Name _____ Date _____ Period _____

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Crowded Cups: A Competition Lab

Biology

Work with your group. Record every measurement with its unit. Answer questions in complete sentences.

Draft lab. This lab has not been tested in a classroom yet. Your teacher may change some steps, times or amounts.

The Puzzle

A gardener packs a cup with radish seeds, hoping for more radishes. Does crowding help or hurt each plant? And is a radish hurt more by other radishes (**intraspecific competition**) or by a different species, like grass (**interspecific competition**)?

Question

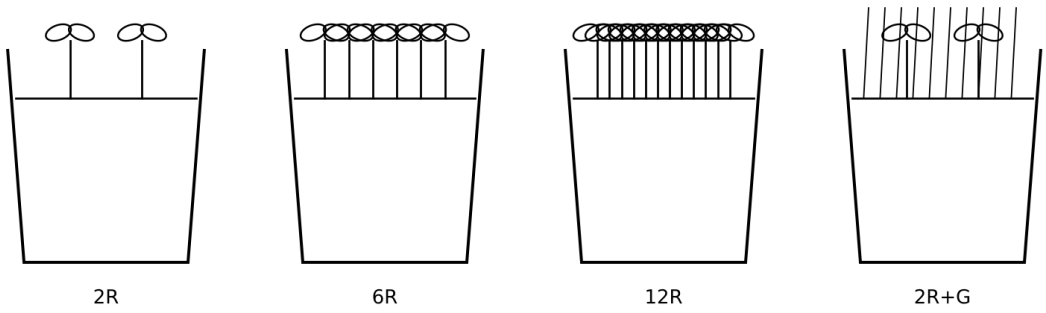
How does the number and type of neighbors affect the growth of a radish plant?

Safety

- Wear gloves when handling potting mix. Do not breathe in the dust.
- Do not eat seeds or plants. Wash your hands after the lab.

Materials (per group)

- 4 cups (16 oz) with drain holes, labeled 2R, 6R, 12R, and 2R+G
- Potting mix, tray to catch water
- About 30 radish seeds and 15 ryegrass seeds
- Measuring cup for water, ruler, scissors
- Balance (0.01 g), paper towels



Four planting designs. Cup 2R+G has 2 radishes and 10 ryegrass plants.

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Before the Lab

1. Predict: which cup will have the heaviest **individual** radishes? Which will have the most **total** radish mass? Explain.

Procedure

Day 1

1. Fill each cup with potting mix to 2 cm below the rim. Water until it drips from the bottom.
2. Plant radish seeds 1 cm deep, spread evenly: plant one extra seed for every plant you need (for example, 4 seeds in cup 2R). In cup 2R+G, also scatter 15 ryegrass seeds and cover them lightly.
3. Put all cups under the same light. Water each cup with the same amount whenever the surface is dry.

Day 7

1. Thin each cup to the target number by snipping the extra seedlings at the soil line: 2, 6, 12, and 2 radishes plus 10 grass plants.

Day 21 (harvest)

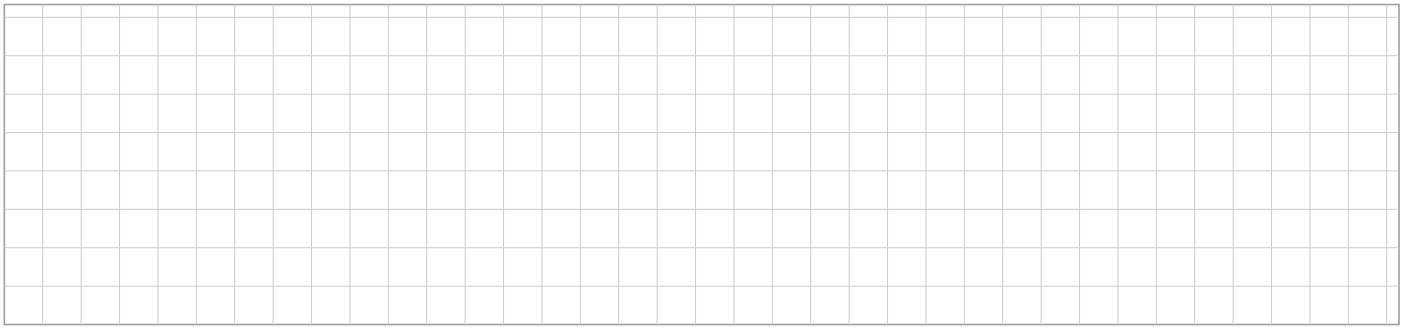
1. Cut every radish plant at the soil line. Do not include grass.
2. Weigh all the radish shoots from each cup together. Record the total mass, then divide by the number of radishes.

Data

Table 1. Radish shoot mass

Cup	Radishes	Neighbors	Total radish mass (g)	Mass per radish (g)
2R	2	1 radish		
6R	6	5 radishes		
12R	12	11 radishes		
2R+G	2	1 radish + 10 grass		

2. Make a bar graph of mass per radish for the four cups.



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Analysis

3. How did crowding with other radishes affect the mass of each radish? Use numbers.

4. Compare total radish mass in cups 2R, 6R, and 12R. Did 6 times as many plants make 6 times as much mass? Explain why or why not.

5. Name two resources the plants in a crowded cup compete for. Where does each competition happen (above or below the soil)?

6. Ten grass plants reduced radish mass less than 11 radish neighbors did (sample data). Suggest one reason, using the idea of niches.

7. Claim, evidence, reasoning: Is a radish hurt more by its own species or by grass?

Claim
Evidence
Reasoning

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