



滨海围垦湿地芦苇凋落物分解对模拟增温的响应

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Responses of decomposition of *Phragmites australis* litter to simulated temperature enhancement in the reclaimed coastal wetland

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摘要 采用开顶式生长室 (Open-top chambers, OTC) 模拟增温, 结合网袋法, 研究了空气增温 (1.984 ± 0.7) °C 对崇明东滩滨海围垦湿地代表植物——芦苇 (*Phragmites australis*) 不同凋落物组分 (茎和叶) 分解速率的影响, 并分析增温和非增温条件下凋落物分解速率与 1.2 m 高度的空气温度、0~5 cm 土壤温度及 0~5 cm 土壤湿度 3 种主要环境因子的相关性及其变化。结果表明: ① 增温与不增温处理下, OTC 组和对照 (CG) 组芦苇茎的年分解率分别为 49.20% 和 45.11%, 而叶的年分解率分别为 63.52% 和 58.53%, 增温对叶的分解促进作用更加显著; ② 增温增大了湿地芦苇凋落物分解常数 K 值, OTC 组和 CG 组茎的平均 K 值分别为 0.028 和 0.027, 叶的平均 K 值分别为 0.093 和 0.080, 叶的增幅显著大于茎的增幅; ③ 3 种主要环境因子与滨海围垦湿地芦苇凋落物的分解速率相关性由大到小依次是 1.2 m 空气温度 > 0~5 cm 土层温度 > 0~5 cm 土层湿度, 且增温使分解速率与 3 种环境因子相关性程度均增大, 其中, 叶分解速率与土壤温度的相关性变化最显著, 增大 6.43%。综上所述, 气温是影响滨海围垦湿地芦苇凋落物分解的关键环境因子, 增温不仅会增大滨海围垦湿地芦苇凋落物的分解速率, 同时也会改变芦苇凋落物分解速率与主要环境因子的相关性。

关键词: 湿地 芦苇 凋落物分解 增温 开顶式生长室

Abstract: By using open-top growth chambers (OTC) to simulate short-term warming and mesh bags, the study was carried out in the reclaimed wetland in the east Chongming tidal flat. The effects of short-term simulated warming (1.984 ± 0.7) °C on the decomposition of *Phragmites australis* litter were studied and the changes of correlations between decomposition rate and environmental parameters were analysed. The results are as follows: ① stem decomposition rates in OTC plots and CG plots are 49.20% and 45.11%, and leaves decomposition rates are 63.52% and 58.53%, respectively, which shows that warming has increased the decomposition rates; ② stems average decomposition coefficients (K) in OTC plots and CG plots are 0.028 and 0.027, while the average decomposition coefficients of leaves are 0.093 and 0.080, respectively, which shows that the increment of leaves K is bigger than stems K ; ③ the order of correlation degree between environmental factors and decomposition rate is: 1.2 m air temperature > 0~5 cm soil temperature > 0~5 cm soil moisture, and the correlation coefficient between leaves decomposition rate and 1.2 m air temperature is biggest which is 6.43%. In summary, air temperature is the key factor affecting the *Phragmites australis* litter decomposition; meanwhile warming not only improves litters decomposition rates, but also changes the relevance between decomposition rate and environmental factors.

Key words: wetland *Phragmites australis* litter decomposition temperature enhancement open-top chambers (OTC)

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- [1] 郭剑芬,杨玉盛,陈光水,等.森林凋落物分解研究进展[J].林业科学,2006(4): 390-398.
- [2] HUI D F,ROBERT B,JAKSON.Assessing interactive responses in litter decomposition in mixed species litter[J]. Plant Soil, 2009,314(2): 263-271. 
- [3] AERS R.Climate,leaf litter chemistry and leaf litter decomposition in terrestrial ecosystems: A triangular relationship[J].Oikos,1997,79(3): 439-449. 
- [4] CADISH G,GILLER K E.Driven by Nature: Plant Litter Quality and Decomposition [M] .Michigan: CAB International,1997.
- [5] GARTNER T B,CARDON G.Decomposition dynamics in mixed-species leaf litter[J].Oikos,2004,104(2): 230-246. 
- [6] RAIJA L,JUKKA L,CARL C T,et al.Scots pine litter decomposition along drainage succession and soil nutrient gradients in peatland forest effects of inter-annual weather variation[J].Soil Biology & Biochemistry,2004,36: 1095-1109. 
- [7] VITOUSEK P M,TURNET D R,PARTON W J,et al.Litter decomposition on the Mauna Loa environmental matrix,Hawaii: patterns,mechanisms and models[J].Ecology,1994,75(2): 418-429. 
- [8] 彭少麟,刘强.森林凋落物动态及其对全球变暖的响应[J].生态学报,2002,22(9): 1534-1544.
- [9] HORNSBY D C,LOCKABY B G,CHAPPELKA A H.Influence of microclimate on decomposition in Loblolly pine stands: A field microcosm approach [J].Can J For Res,1995,25: 1570-1577. 
- [10] SINGH K P,SINGH P K,TRIPATHI S K.Litter fall,litter decomposition and nutrient release patterns in four native species raised on coal mine spoil at Singrauli,India[J].Biol Fertil Soil,1999,29: 371-378. 
- [11] 孙志高,刘景双.湿地枯落物分解及其对全球变化的响应[J].生态学报,2007,27(4): 1606-1618. 
- [12] 柳新伟.大汶河湿地香蒲和芦苇分解动态研究[J].中国农学通报,2009,25(24): 464-467.
- [13] 童晓丽,颜玲,赵颖,等.树叶凋落物在受酸性矿山废水污染溪流中的分解[J].生态学报,2006,26(12): 4033-4038.
- [14] 白光润,王升忠,冷雪天,等.草本泥炭形成的生物环境机制[J].地理学报,1999,54(3): 247-254.
- [15] 田应兵,熊明彪,熊晓山,等.若尔盖高原湿地土壤——植物系统有机碳的分布与流动[J].植物生态学报,2003,27(4): 490-495. 
- [16] 刘景双,孙雪利,于君宝.三江平原小叶章、毛果苔草枯落物中氮素变化分析[J].应用生态学报,2000,11(6): 898-902.
- [17] 郑玉琪,刘景双,王金达,等.三江平原典型沼泽生态系统毛果苔草枯落物中化学元素变化的分析[J].中国草地,2000(3): 12-16.
- [18] 王世岩,杨永兴.三江平原小叶章枯落物分解动态及其分解残留物中磷素季节动态[J].中国草地,2000(6): 6-10.
- [19] SILVER W L,MIYA R K. Global patterns in root decomposition: comparisons of climate and litter quality effects[J]. Oecologia,2001,129: 407-419.
- [20] COUTEAUX M M,BOTTNER P,BERG B. Litter decomposition,climate and litter quality[J].Trends in Ecology and Evolution,1995(10): 63-66.
- [21] WANG C Y,HAN G M,JIA Y,et al.Insight into the temperature sensitivity of forest litter decomposition and soil enzymes in subtropical forest in China [J] .Journal of Plant Ecology,2011: 1-8.
- [22] 曾峰,邱治军,许秀玉.森林凋落物分解研究进展[J].生态环境学报,2010,19(1): 239-243.
- [23] 周华坤,周兴民,赵新全.模拟增温效应对矮嵩草草甸影响的初步研究[J].植物生态学报,2000,24(5): 547-553.
- [24] CHEN H,HARMON M E,TIAN H Q.Effects of wetland litter decomposition and its responses to global change[J].Acta Ecologica Sinica,2007,27(9): 1549-1563.
- [25] 吕桂芬.油蒿群落枯枝落叶分解过程中微生物数量的季节动态变化研究[J].内蒙古大学学报,2000,31(1): 69-70.
- [26] SCHIMMEL J, BALSER T C, WALLENSTEIN M. Microbial stress-response physiology and its implications for ecosystem function [J].Ecology,2007,88: 1386-1394. 
- [27] ZHANG W,PARKER K M,LUO Y,et al.Soil microbial responses to experimental warming and clipping in a tallgrass prairie[J].Global Change Biol,2005(11): 266-277.
- [28] ZHANG W J,XU Q,WANG X K,et al.Impacts of experimental atmospheric warming on soil microbial community structure in a tallgrass prairie [J] .Acta Ecol Sin,2004: 1742-1747.
- [29] 陈华,MARK E H,田汉勤.全球变化对陆地生态系统枯落物分解的影响[J].生态学报,2001,21(9): 1549-1560.
- [30] LIU Q,PENG S L.Decomposition of leaf litter in tropical and subtropical forests of southern China[J].Journal of Tropical Forest Science,2005,17(4): 543-556. [KH-*2]
- [31] RIBEIRO C,MADEIRA M, ARAU [DD(-1*5)] [KG3*5] [HT4"SS] \ [DD)] JO M C.Decomposition and nutrient release from leaf litter of *Eucalyptus globulus* grown under different water and nutrient regimes[J].Forest Ecology and Management,2002,171: 31-41. 
- [1] 祁秋艳, 杨淑慧, 仲启铖, 张超, 王开运. 崇明东滩芦苇光合特征对模拟增温的响应[J]. 华东师范大学学报(自然科学版), 20120, 2012(6): 29-38.

- [2] 李真;罗锦洪;黄民生;张勇;何岩. 以蜂巢石为基质的垂直流人工湿地对黑臭水体除磷中试研究[J]. 华东师范大学学报(自然科学版), 2011, 2011(1): 126-134.
- [3] 钱婷婷;陈振楼;曹承进;王军. 人工湿地技术削减雨水初期径流污染负荷研究进展[J]. 华东师范大学学报(自然科学版), 2011, 2011(1): 55-62.
- [4] 栗小东;过仲阳;朱燕玲;戴晓燕. 结合GIS数据的神经网络湿地遥感分类方法:以上海崇明岛东滩湿地为例[J]. 华东师范大学学报(自然科学版), 2010, 2010(4): 26-34.
- [5] 姚允龙;吕宪国;王蕾. 气候变化对挠力河径流量的影响[J]. 华东师范大学学报(自然科学版), 2009, 2009(3): 153-159.
- [6] 邓泓;叶志鸿;黄铭洪. 湿地植物根系泌氧的特征[J]. 华东师范大学学报(自然科学版), 2007, 2007(6): 69-76.
- [7] 周亮进;由文辉. 闽江河口湿地景观格局动态及其驱动力[J]. 华东师范大学学报(自然科学版), 2007, 2007(6): 77-87.
- [8] 赵平;葛振鸣;王天厚;汤臣栋. 崇明东滩芦苇的生态特征及其演替过程的分析[J]. 华东师范大学学报(自然科学版), 2005, 2005(3): 98-104.
- [9] 祁秋艳, 杨淑慧, 仲启铨, 张超, 王开运. 崇明东滩芦苇光合特征对模拟增温的响应[J]. 华东师范大学学报(自然科学版), 0, 0: 1-10.