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**Systematics, Biology and Ecology of New Zealand's Pygmy Mistletoes  
(*Korthalsella*: Viscaceae)**

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# Abstract

New Zealand's pygmy mistletoes belong to the genus *Korthalsella* Tieghem, which comprises about 30 species ranging from Malesia to Hawaii, the Marquesas and Henderson Islands in the east, Japan in the north, Australia, New Zealand in the south, and Ethiopia and Madagascar to the west. Mainland Australia, Hawaii, Malesia and Madagascar all have high levels of species richness. This thesis shows that *Korthalsella* has high levels of regional endemism and has widespread parallelism and supports the biogeographic model of speciation, whereas, the traditional sections based on morphology are not supported.

*Korthalsella* is represented in New Zealand by a monophyletic clade of three species *K. clavata* (Kirk) Cheeseman, *K. lindsayi* (Oliver ex J. D. Hooker) Engl., and *K. salicornioides* (A. Cunningham) Tiegh. *Korthalsella clavata* and *K. lindsayi* are both generalists with relatively broad host ranges whereas *K. salicornioides* is a specialist species with most host records from two myrtaceous genera *Kunzea* Rchb. (kanuka) and *Leptospermum* J. R. Forst & G. Forst (manuka). Cross-infection experiments in *Korthalsella salicornioides* indicate the presence of putative *Kunzea*- and *Leptospermum*-specific races with better success rates of seedling survival when maternal and recipient hosts were the same. However, genetic data based on nuclear internal transcribed spacer (ITS) and chloroplast *trnQ-rps16* spacer sequences does not support the presence of host related variability and the within-species genetic structure appears to be geographic rather than host-based. My study shows that both cpDNA haplotypes and ITS sequence types are shared between *K. clavata* and *K. lindsayi*, which possibly is an outcome of hybridisation and introgression between the two species. *Korthalsella salicornioides* is an ambophilous species relying both on insects and on wind for effective pollination, whereas *K. lindsayi* is an anemophilous species. This study confirms the presence of explosive seed discharge in both species with dispersal distances ranging up to 4 and 7 m in *K. lindsayi* and *K. salicornioides*, respectively. However, dispersal distances of around 1 m are more typical. This study

also describes the first account of clonal propagation by means of proliferation of endophyte and formation of adventitious sprouts in these species.

Several new natural enemies specialising on New Zealand *Korthalsella* were discovered - two specialist armoured scales (*Leucaspis albotecta* Henderson and *L. trilobata* Henderson), a felt scale (*Eriococcus korthalsellae* Henderson), and two pathogenic ascomycetes *Guignardia korthalsellae* Sultan, Johnston, Park & Robertson and *Rosenscheldiella korthalsellae* Sultan, Johnston, Park & Robertson. Other natural enemies include a specialist gall mite *Aceria korelli* Manson, whereas generalists include native and adventive scale insects and generalist Lepidoptera.

Demographic study of several populations revealed that all species have high growth rates and high ramet turnover. *Korthalsella salicornioides* and *K. clavata* had relatively stable recruitment rates in all size/stage classes whereas *K. lindsayi* populations were apparently declining at the two study sites.

To Khwaja Shamsuddin Azeemi, his writings have familiarised me with inner peace  
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