

The Effects of Spatial Configurations of Simulated Shrubs on Wind-proof Effectiveness

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Abstract

Maximizing the benefits of windbreaks requires a thorough understanding of the physical interaction between the wind and the barrier. In this experiment, a profiling set of Pitot tubes was used to measure the airflow field and wind velocity of simulated shrubs in a wind tunnel. The effects of form configurations and row spaces of simulated shrubs on wind-proof effectiveness were in-depth studied. We come to the following results: the weakening intensity of hemisphere-shaped and broom-shaped shrubs on wind velocity was mainly reflected below 2 cm in the root and 6-14 cm in the middle-upper, respectively, while the wind-proof effect of the spindle-shaped shrubs at the canopy (0.2-14 cm height) was the best. Besides, the simulated shrubs under 26.25 cm had the best protection effect on the wind velocity. Moreover, the designed windbreaks with *Nitraria tangutorum*, more effectively reduced the wind velocity among the windbreak compared to behind the windbreak. In the wind control system, the hemisphere-shaped windbreaks should be applied as near-surface barriers, and the windbreaks of broom-shaped and spindle-shaped can be used as a sheltered forest. The results could offer theoretical guidelines on how to arrange the windbreaks for preventing wind erosion in the most convenient and efficient ways.

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