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Design of Leylus-chinensis grassland root-cutter

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Key words : degenerated glassland ,Leylus-chinensis ,soil hare layer , root-cutter ,the curve of blade

Introduction Eliminating the soil subsurface hard layer and cutting off the transverse roots of Leylus-chinensis to promote its propagation and self-reproduction by a mechanical method is a way to improve degenerated Leylus-chinensis glassland (Yan Zhijian 2002) . Shallow ploughing can loosen the soil and promote root system reproduction (Burgess , C .P 2000) .In order to serve the above purpose the gap disc harrow is usually used , the rotary cultivator , the no-wal-coulter and so on . However , these tools may cause soil wind erosion or water erosion , and destroy the pasture vegetation . Therefore , designing a new root-cutter , which can shut off Leylus-chinensis root with little destruction to vegetation and soil is necessary .

Methodology As Figure .1 shows , the root-cutter designed is composed of the blades and the cutter head base which were built in the axletree by symmetrical keyways and driven revolving at high speed by lat key transmission load , to complete the cutting root process . Every blade is fixed in the cutter head singly , so it is replaced easily if broken ,6~12 blades could be built in the cutter according to the pasture situation .The cutting edge curve is a section of the concentric circle , which satisfies the sliding-cutting performance (Gupta ,J .p ,Pandey .K .P ,1996) . The cutter radius of gyration is 350mm , its head base radius is 150mm ,and the . When used in the experimental plot ,it's approaching speed was 1.2~1.5m/s , and the rotational speed was 500r/min .

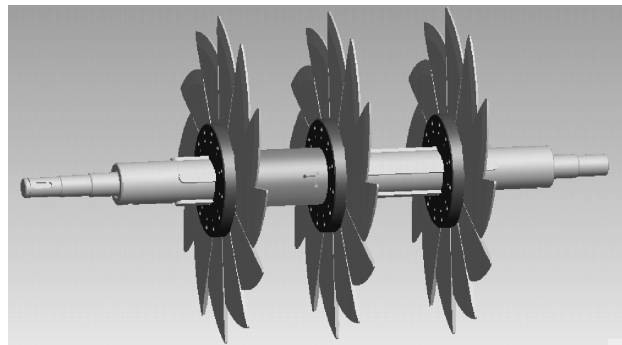


Figure 1 Sketch chart of root-cutter .

Results and discussions Experimental plots were placed in selected Leylus-chinensis degraded grassland in The Hebei Guyuan Grassland Ecosystem observation research station . The root-cutting rate (the roots's proportion which were cut off) and the width of slot on the soil surface were increased when the cut root depth changed from 150mm to 200mm , Even if the depth is only then 150mm , the rate also achieved above 90% , and the width is only between 10~15mm . After cutting work had finished , the pasture plot looked like that in fig .2 . Compared with other soil cultivation conditions ,the cutter had broken the soil hard layer ,but it did not turnor plow the soil , . It created a slot which is a litter thicker than the thickness of the blade . The cutter had cut off most of roots ,but it did not destroy native vegetation , and there were fewer roots which had been drawn out of the soil .The use of this cutter could protect the soil against wind erosion or water erosion , and improve the soil structure to a certain extent , but it cannot change soil conditions like a loosening tiller .



Figure 2 cutted Root and slot in soil .

Conclusions Ddesigned a kind of rotaty root-cutter which was used to breaking soil hard layer and cutting off Leylus-chinensis roots to promote its develop , in this way ,the eteriorated grassland could be improved .The cutter could shut off Leylus-chinensis roots completely ,however make a small destruction to the pasture soil and vegetation .

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