Risk Prediction of Sudden Oak Death (SOD) in China under Different Trends of Future Climate Change

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Sudden Oak Death (SOD) is one of the most serious plant diseases in the west coast of the United States and Europe. In the USA, SOD is mainly found in California and Oregon, and in Europe they occurred in UK, Spain, German and France. SOD is caused by *Phytophthora ramorum* (P. ramor). The spores of the SOD can be transmitted by water, wind and soil to other host plants. SOD have more than 100 kinds of host plants and most of them can be found in China (e.g. Viburnum, Lonicera, Photinia serrulata). China has similar environment and climate conditions to those of SOD epidemic areas. If SOD broke out in China, it will cause ecological disaster and huge economic losses. Therefore, it is necessary to predict the potential risk of SOD in China.

The Maxent model is a machine learning method that estimates the distribution of species through the distribution of the maximum entropy. In the 5th assessment report, the IPCC identified four possible trends of future climate change scenarios based on greenhouse gas (GHG) emission patterns, namely RCP26, RCP45, RCP60 and RCP85. In this study, Maxent model, meteorological data of 2000 and two types of climate change trends (RCP45, RCP85) were used to predict the potential risk of SOD in China. Then statistical analysis of the results were obtained.

The results showed that the risk area is mainly concentrated in the central and southern regions of China. In 2050, compared with 2000, the whole of China's low risk area will be decreased (-22.31% in RCP45, -42.72% in RCP85), but high risk area will be increased (193.41% in RCP45, 245.90% in RCP85). In 2070, compared with 2050, the whole of China's low risk area will be decreased by 8.57% in RCP45 and increased 97.52% in RCP85, high risk area will be increased 26.06% in RCP45 and decreased 25.65% in RCP85.

Potential risk area of SOD mainly concentrated in 8 provinces of Guangdong, Guangxi, Hunan, Hubei, Jiangxi, Anhui, Zhejiang, and Fujian. Under the first trends of future climate change (RCP45), from 2000 to 2070, almost all provinces with low risk areas will be decreased while high risk areas will be increased. Compared with 2000, the increase of high-risk areas in the central provinces is higher than that of the southern provinces, for example, Guangdong provinces and Guangxi province increased by 123.35%, 126.15% in 2050, and increased by 191.89%, 158.34% in 2070, but Jiangxi province and Anhui province increased by 717.86%, 236.66% in 2050, increased by 756.88%, 291.20% in 2070. Under the second trends of future climate change (RCP85), from 2000 to 2070 almost all provinces with low risk areas will be decreased first and then increased, while high risk areas are increased first then decreased. In all trends of future climate change, Jiangxi, Hunan, Fujian and Zhejiang provinces all have high risk of SOD outbreak.

Keywords: Sudden Oak Death, Maxent, Future climate scenario, China