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Abstract

The loss of biodiversity in communities can degrade ecosystem services including productivity, stability, resilience and disease regulation. While high species richness has been often correlated with reduced infection and transmission risk, multiple interacting mechanisms could underlie this dilution effect. The effects of biodiversity on disease prevalence can depend on both the species loss order in community disassembly and the traits of species left in low richness communities. If host communities decay to a predictable subset of hosts in low richness communities, infection risk by generalist, vector-borne parasites may be elevated because the remaining hosts are highly susceptible as well as highly competent to transmit parasites to vectors and/or to support vector reproduction.

Using grassland communities along the US West Coast as our model system, we measured the distribution and local abundance (% cover) of grass species among eleven sites across a latitudinal gradient of 15 degrees and 2000 kilometers. At each site, we monitored the prevalence of a group of generalists aphid-vectored pathogens, the *Barley* and *Cereal yellow dwarf* viruses (B/CYDVs), using two widespread grass species as sentinel hosts (*Elymus glaucus* and *Bromus hordeaceus*). We assessed in controlled conditions the ability of twenty common grass hosts to support i) viral infection after inoculation of a BYDV-PAV isolate, ii) secondary infection of new hosts and iii) reproduction of the aphid vector *Rhopalosiphum padi*. Finally, using a reduced set of six grass hosts, we quantified the reproductive rate of three aphid vectors of B/CYDVs (*R. padi, R.maidis* and *Sitobion avenae*), in field and/or lab experimental settings.

Using these data, we show that the change in plant community composition due to biodiversity loss is associated with an altered overall competence of host species assemblages to sustain the reproduction and transmission of infectious agents, as well as the reproduction of their aphid vectors.

Key words: disease dilution effect, vector-borne pathogen, grasslands, B/CYDV, nestedness