

**Bi 213 Laboratory Experimental Studies of Plant Competition 2009**  
(Adopted and modified from Cox, G.W. 1990. *Laboratory Manual of General Ecology, 6<sup>th</sup> Ed.*, Wm. C. Brown)

**INTRODUCTION**

Many problems involving **intraspecific** and **interspecific** competition may be investigated in experiments with single-species and mixed-species populations of annual or perennial herbaceous plants. **Density dependent** factors include those that affect densely populated populations more than sparsely populated populations. Density dependent effects of competition for space, moisture, or soil nutrients may be shown in experiments involving different total densities of single-species or mixed-species populations. Mixed-species experiments may also be designed to investigate the role of specific environmental conditions, such as moisture and nutrient availability, in determining the species possessing the advantage in competition in a given situation. The present exercise is designed to furnish an outline for studying the effects of the two types of competition on total yield, survival, and individual growth of different species at various densities and soil moisture or nutrient levels.

Any of a wide variety of wild or cultivated species of annuals or herbaceous perennials may be suitable for use in this experiment. Rapidly growing annuals are probably most satisfactory for experiments confined to a single college term, although some of the more rapidly growing cultivated biennials or perennials may also be suitable. It is desirable that the species used have high germination percentages, since this facilitates the establishment of desired densities or density combinations.

Experiments with closely related species of wild annuals are especially interesting and may produce results that can be related to the problem of competitive exclusion and the distribution pattern of the species in nature. The pairing of a legume and a non-legume in experiments having soil nitrogen level as a variable may furnish results relating to the basis of competitive advantage under different environmental conditions.

For this term, we will be using the following agriculturally important plants: sorghum (*Sorghum bicolor*) and barley (*Hordeum vulgare*).

For experiments such as those described below, six-inch flower pots are most satisfactory. Various patterns of distributing seeds over the soil surface have been used in studies of **interspecific** competition (Harper, 1961), but the most convenient method for general studies is to distribute them uniformly over the entire soil surface, interspersing seeds of different species so that individuals of the different species will be adjacent to each other.

**OVER**

## EFFECTS OF INTRASPECIFIC AND INTERSPECIFIC COMPETITION ON YIELD

This experiment is designed to compare total yield, *in biomass of shoot tissue*, for two species growing alone (**intraspecific** competition) and together (**interspecific** competition), at three different levels of **total density**.

### PROCEDURES

- Your group will need:
  - 6, six-inch pots
  - sorghum and barley fruits (these are the grains, each of which, contains a single seed)
- Planting:
  - one 2-pot set with seeds of **sorghum** only at densities of 10 and 30, respectively
  - one 2-pot set with seeds of **barley** only at densities of 10 and 30, respectively
  - one 2-pot set with seeds of both **sorghum** and **barley** at densities of 10 (5:5) and 30 (15:15), respectively

Note: While it would be beneficial to have many replicates for each combination of variables, limited greenhouse space prohibits this. However, you should be aware that the use of replicates would help with determining the amount of variation (“experimental error”) shown by supposedly identical experimental situations. This, in turn, is necessary for the determination of the degree of interaction between the variables.

- When the plants have achieved maximum growth, the shoot tissue will be harvested and the wet weight for each species determined.
  - These values will be recorded in a MS Excel spreadsheet that your group designs.
  - These data will be analyzed toward at end of the term.
  - Additional instructions will be provided at that time.
- It is EXTREMELY important that your lab table attends to regular maintenance of your 3 pots.
  - This includes regular watering and application of any treatments (e.g., fertilizer).
  - You will be responsible for establishing a maintenance schedule and sticking to it – this includes weekend watering!!!
  - I will be monitoring the progress of each group’s plants