

Functional traits of grass weeds

- Investigating the processes that determine weediness

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What is a weed?

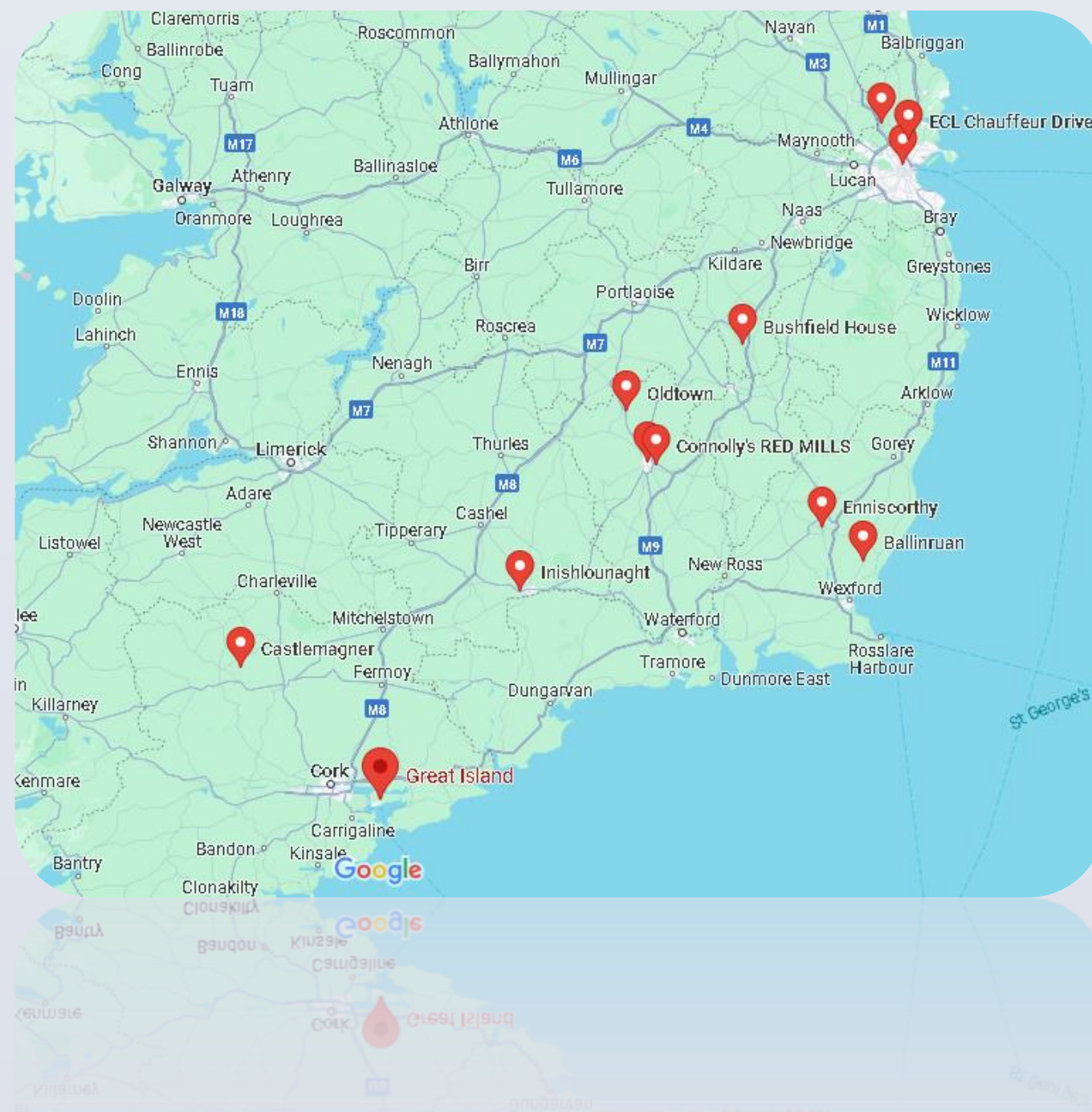


The term 'weed' is often used in a colloquial manner when regarding any unwanted plants growing in an undesirable place. Thus, categorizing weeds is an important step in the process of determining weediness. It has been stated that a plant may be categorized as a weed when its populations primarily flourish in areas notably affected by human disturbance within a specified geographic region, excluding plants deliberately cultivated. (Baker, 1974).

Weeds are, if left unmanaged, the most serious problem faced by farmers around the globe, causing higher crop losses than pests and pathogens. Grass weeds are a serious subset of weeds causing issues in many agricultural settings. *Avena fatua* (wild common oat) is closely related to *Avena sativa* (oat) and reduces crop yields of, e.g. wheat and barley, through competition.

Objectives

Our work intends to characterize the traits that lead to increased weediness in *A. fatua*. Through experiments documenting functional traits and strategies we are comparing populations of *A. fatua* from around Ireland from farms, predominantly tillage based.



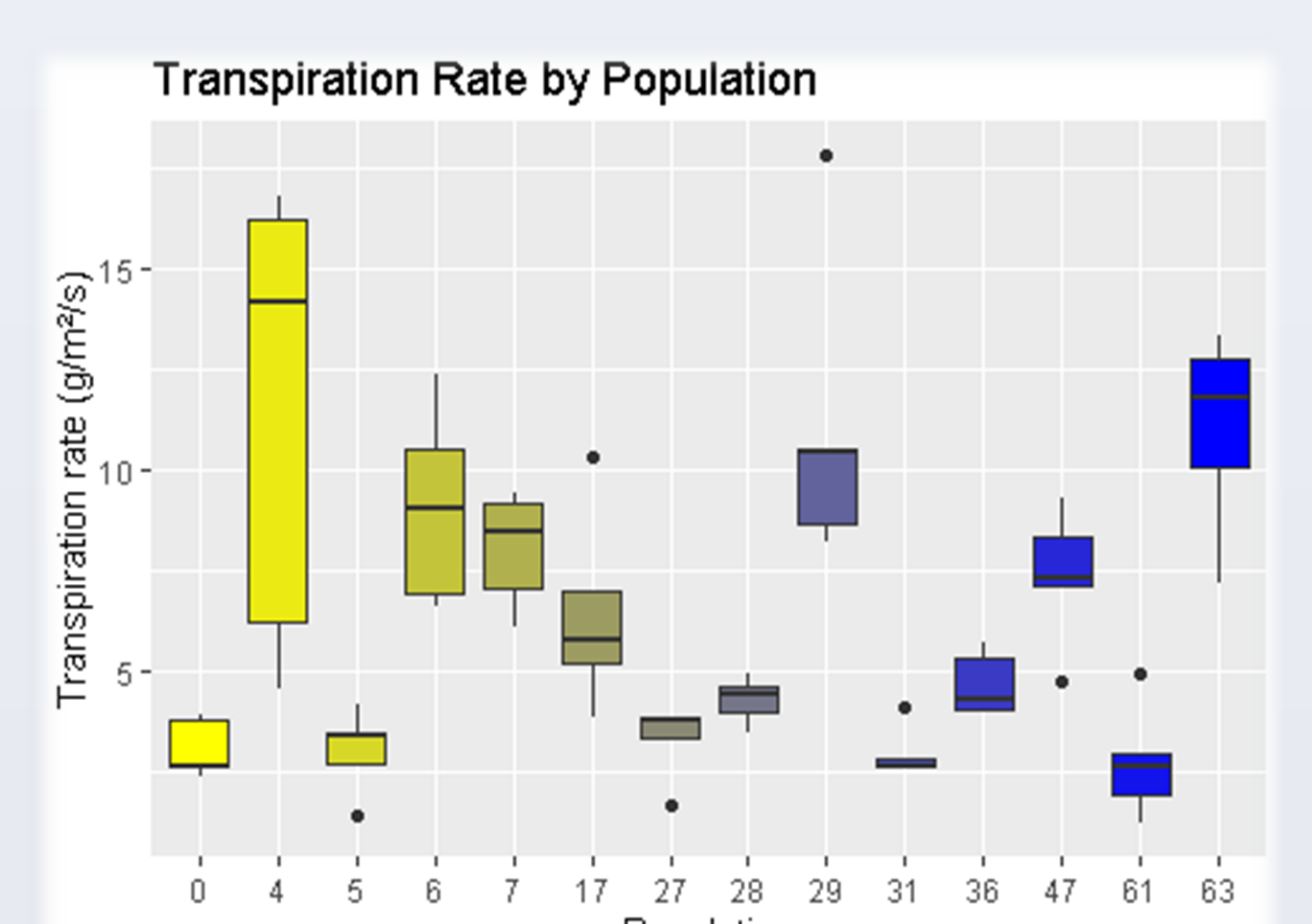
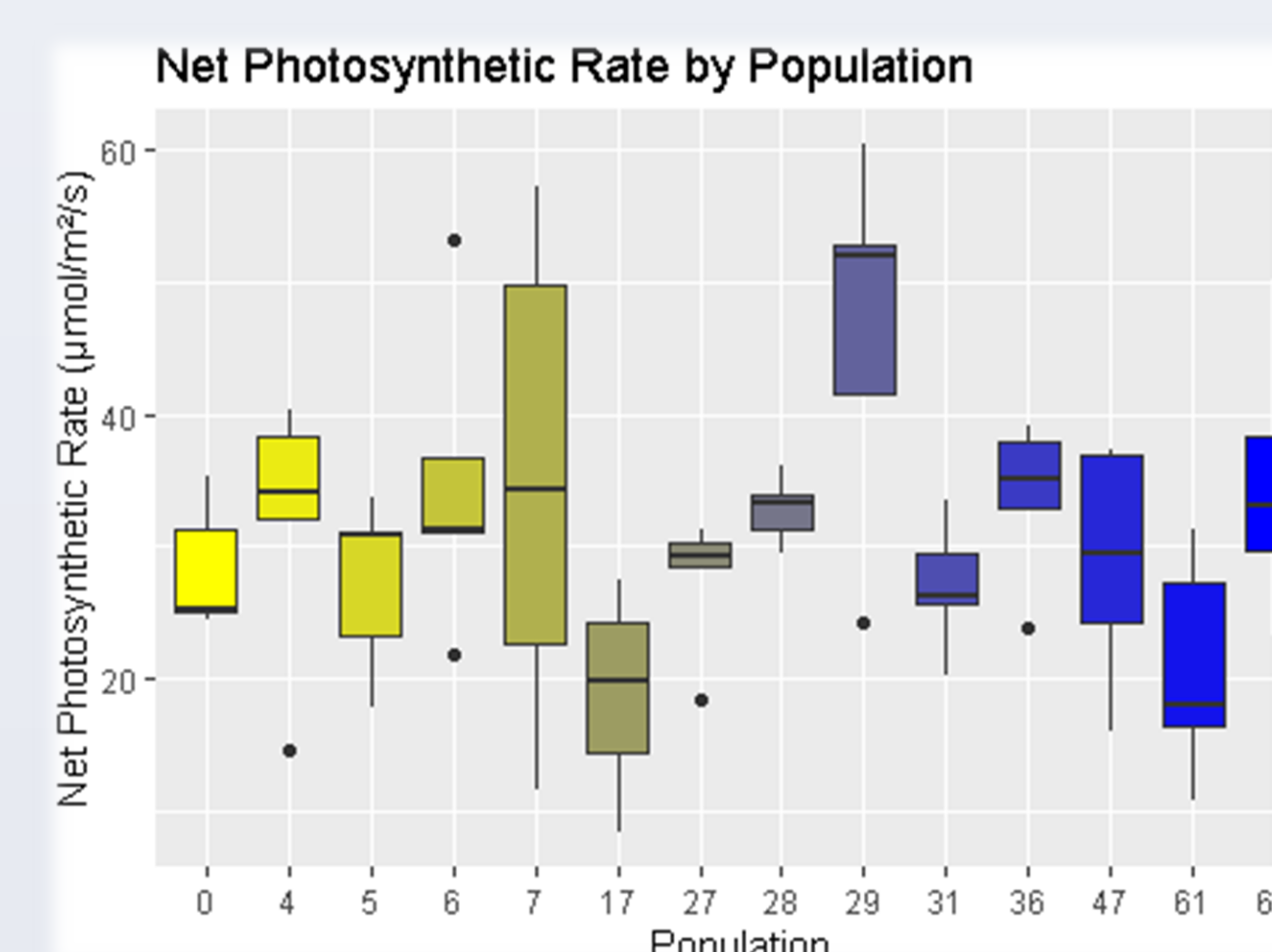
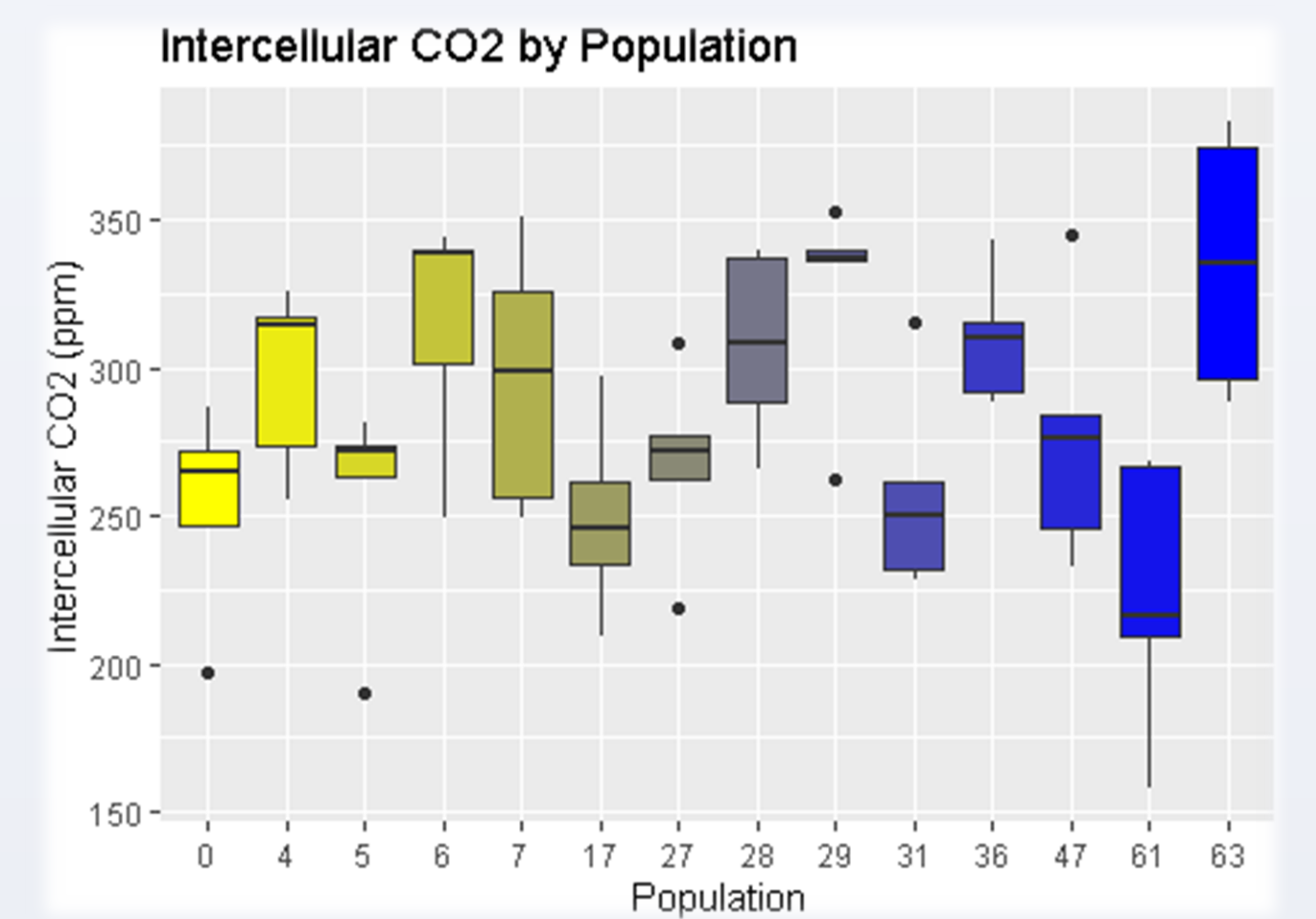
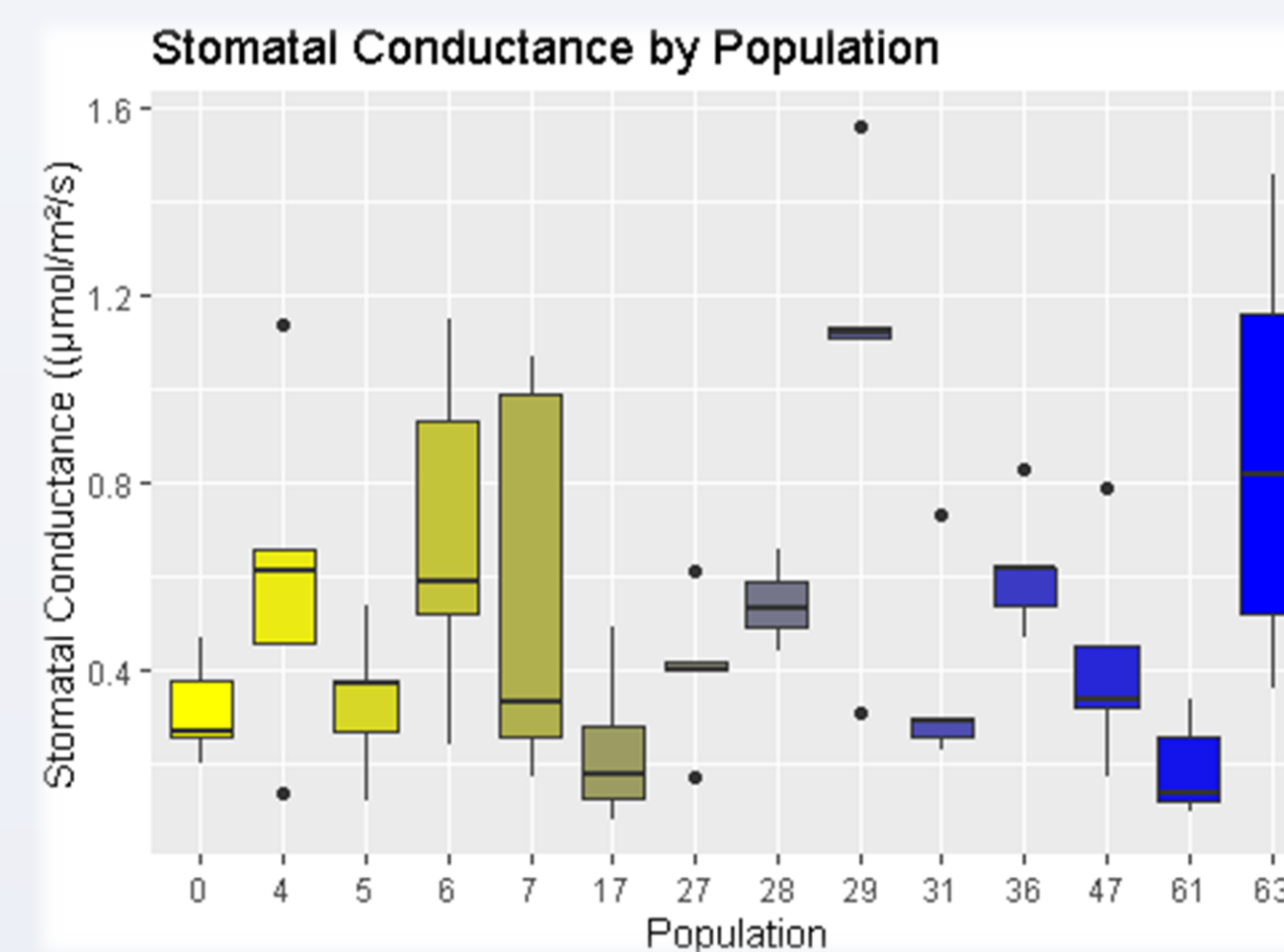
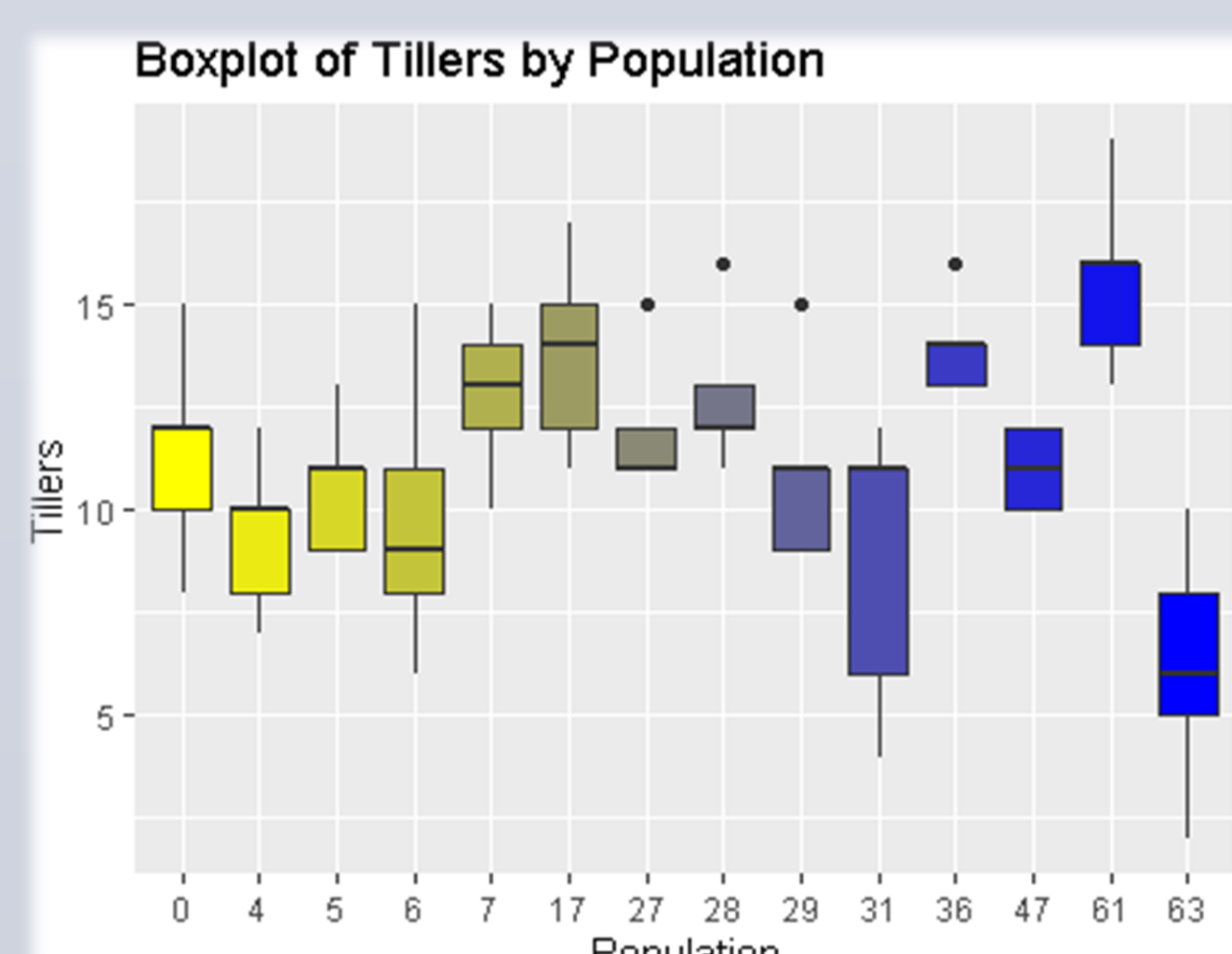
Understanding Weediness



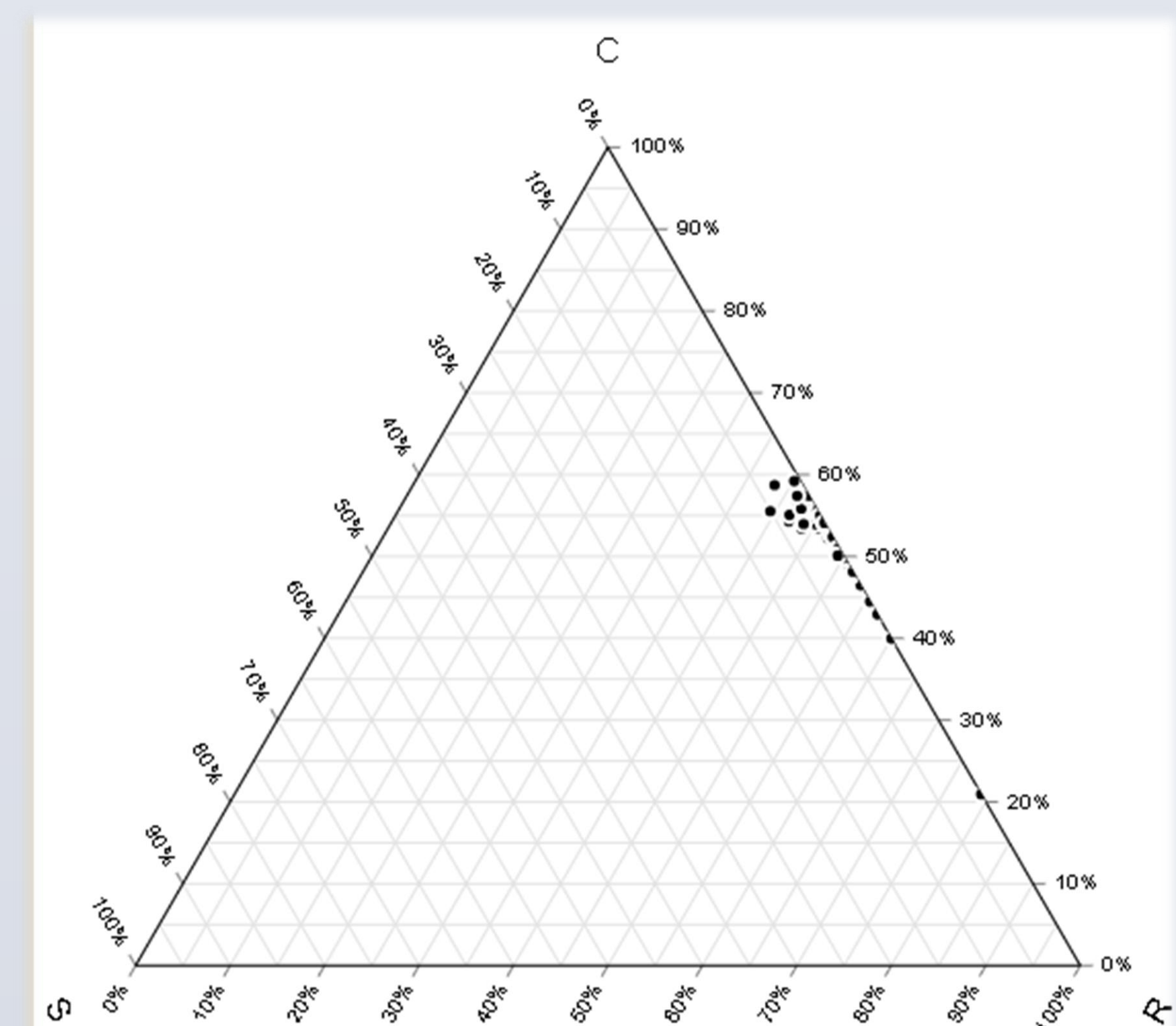
Weediness refers to the tendency of certain plants to grow aggressively and spread rapidly. Studying functional traits in weeds is instrumental in unravelling the intricate mechanisms underlying their adaptation and response to environmental conditions. Functional traits encompass a diverse array of attributes within organisms, ranging from their physical structure to their biochemical makeup, physiological processes, timing of phenological events, and even their behavioral tendencies. These traits wield considerable influence over an organism's overall performance and fitness within its environment.

Results

There was no difference among populations in height, leaf number on main tiller, leaf dry matter content (LDMC) and specific leaf area (SLA). However, the tiller counts varied significantly between populations. The p-value of (4.46e-06) indicates a statistically significant variation in the number of tillers across different population groups.



Understanding how different populations affect plant physiology is crucial for agricultural and ecological studies. We conducted an ANOVA analysis to investigate the impact of population on four key physiological variables: intercellular CO₂, transpiration rate, stomatal conductance, and net photosynthetic rate. The one-way ANOVA results showed highly significant variation between populations for intercellular CO₂ levels, transpiration rate, and stomatal conductance ($p < 0.001$). The variation in net photosynthetic rate was marginally significant ($p = 0.0148$).



The competitive/stress tolerant/ruderal (CSR) system allows classification of functional strategies and visualization in ternary plots. As seen above, *Avena fatua* is positioned along the competitive ruderal axis, these plants demonstrate adaptability in challenging conditions, balancing between competitive ability and resilience to disturbance within their ecological niche.

Future Work

Future research will focus on investigating the stress tolerance of *Avena fatua* and comparing its functional traits and adaptive strategies to those of other plant species like barley, wheat, oat, and other grass weeds. By comparing the competitive, stress-tolerant, and ruderal strategies of these species, we aim to gain insights into their ecological dynamics and inform better management practices.

Additional information

Introductory Video



Website



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