

气候变化情景下松材线虫病在东北地区的生境适宜性

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摘 要:【目的】由松材线虫引发的松材线虫病是世界范围内最严重的森林病害之一。松材线虫病对我国松树造成了毁灭性危害, 严重威胁了林业生产和森林生态环境, 每年给我国造成超百亿元的经济损失。以往的研究表明, 松材线虫病的传播与气候因子密切相关。当今由于气候的异常变化, 松材线虫病正在迅速蔓延。为给防控松材线虫病在我国的传播提供参考。【方法】在本研究中, 我们评估了松材线虫病在东北地区持续传播的风险; 采用 MaxEnt 模型评估了松材线虫病对中国的气候适宜性; 以辽宁省为例, 分析了平均降水量、平均温度、平均相对湿度、平均蒸汽压亏缺、平均风速、平均日照持续时间与疫区面积之间的关系, 研究了气候因子对松材线虫病在东北地区传播的影响。【结果】结果表明, 随着气候的变化, 松材线虫病适生区不断扩大, 而一些之前不适生的地区也开始变为适生区。温度和降水在松材线虫病的发生和危害中起着关键作用, 炎热和干旱条件有利于松材线虫病的传播。建议对在适生区内但尚未感染松材线虫病的地区加强隔离, 防止松材线虫病的进一步传播。此外, 应特别注意高温和干旱疫区, 加强监测, 及早发现并及时处理疫木。【结论】如果气候变化像预测的那样进行, 松材线虫病将对我国东北地区的松树构成重大威胁。今后应加强关注松材线虫病向北传播的监测, 并进一步考虑根据气象数据预报及时采取防治措施。

关键词: 松材线虫病; 气候因子; 东北地区; 温度; 降水

Habitat Suitability of Pine Wilt Disease in Northeast China under Climate Change Scenario

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Abstract: **【Objective】** Pine wilt disease (PWD), caused by *Bursaphelenchus xylophilus*, is one of the most severe forest diseases worldwide. PWD causes devastating disasters to Chinese pine trees, seriously threatening forestry production and the forest ecological environment, and causes economic losses of over ten billion yuan per year to China. Previous studies have shown that the spread of PWD is closely related to climate factors. Today, PWD is spreading rapidly owing to abnormal climate changes. In order to provide a reference for controlling the spread of PWD in China. **【Method】** In this study, we accurately assessed the risk of the continued spread of PWD in Northeast China; a correlative species distribution model (MaxEnt) (RM = 1, AUC = 0.9904) was used to evaluate China's climate suitability for PWD. The effects of climate factors on the spread of PWD in Northeast China were studied using Liaoning Province as an example by analyzing the relationship between the changes in average precipitation, average temperature, average relative humidity, average vapor pressure deficit, average wind speed, average sunshine duration and the area of the PWD epidemic over the past five years. **【Result】** These results suggest that with the change in climate, the areas suitable for PWD have expanded, and certain previously unsuitable areas for its distribution have become suitable. Temperature and precipitation were found to play key roles in the occurrence and damage of PWD, and hot and arid conditions favored the spread of PWD. It is recommended that for areas within the suitable range of PWD but not yet epidemic areas, quarantine should be strengthened to prevent the further spread of PWD. In addition, special attention should be paid to epidemic areas with high temperatures and arid while the monitoring of PWD should be strengthened to achieve the early detection and timely treatment of infected epidemic trees. **【Conclusion】** Our results indicate that PWD undoubtedly poses a major threat to Northeast Chinese pine species if climate change proceeds as projected. In the future, more attention should be paid to monitoring the northward spread of PWD, and further studies should consider meteorological data forecasts, which could facilitate timely control measures.

Key words: pine wilt disease; climate factors; Northeast China; MaxEnt; temperature; precipitation.