Local management and landscape diversity drive species richness and abundance of carabids in European vineyards.

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Carabids are one of the most studied taxa responsible for multiple ecosystem services in agricultural systems such as weed seed consumption and pest control. In vineyards, their diversity and response to soil management practices are less studied.

This study was set up across 4 vineyard regions in Europe (Bordeaux, France; Valais, Switzerland; Rhinehessen, Germany and Dobrogea, Romania). We assessed the relative importance of local management (grass cover, bare ground or intermediate treatments), plant diversity within vineyards; and landscape diversity (strongly driven by the proportion cover of semi-natural habitats [SNH]) on species richness and abundance of ground beetle communities. In each country, vineyards were divided in 3 different parts which were managed with grass cover, alternate cover or bare ground by tillage, except for Switzerland where entire plots were treated. Carabids were sampled at two key phenological periods (spring during vine flowering and autumn around harvest) using pitfall traps, replicated in 60 vineyards across all the 4 regions. We quantified the relative effects of different local and landscape variables on carabid abundance and species richness using generalized linear mixed models.

Species richness was both affected by local and landscape effects: we found a highly negative relationship with the proportion of semi-natural habitats at the landscape scale but a positive relationship with the plant species richness observed in vineyards. Plant cover also influenced carabid species richness but in interaction with the local management: carabid richness increased with plant cover in tilled vineyards whereas it decreased with plant cover in vineyards with green cover. Carabid abundance was also influenced by strong and interactive effects between local management and landscape diversity: it significantly increased with SNH cover only in tilled vineyards whereas no effect was found in vineyards with permanent or alternate covers.