

Analysis of the spatiotemporal variability of droughts and the effects of drought on potato production in northern China

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A B S T R A C T

Knowledge about drought variability in the main potato producing areas can provide a scientific basis for management of potato crops. In this study, the variations and patterns of drought in the potato growing period (GP), seedling stage (SS), tuber-growth stage (TS), and mature stage (MS) identified by the Standardized Precipitation Evapotranspiration Index (SPEI) were investigated in the north single cropping zone (NSCZ) in China for the period of 1960–2016 based on the empirical orthogonal function analysis, Mann–Kendall statistical test, Mann–Kendall test, Sen's slope, Hurst exponent, and continuous wavelet transform. Additionally, grey theory was used to study the relationship between drought and potato production. The results of the study follow: 1) The spatiotemporal patterns of drought of the two leading patterns were identified. 2) Since the 1970s, the NSCZ has become drier in the GP and MS, has become wetter in the TS, but has always remained in an unstable state of alternating wet and dry conditions in the SS. 3) The changes in dryness/wetness conditions include significant periodic oscillation features. 4) The future drought trend is generally consistent with the current state. In addition, it is worth noting that the NSCZ as a whole will become drier in the MS. 5) The drought of SS and TS had a relatively large negative effect on potato production, whereas that of MS had a relatively small positive effect. Because the NSCZ is within the marginal region of the Asian monsoon and the agro-pastoral ecotone, it is an ecologically fragile region. Therefore, under the background of global climate change, studying changes in dryness/wetness conditions has important implications for the ecological security and potato production of the region.