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Spatial heterogeneity of the weed community in a manilagrass lawn

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Key words: *Zoysia matrella*, weed community, spatial heterogeneity, turf, power law

Introduction *Zoysia matrella* (L.) Merr. (manilagrass) can form a dense and pest-free turf. However if mowing at low height is coupled with frequent watering, the lawn is more easily invaded by weeds. In order to evaluate the quality and sustainability of manilagrass lawn, the spatial variation and species of weed community were analyzed with a new power-law method in this study (Shiyomi et al., 2001), which is helpful to recognize the patterns of weed invasion and distribution, as well as to eventually anticipate weed population dynamics as affected by lawn management strategies.

Materials and methods The experimental site was selected in a subtropical zone (Guangzhou, China), on the manilagrass lawn established in 1999. We surveyed fifty 50 cm × 50 cm frames (L-frames), each of them was divided into four 25 cm × 25 cm smaller frames (S-frames), on a 25 m line-transect in November 2006 ($N = 50$; $n = 4$). All species names occurring in each S-frame were recorded. According to the power-law of Shiyomi et al. (2001), the following equations were established: $v_i / n^2 = a [p_i (1-p_i)]^b$, where p_i denotes the occurrence frequency of species i in S-frame; v_i denotes the variance of actually observed occurrence counts for species i among L-frames; n is the number of S-frames in a L-frame (here, $n=4$); a and b are constants ($a = \log a$).

Results There were 27 weed species found in the lawn. The regression line for weed species based on the power-law equation had a slope $\beta=1.1017$ and an intercept $\alpha=0.3854$ (Fig.1). As the slope is greater than 1 and the intercept is greater than 0, it suggests that that the weed community was not randomly distributed as a whole and exhibited an overall aggregated spatial pattern. The results also showed that the perennial weed species had a tendency with high heterogeneity, and the annuals weed species had a low heterogeneity.

Conclusions As for the spatial characteristics of the weed community, *F. schoenoide*, *E. prostrata*, *P. cernua* and *C. asiatica* had a high heterogeneity. *L. japonicum*, *E. sonchifolia*, *D. sanguinalis*., *H. corymbosa*, *P. crinitumh*, *S. dulcis*., *C. dactylon*, *P. zeylanica*, *U. lobata* and *E. tenella* demonstrated an approximately random pattern. Other species showed a relatively low heterogeneity. The mode of propagation is one of the major factors controlling spatial heterogeneity.

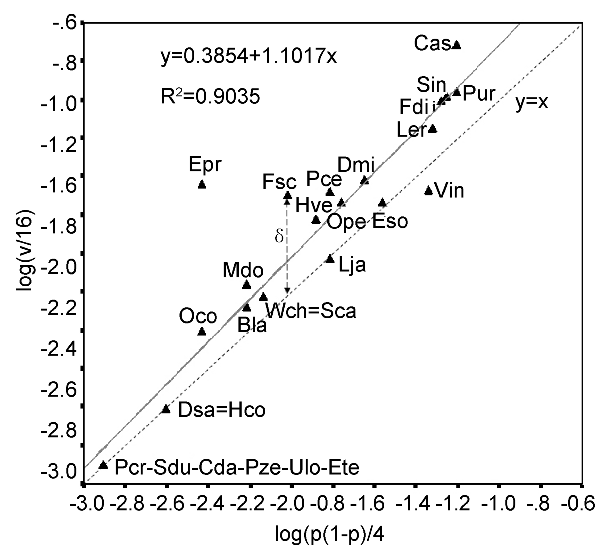

Figure 1 *Regression line for weed community of manilagrass lawn using power-law Solid line: regression line; broken line:* $y=x$; double arrow line: $\delta=\log(v_i/16)-\log[p_i(1-p_i)/4]$; Bla: Borreria latifolia; *Cas*: Centella asiatica; *Cda*: Cynodon dactylon; *Dmi*: Desmodium microphyllum; *Dsa*: Digitaria sanguinalis; *Epr*: Eclipta prostrate; *Ete*: Eragrostis tenella *Eso*: Emilia sonchifolia; *Fdi*: Fimbristylis dichotoma. *f*. Annun; *Fsc*: Fimbristylis schoenoide; *Hco*: Hedyotis corymbosa; *Hve*: Hedyotis verticillata; *Lcr*: Lindernia crustacea; *Lja*: Lygodium japonicum; *Mdo*: Melastoma dodecandrum; *Ope*: Ophioglossum pedunculosum; *Oco*: Oxalis corniculata; *Pce*: Palhinhaea cernua; *Pur*: Phyllanthus urinaria; *Pcr*: Pogonatherum crinitum; *Pze*: Pouzolzia zeylanica; *Sin*: Sacciolepis indica; *Sca*: Salomonia cantoniensis; *Sdu*: Scoparia dulcis; *Ulo*: Urena lobata; *Vin*: Viola inconspicua; *Wch*: Wedelia chinensis.