

黑河下游河岸林植物水分来源初步研究

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中文摘要:通过分析黑河下游极端干旱区荒漠河岸林植物木质部水及其不同潜在水源稳定氧同位素组成($\delta^{18}\text{O}$),应用“同位素质量守恒多元”分析方法初步研究了不同潜在水源对河岸植物的贡献.结果表明:在黑河下游荒漠河岸林生态系统,在河水转化为地下水和土壤水及水分在土壤剖面再分配的过程中均存在强烈的同位素分馏.对植物水 $\delta^{18}\text{O}$ 而言,胡杨、柽柳和苦荬的 $\delta^{18}\text{O}$ 分别为-6.43‰、-6.28‰和-6.61‰,较苦苣菜(-5.14‰)和蒲公英(-5.52‰)明显偏负.柱状频率图显示胡杨最多能利用93%的地下水,柽柳最多利用90%的地下水,而苦豆子90%水分来源于80 cm土层范围内的土壤水.除0~20 cm土层内的土壤水外,苦苣菜和蒲公英可能还有其他潜在水源.即在黑河下游天然河岸林乔木和灌木较多地利用地下水,而草本植物仍以地表水为主.

中文关键词:稳定氧同位素 黑河 河岸林 水分来源

A Preliminary Study of Water Sources of Riparian Plants in the Lower Reaches of the Heihe Basin

Abstract: Using the multiple source mass-balance isotopic approach, the authors tentatively evaluated water sources of riparian forest plants in the extremely arid region along the lower reaches of the Heihe River basin by analyzing the stable oxygen isotope ($\delta^{18}\text{O}$) of plant water and the potential water sources such as soil water, river water and groundwater and calculating probable contributions of multiple potential sources to total plant. The results show that there exist significant evaporative isotopic fractionation during the process of hydraulic infiltration from river water to groundwater and soil water and that of hydraulic redistribution in soil profiles in the riparian forest ecological system along the lower reaches of the Heihe River basin. The $\delta^{18}\text{O}$ values of *Populus euphratica* Oliv., *Tamarix ramosissima* and *Sophora alopecuroides* are -6.43‰, -6.28‰ and -6.61‰ respectively, being relatively negative in comparison with the values of *Sonchus oleraceus* Linn (-5.14‰) and *Herba Taraxaci* (-5.52‰). Frequency histograms produced from the multiple source mass-balance analysis have revealed that the *Populus euphratica* Oliv. and *Tamarix ramosissima* obtained over 93% and 90% of their water from groundwater. However, the *Sophora alopecuroides* obtained more than 97% of its water from the soil layer about 80 cm in depth. In addition to obtaining water from the upper 20 cm, *Sonchus oleraceus* Linn and *Herba Taraxaci* may have other water sources in the extremely arid region. The results obtained by the authors show that in the riparian