

Biogeographic differences in the allelopathy of leaf surface extracts of an invasive weed

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Allelopathy, the release of chemicals by plants that inhibit the germination and growth of competing species, can be an important trait for invasive success. However, little is known about potential biogeographical differences in allelopathy due to divergent regional eco-evolutionary histories. To test this, we examined the allelochemical potential of the highly invasive species *Centaurea solstitialis* from six world regions including native (Spain, Turkey) and non-native ranges (Argentina, Chile, California and Australia). Seeds from several populations in each region were collected and grown under common garden conditions. Allelopathic potential and chemical composition of three leaf extract concentrations of *C. solstitialis* from each region: 0.25%, 0.5% 0.75% (w/v?1) were assessed on the phytometer *Lactuca sativa*. The main allelochemicals present in the leaf-surface extract were sesquiterpene lactones that varied in major constitutive compounds across regions. These leaf extracts had strong inhibitory effects on *L. sativa* seed germination and net growth. Summed across regions, the 0.25% concentration suppressed germination by 72% and radicle

elongation by 66%, relative to the controls. At the 0.5% concentration, no seeds germinated when exposed to extracts from the non-native ranges of Argentina and Chile, whereas germination and radicle growth were reduced by 98% and 89%, respectively, in the remaining regions, relative to controls. Germination and seedling growth were completely inhibited at the 0.75% concentration extract for all regions. Some non-native regions were characterized by relatively lower concentrations of allelochemicals, suggesting that there is biogeographical variation in allelopathic expression. These findings imply that rapid selection on the biochemical signatures of an exotic invasive plant species can be highly region-specific across the world.