate spring phenology, however, if the plants receive insufficient chilling during winter, there may be a delay in spring phenology even if forcing temperature meet the requirement. Furthermore, photoperiod may compensate for a lack of chilling temperature in some photosensitive species. In this study, we present a multispecies growth chamber experiment to test the effects of cumulative chilling hours (low, intermediate, high), forcing temperature (12[U+2103], 15[U+2103], 18[U+2103]) and photoperiod (long: 14h, short: 10h) on the spring phenology of six woody species (Jasminum nudiflorum, Forsythia suspense, Viburnum dilatatum, Cerasus sp., Amyg pedalusrsica , Yulania denudata) during 2017-2018 at Beijing. Sevaral hypotheses were tested by this experiment. The first flowering time and first leaf unfold time were documented per day for each species in each temperature condition. The results showed that with the increase of cumulative chilling hours, the forcing temperature required for flowering and leaf unfold decreased. However, the chilling length effect on spring phenology was differential between species: for the species with low chilling requirment, increased chilling length advanced the spring phenology; while for the species with high chilling requirment, insufficient chilling will lead to a stagnation of plant development (low cumulative chilling hours) and the forcing temperature had no significant influence on the subsequent bud development when chilling was satisfied (intermidiate and high cumulative chilling hours). The interaction between cumulative chilling hours and forcing temperature was species-specific, and the forcing temperature showed more significant effect on low chilling requirmant species. The results of this study can provide theoretical basis for predicting species' response to climate change.