EXPERIMENTS

LIST OF EXPERIMENTS

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LEGEND


What to observe


How often


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Basic conditions


Dimensions


Number

Other worksheets and experiment tables can be downloaded from:

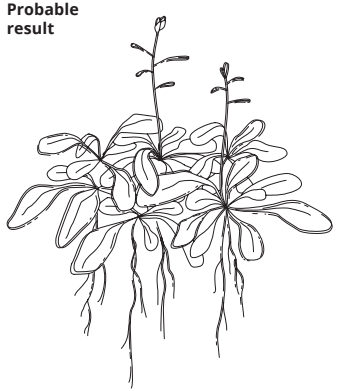
www.albi.eu

1/ COMPETITION AND HOW TO DEAL WITH IT

WHY: Plants seldom grow alone. On the contrary, they frequently have to come to terms with the presence of other plants of both the same and other species and fight for basic and usually limited resources, such as light, water and nutrients.
In order for a plant to be successful, **it must frequently fundamentally change its growth strategy** in line with the place it is growing in.

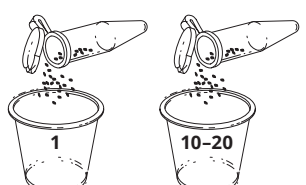
Control plant

Probable result



BASIC CONDITIONS:

Regular recommended light conditions.



Cultivate one plant in one pot and several seeds in the second pot, so that multiple plants grow there. **The more plants, the stronger the competitive pressure.**
There can be up to 20 plants.

WHAT TO OBSERVE:

The plant without any competition: measure the rosette diameter and the number of leaves at least twice a week, later also the stem length.

At the end of the experiment, count to the number of fruits (siliques).

2× a week

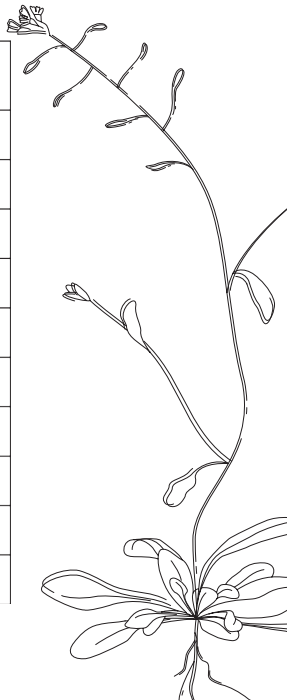
rosette ø
stem length

no. of leaves
no. of fruits

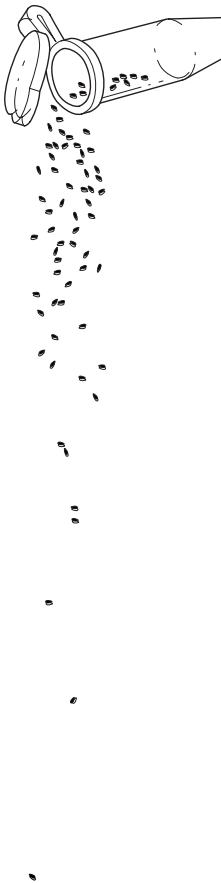
Label a randomly selected plant in the centre of the competition area. The regular measurement of this plant will be more difficult, but **try to measure the same parameters as for the plant that is growing alone.**

Sowing date: _____

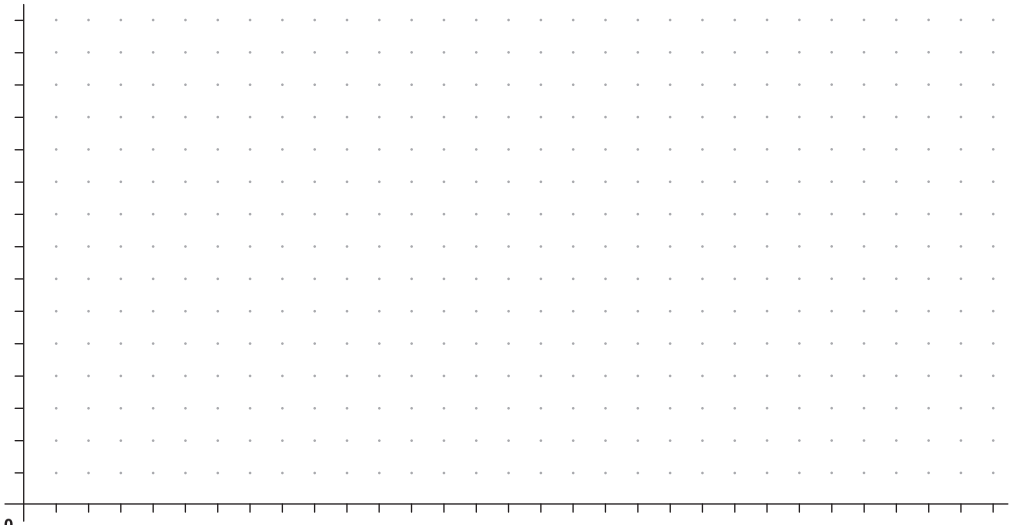
Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length	
	A	B	A	B	A	B



Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length	
	A	B	A	B	A	B

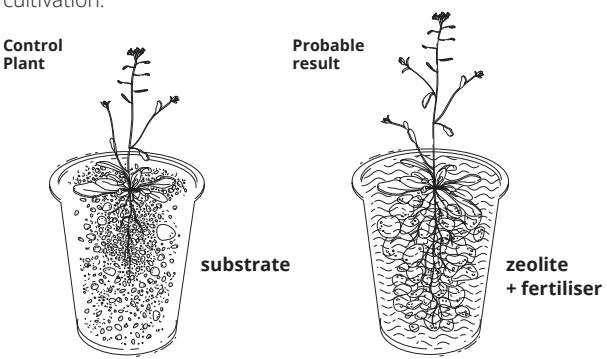


Number of siliques: Plant A _____ Plant B _____


0
Numbers of days from the start of the experiment

HYDROPONICS - A MODERN PLANT CULTIVATION METHOD

WHY: Hydroponics is a **method of plant cultivation without the use of soil**, where the plants acquire their nutrients directly from a mineral solution. The advantages of hydroponics include **faster plant growth**, higher yields, **more effective water and nutrient use** and the option of cultivating plants in environments, where traditional agriculture would be impossible or very difficult. On the other hand, hydroponic cultivation is more demanding, as **it requires greater control of the environment**, such as the pH, the nutrient concentration and the light conditions, and not all plant species are suitable for this type of cultivation.



BASIC CONDITIONS:

Regular recommended light conditions.

Use the pre-moistened zeolite in one chamber. (You can submerge the pot in water up to the edge for several minutes so that the water gets into all the pores. Ideally, the water should contain dissolved fertiliser: choose the concentration according to the fertiliser's instructions. The fertiliser does not come with the kit.) **Use the supplied substrate in the second chamber.** Sow several seeds in both pots. **Sort them after germination and keep only one seedling.**

WHAT TO OBSERVE:
The rosette diameter and number of leaves at least twice a week: Later, the stem length, **the period required for the first flowers to appear**, the number of flowers and later the number of fruits.


2× a week


rosette ø
stem length


no. of leaves
no. of flowers
no. of fruits

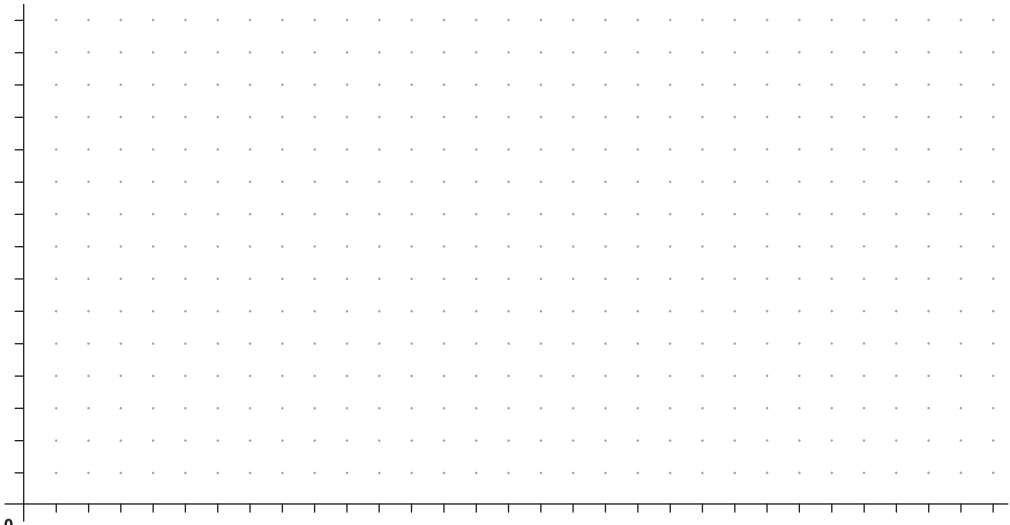
Sowing date: _____

Growth day (measurement day)	**Rosette diameter**		**Number of leaves**		**Stem length**		**Number of flowers**		**Number of fruits**	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Flowering date: Plant A _____ Plant B _____

Time required for the initial flowering: Plant A _____ Plant B _____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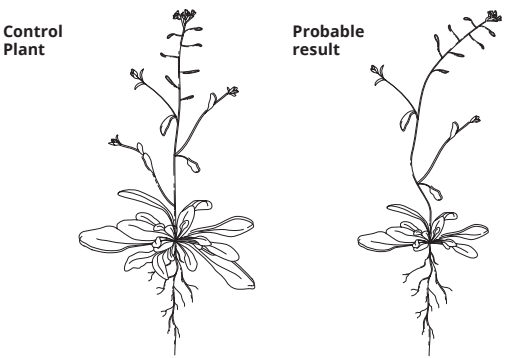
Number of days from the start of the experiment

LIGHT INTENSITY INFLUENCES PLANT GROWTH

WHY: Light plays a critical role in photosynthesis, the process used by plants to transform light energy into chemical energy in the form of glucose, which is then used as fuel for growth and other life processes. **Increased light intensity usually leads to a higher rate of photosynthesis, which can increase the growth rate in** plants, provided other conditions, such as sufficient water and nutrients, are also met. Naturally, **excess light intensity can** exceed the absorptive capacity of the chlorophyll in the plants' photosynthetic centres and may **potentially damage the photosynthetic system**.



BASIC CONDITIONS:

Different levels of light intensity set by changing the distance of the light source from the plant.

One growth chamber has a light ring situated above the pot (more intense lighting), **while the second chamber has its light source located one cube higher.** Always only cultivate one plant in each growth chamber (see p. 15 of the Journal).

WHAT TO OBSERVE:
The main growth parameters twice a week. The light intensity can be measured using an application in your phone.


2× a week


rosette ø
stem length


no. of leaves
no. of flowers
no. of fruits

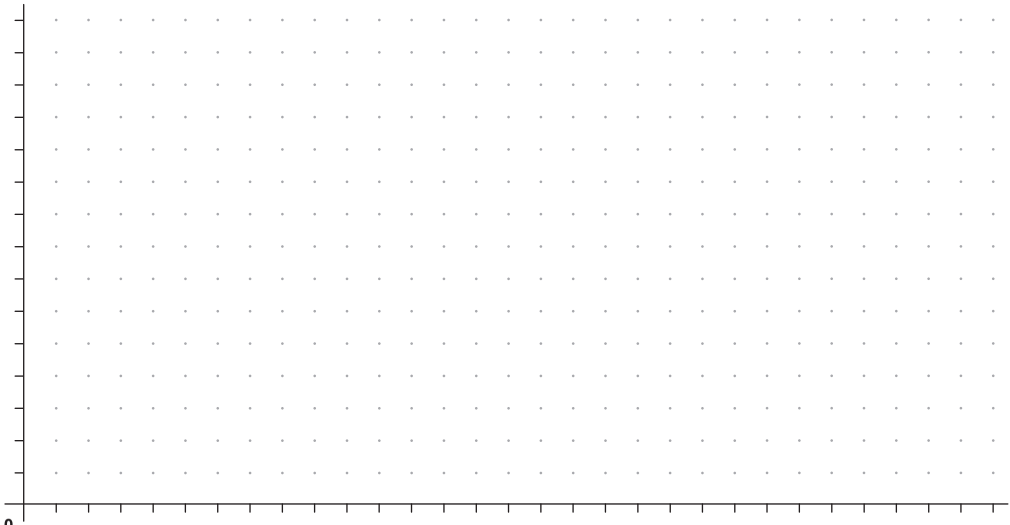
Sowing date: _____

Growth day (measurement day)	**Rosette diameter**		**Number of leaves**		**Stem length**		**Number of flowers**		**Number of fruits**	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Flowering date: Plant A _____ Plant B _____

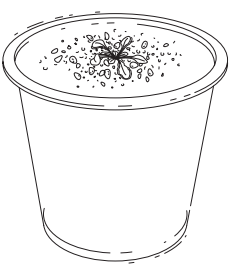
Time required for the initial flowering: Plant A _____ Plant B _____


0
Number of days from the start of the experiment

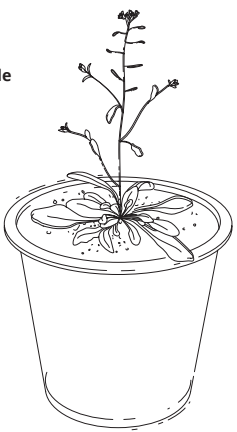
COMPARING THE INFLUENCE OF LIGHT CONDITIONS ON GROWTH OF CRESS IN A ROOM AND IN THE ALBILAB

WHY: Mouse-ear cress can of course also be cultivated under regular room conditions. Each room naturally has differing light conditions and success may also depend on the season when the plant is growing. **That is why a number of experiments must be performed under controlled conditions, which can also be simulated in the kit.** Compare how the mouse-ear cress grows under room conditions and under the controlled conditions.

Control Plant



Probable result



BASIC CONDITIONS:

Grow one plant uncovered and the second under controlled conditions in the AlbiLAB.

Always start with a short day, use the covers and darken all the openings with black tape, if possible, so that no light from the surrounding environment reaches the plant.

WHAT TO OBSERVE:

The main growth parameters at least twice a week. If you are experimenting during the summer months, **also focus on the phenology, i.e. the period when the plants start to grow.**

2× a week

rosette ø
stem length

no. of leaves
no. of flowers
no. of fruits

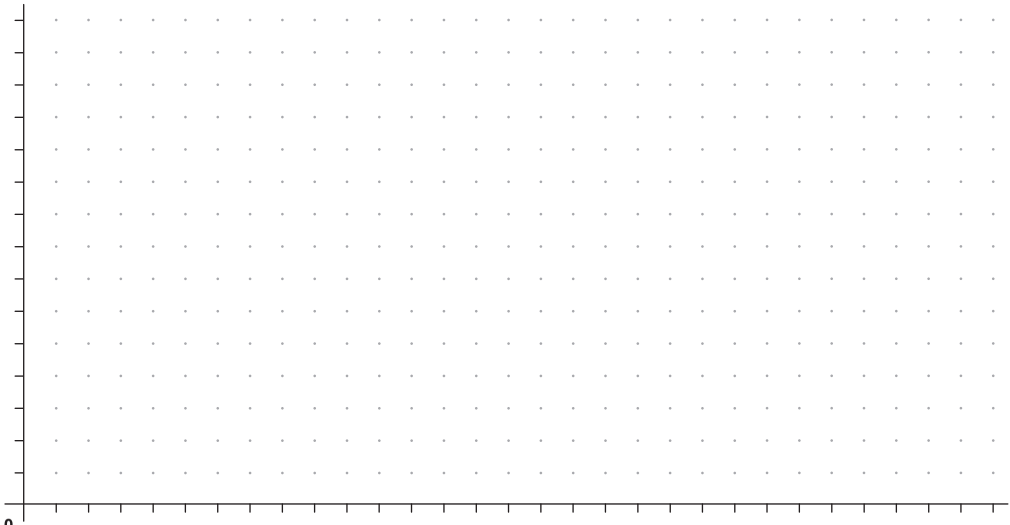
Sowing date: _____

Growth day (measurement day)	**Rosette diameter**		**Number of leaves**		**Stem length**		**Number of flowers**		**Number of fruits**	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Flowering date: Plant A _____ Plant B _____

Time required for the initial flowering: Plant A _____ Plant B _____


0
Number of days from the start of the experiment

HOW LONG CAN A PLANT LAST WITHOUT LIGHT?

WHY: We already know from the previous experiments that light is indispensable for plant growth. **Natural growth conditions are often highly dynamic** and a germinating plant may be completed shaded, for example by a tree branch or a molehill. **How does the plant change its growth strategy in an environment without any light and how long can it survive in such an environment?**

Control Plant

Probable result

BASIC CONDITIONS:

Regular light conditions x no light

Grow seedlings that are approximately three weeks old in each of the growth chambers. Use a regular light regimen in one growth chamber and turn off the light in the second chamber, while also darkening it using the black covers.

WHAT TO OBSERVE:
Watch how the plants in the darkened chamber grow in comparison with the plant in the well-lit chamber. Measure this according to the leaf colour and shape. Measure the period that it takes for the plant without light to die.

daily

- **leaf colour**
- **leaf shape**
- **how long the unlit plant survives**

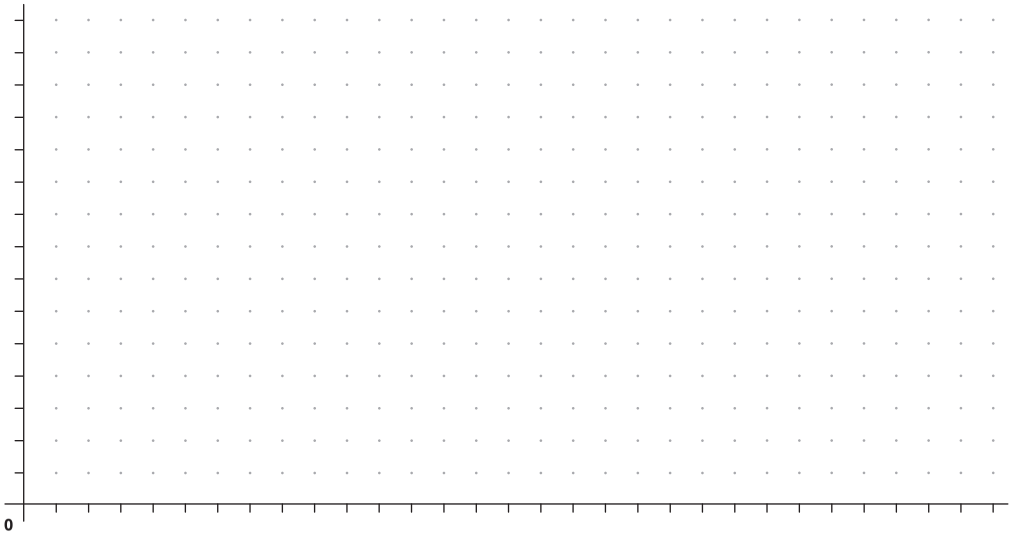
Sowing date: _____

Growth day (measurement day)	**Rosette diameter**		**Number of leaves**		**Stem length**		**Number of flowers**		**Number of fruits**	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Flowering date: Plant A _____ Plant B _____

Time required for the initial flowering: Plant A _____ Plant B _____


0
Number of days from the start of the experiment

THE INFLUENCE OF NUTRIENTS ON PLANT GROWTH AND DEVELOPMENT

WHY: Nutrients, especially nitrogen, phosphorous or potassium, **play an essential role in healthy plant growth and development.** For example, **nitrogen is a key component in chlorophyll**, the pigment that enables plants to perform photosynthesis and thus to transform solar energy into chemical energy. **Potassium** helps plants **effectively absorb nutrients, increases their resistance to disease and helps them regulate the enzymatic reactions that** are essential for healthy growth and development, amongst other things. **Phosphorous is part of DNA, RNA and ATP** (adenosine triphosphate), which is the main energy medium in plant cells.

Control Plant

Probable result

BASIC CONDITIONS:

Regular recommended light conditions.

Grow the plants hydroponically in zeolite without any nutrients **in both growth chambers**. Provide one of the plants with sufficient nutrients according to the fertiliser's instructions, while either giving the second plant no nutrients at all or just a fifth of what the well-fertilised plant receives.

WHAT TO OBSERVE:
The main growth parameters at least twice a week.


2× a week


rosette ø
stem length


no. of leaves
no. of flowers
no. of fruits

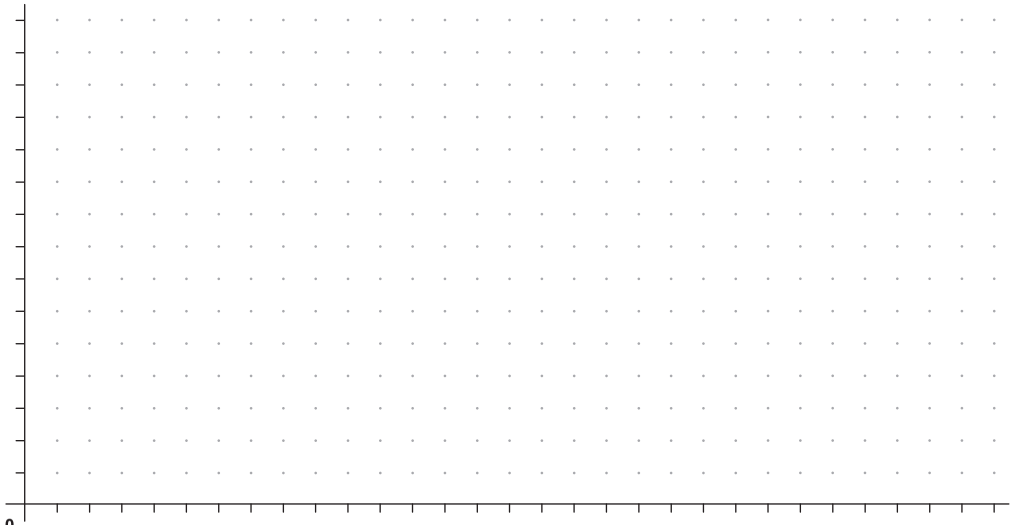
Sowing date: _____

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

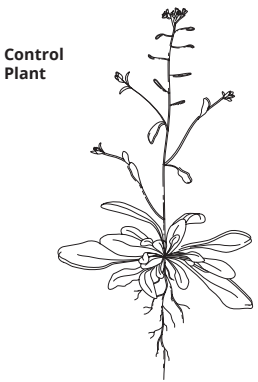
Flowering date: Plant A _____ Plant B _____

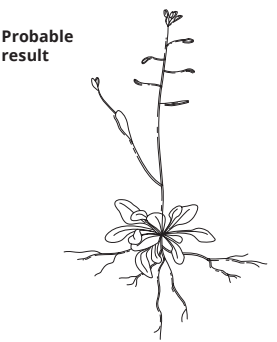
Time required for the initial flowering: Plant A _____ Plant B _____


0
Number of days from the start of the experiment

PLANTS USUALLY DO NOT THRIVE IN ACIDIC SOIL

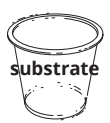
WHY: A frequent environmental problem that you can come across involves soil acidification that can be caused by atmospheric pollution, acid rain and the release of acidic ions from some industrial and agricultural activities. This phenomenon **can have a significant impact on plants and the overall productivity of the ecosystem, because soil acidity influences the accessibility of nutrients and toxic elements in the soil**.





BASIC CONDITIONS:

Regular recommended light conditions.



Carefully acidify the substrate in one of the growth chambers using regular vinegar and measure the resulting pH using the pH strips. **It is important that the soil pH should not drop below 4.5, because extremely acidic conditions can be highly toxic for mouse-ear cress.** Grow the cress in the second growth chamber without any acidification for comparison. The supplied substrate has a pH of 5.5–6.5, which is optimum for mouse-ear cress.

WHAT TO OBSERVE:
The main growth parameters and the **colouring of the leaves** at least twice a week.


2× a week


rosette ø
stem length


no. of leaves
no. of flowers
no. of fruits

TIP: Record the leaf colouring in the **Number of leaves** column using the closest matching colour.

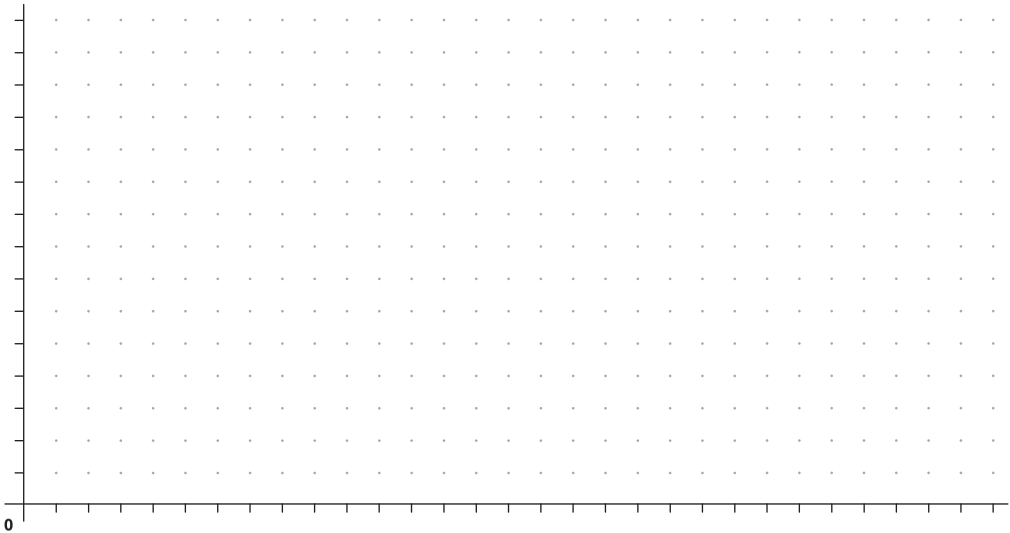
Sowing date: _____

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Flowering date: Plant A _____ Plant B _____

Time required for the initial flowering: Plant A _____ Plant B _____


0
Number of days from the start of the experiment

SOIL SALINITY

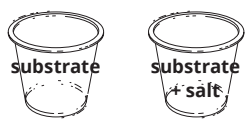
WHY: Soil can come to be salinized under our local conditions due to the salting of roads in winter. **Soil salinity can seriously influence the ability of plants to absorb water**, even though water is readily available, which then leads to stress caused by insufficient water intake **and can significantly limit growth.**

Control Plant

Probable result

BASIC CONDITIONS:

Regular recommended light conditions.



Pour a salt solution (brine) into the pot in one growth chamber, but grow the plant in the second chamber without salinizing the substrate. **It is important for the salt concentration to be sufficiently high, while at the same time not so high as to instantly kill the plant.** For example, mouse-ear cress can bear a NaCl concentration of approximately 125 mM, which roughly corresponds to 7.5 g NaCl per kilogram of soil.

WHAT TO OBSERVE:
The growth parameters and **leaf** colouring at least twice a week.


2× a week


rosette ø
stem length


no. of leaves
no. of flowers
no. of fruits

TIP: Record the leaf colouring in the **Number of leaves** column using the closest matching colour.

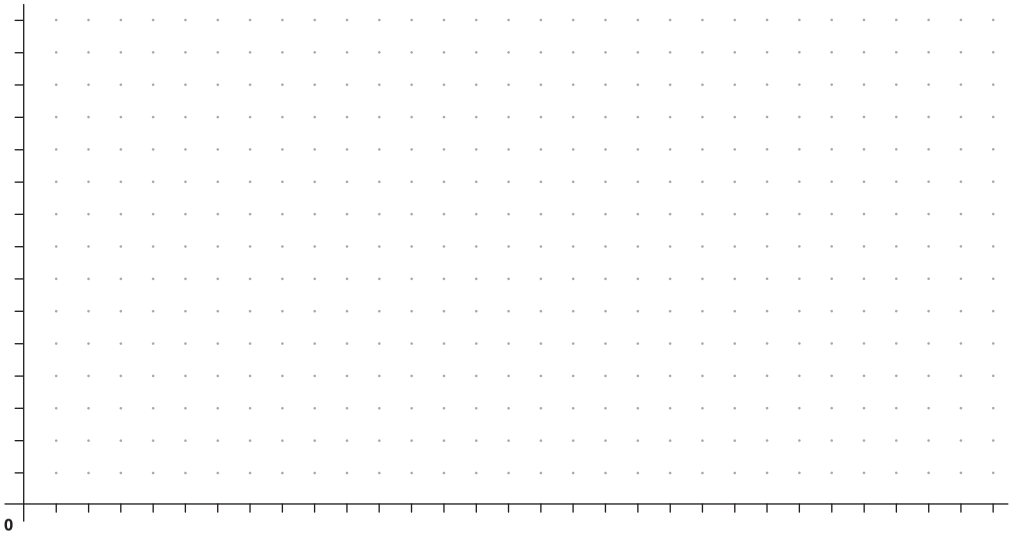
Sowing date: _____

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Flowering date: Plant A _____ Plant B _____

Time required for the initial flowering: Plant A _____ Plant B _____


0
Number of days from the start of the experiment

EXPERIMENT NAME:

Control plant

Probable result

WHY:

BASIC CONDITIONS:

WHAT TO OBSERVE: .....

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.....

.....

.....

.....

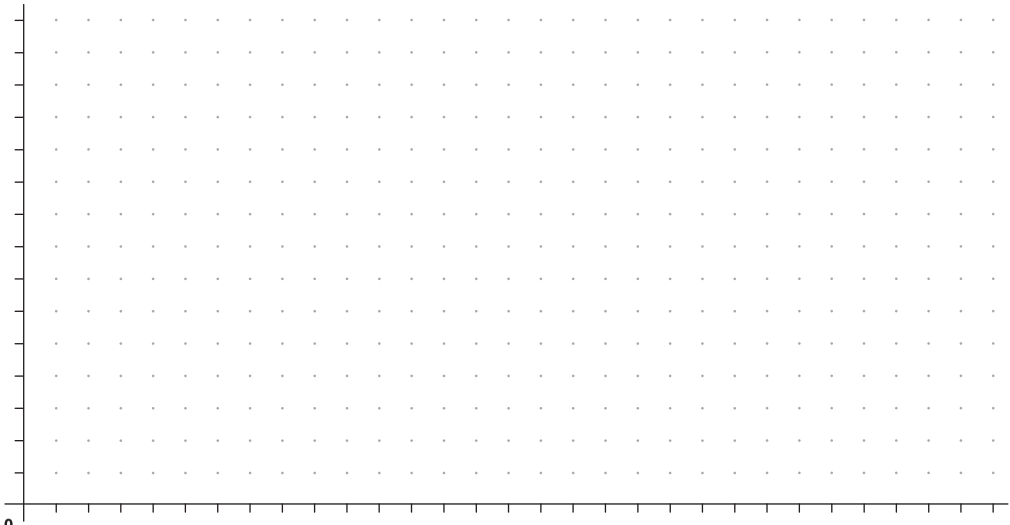
Sowing date: _____

Growth day (measurement day)	**Rosette diameter**		**Number of leaves**		**Stem length**		**Number of flowers**		**Number of fruits**	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Flowering date: Plant A _____ Plant B _____

Time required for the initial flowering: Plant A _____ Plant B _____


0
Number of days from the start of the experiment

EXPERIMENT NAME:

Control plant

Probable result

WHY:

BASIC CONDITIONS:

WHAT TO OBSERVE: .....

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.....

.....

.....

.....

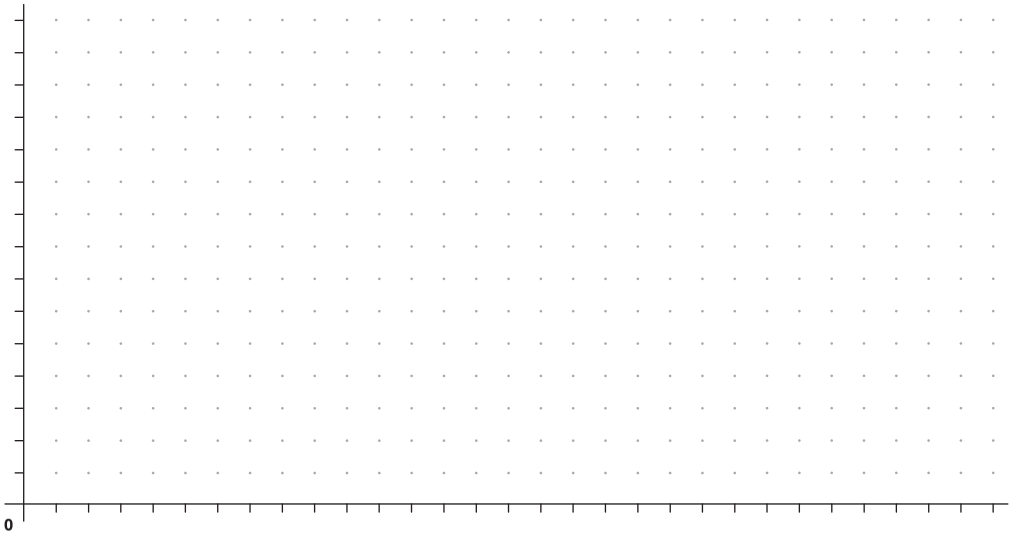
Sowing date: _____

Growth day (measurement day)	**Rosette diameter**		**Number of leaves**		**Stem length**		**Number of flowers**		**Number of fruits**	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Flowering date: Plant A _____ Plant B _____

Time required for the initial flowering: Plant A _____ Plant B _____


0
Number of days from the start of the experiment

EXPERIMENT NAME:

Control plant

Probable result

WHY:

BASIC CONDITIONS:

WHAT TO OBSERVE: .....

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.....

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.....

.....

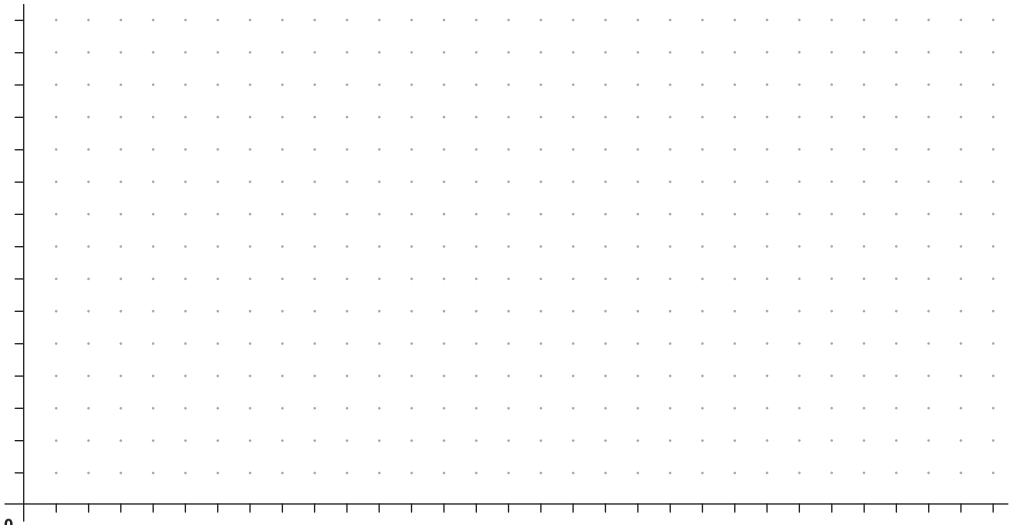
Sowing date: _____

Growth day (measurement day)	**Rosette diameter**		**Number of leaves**		**Stem length**		**Number of flowers**		**Number of fruits**	
	A	B	A	B	A	B	A	B	A	B

Growth day (measurement day)	Rosette diameter		Number of leaves		Stem length		Number of flowers		Number of fruits	
	A	B	A	B	A	B	A	B	A	B

Flowering date: Plant A _____ Plant B _____

Time required for the initial flowering: Plant A _____ Plant B _____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Number of days from the start of the experiment