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Assessing chilling conditions by sites and years for perennial fruit production in Kentucky

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Temperate regions of the world are characterized by seasonal warm and cool temperature. Cool temperatures enable perennial plants to undergo physiological processes essential for flowering and fruit bearing in the following season. Failure of environments to provide chilling conditions results in deformed leaves, fruits, or barren trees. Global warming is reducing chilling conditions. Our research is aimed towards the assessment of availability of chilling hours in Kentucky environments. Weather data provided by Kentucky Mesonet system have permitted study of 50 countries over a five year period. A chilling unit is defined as a clock hour when air temperature is between 32°F and 45°F from September through April. Average chilling hours were 1556 overall, ranging from 1463-1680 for sites, and 1473-1842 for years. Accumulated chilling hours at the 50 sites reached approximately 1000 by mid-January, thereby meeting the requirements for many fruit crops. At that point, plants enter bud-break and become subject to freezing damage by alternating warming and freezing temperatures during the remainder of winter. Results indicated that chilling exceeded requirements for most Kentucky crops. This margin of excess has both negative and positive value. First, the plants become more vulnerable to freezing damage early before winter weather is completed. Second, since warming has been shown to decrease chilling production, the margin of chilling hours would provide some time for adjusting horticultural enterprises to global warming. Research is continuing to further elucidate chilling conditions. Additional understanding for relationships between environments and chilling will contribute to perennial fruit production in temperate regions.

Biography

Yao Xue has completed her Master Degree in Agriculture from Western Kentucky University and is currently studying in Environmental Resource and Policy doctorate program at Southern Illinois University. Her research interests include chilling requirements, frost events, climate model simulations, etc.

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