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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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Study on wind-sand defending mechanism of single shrub

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Key words : single shrub, wind velocity, sand-transporting quantity, mechanism, wind-sand flow

Introduction Sand-fixing grass belt is an important part of Wind Erosion Protective System (Dong Zhi, 2004). By studying the wind velocity and sand-transporting quantity around single shrub in this area, wind-sand defending mechanism was analyzed in order to provide a theoretical foundation for the building of sand-fixing grass belt.

Materials and methods In the sand-fixing grass belt, using PC-2F multichannel Anemometer and Sand Collectors, wind velocity and sand-transporting quantity around single shrub were observed. The Observation height was decided based on the height of shrub. The wind velocity recording time was one time for one minute, 60 minutes for one experiment. At the same time, sand (0~20cm from ground) was collected every 3 minutes. Then sand was weighed by 1/1000g electron balance, and the sand-transporting quantity was calculated.

Results On the windward side of the shrub, airflow was blocked and wind speed declined, when arriving the top and the side of shrub, it accelerated. On the leeward side, wind velocity was declined on different degree, away from shrub, wind velocity start increase and renew to original velocity. For the shrub with closed structure, wind velocity declined quickly and renew quickly. For porous structure, wind velocity declined most and renew slowly. For ventilation structure, wind velocity declined least (Figure 1). In addition, on the leeward side, Sand transporting quantity is the least, while, on the other two sides, it is the most, which is the same with the change of wind velocity. Therefore, on the windward and leeward side, sand was accumulated, but on the other two sides, there is a wind erosion area. However, wind direction usually changed with season, which will result in sand sediment around every side of the shrub and form the shrub-sand pile (Figure 2).

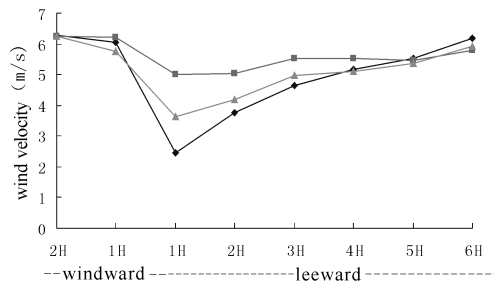


Figure 1 wind velocity around the shrub.

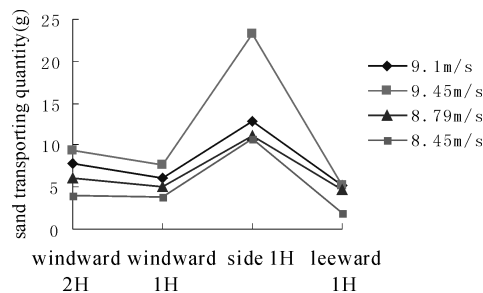


Figure 2 Sand transporting Quantity around the shrub.

Conclusions Shrub, higher than ground, is a holdback of airflow movement, when the airflow go though it, velocity will declined on the windward and leeward side, which is the main factor of wind-sand flow cumulating, and is also the mechanism of sand fixing of shrub. Based on the above experiment, shrub with porous structure has the best wind-sand defending effect.

Reference

Dong Zhi, 2004. Research on Farmland Wind-Sand Disaster of Oasis and its Control Mechanism in Ulan Buh Desert, Chinese degree paper data.