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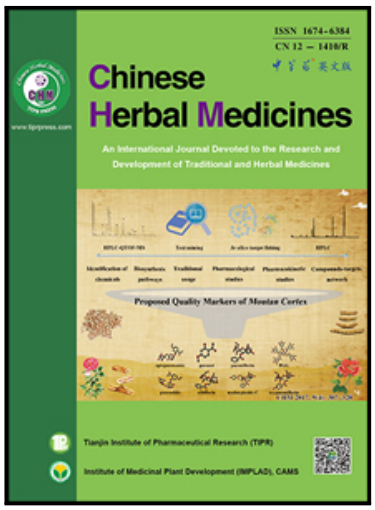

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Evaluation and Prediction of Ecological Suitability of Medicinal Plant American Ginseng (*Panax quinquefolius*)

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Abstract: Objective American ginseng is a medicinal plant with large market demand, however, its producing areas are shrinking because of the continuous cropping obstacles in China. Therefore, it is urgent to establish a suitable model to determine the new producing areas. Here we evaluated and predict the suitable areas of American ginseng using the maximum entropy model (MaxEnt). **Methods** Based on the 37 environmental variables over thirty years from 1970 to 2000 and 226 global distribution points of American ginseng, MaxEnt was used to determine the global ecological suitable areas for American ginseng. The Receiver Operating Curve (ROC) was used to evaluate the model prediction accuracy. Meanwhile, an innovative ecological variable, the precipitation–temperature ratio, was established to indicate the climate characteristic in the American ginseng suitable areas based on the monthly precipitation and temperature. **Results** The potential ecological suitable areas of American ginseng were primarily in Appalachian Mountain in America and Changbai Mountain in China, about in the range of 35°N-50°N, 60°W-120°W and 35°N-50°N,110°E-145°E, respectively, including the United States, Canada, China, North Korea, South Korea, Russia and Japan. South Korea and Japan were the potential producing regions. The precipitation–temperature ratios were stable at (0.22, 0.56) of the vigorous growth period (April to October) in the best suitable areas of American ginseng, serving as characteristic parameters to optimize the prediction model. The model showed that the common soil parameters were pH 4.5-7.2, Base Saturation (BS) above 80%, Cation Exchange Capacity (CEC) 10-20 cmol/kg, Organic Carbon (OC) ＜ 1.4%, and the soil types were sandy loam or loam. **Conclusion** An optimized MaxEnt model was established to predict the producing area for American ginseng that needs to be validated by a field test.
Keywords: American ginseng; climate characteristics; ecological suitability; maximum entropy model; *Panax quinquefolius* L.; soil characteristics

1. Introduction

American ginseng (*Panax quinquefolius* L.), native to Montreal in Canada and Wisconsin in the mid-western United States, began to be cultivated in China in the 1980s, and the major producing areas are Liaoning, Jilin, Heilongjiang, Shandong and Shaanxi Provinces (Huang et al, 2013). As a traditional Chinese medicine, its rhizome contains various bioactive components, such as ginsenosides, polysaccharides and amino acids (Qi, Wang, and Yuan, 2011). Modern pharmacological studies showed that American ginseng is a valuable tonic to treat upper respiratory tract infections and diabetes and obesity, an inhibitor of tumor growth, and an ameliorant of cancer-related fatigue; it also has anti-oxidative, anti-aging and immunoregulatory