

The Relationship between the Growth of White Radish Sprout Plant and Shading Time Under Low Total Pressure and the High Pressure of Carbon Dioxide

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Object

To cultivate some plants on Mars.

→To research the relationship between the growth of white radish sprouts and shading time under low pressure and the high pressure of carbon dioxide. To make the same size as the store-bought white radish sprouts.

Background To solve the food problem on the migration project to Mars.

Atmospheric pressure 0.75kpa
Atmospheric composition
CO₂ 95.32%
N₂ 2.7%
O₂ 0.13%

Atmospheric pressure 101.32kpa
Atmospheric composition
N₂ 78.08%
O₂ 20.95%
CO₂ 0.037%

By [Newton] September 2018th

Hypothesis

The best growth is seen when light is shut out for 5 days during a 10-day cultivation period.

Process

- 1.The seeds were soaked in water for 6 hours.
- 2.Absorbent cotton was put in vacuum desiccators, then wetted. 50 seeds were put in regularly, and light was shut out for germination.
3. The seeds which did not germinate were taken out, and the germinated seeds were put in vacuum desiccators. Then the pressure was set for the experiment.
- 4.Shutting out the light was stopped after the set period of time.
- 5.The length of the leaves and stems were measured by caliper, and the masses were measured without their roots by electronic balance.

The distribution of the air

device

Vacuum desiccator

Black mulching sheet

Table1. The distribution of the air

Air	O ₂ [kPa]	CO ₂ [kPa]	N ₂ [kPa]	Total pressure [kPa]
Experiment	10	1	9	20
Atmosphere	21	0.04	78	100



Experimental Results

Condition cultivation period:for 10 days

Experiment (1,3,5,7,and,9 days, and outside)

Temperature:About 22°C、 Illuminance : (Morning) : about 3000lx

(Noon) : About 4800lx (evening) : About 300lx

Table 2 Shading time and the number of measurement

shading time(days)	1	3	5	7	9	5(outside)
The number of measurement	42	40	39	33	32	27

Result :The longer the shading time, the longer the stems.

The longer the shading time, the heavier the masses.

The shorter the shading time, the smaller the leaves

Figure1 Length of the stems

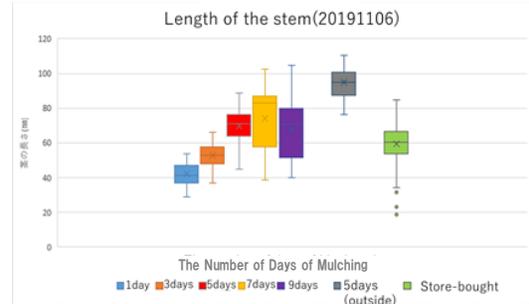


Figure2 Overall masses

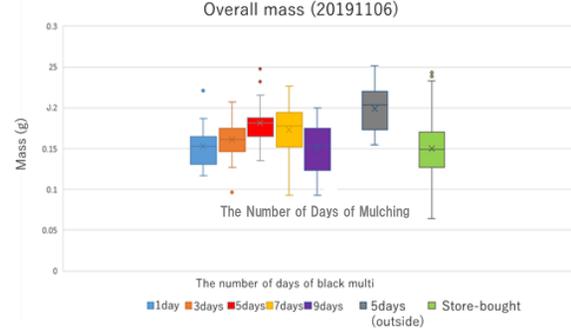
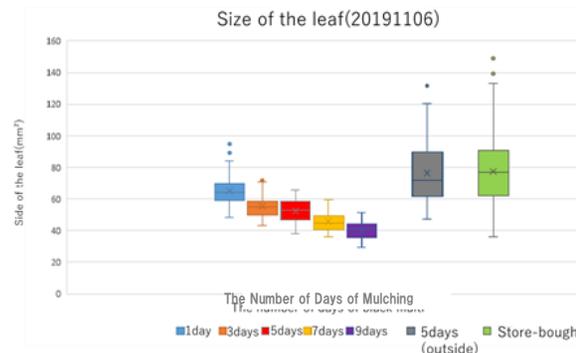


Figure3 Size of the Leaves



Discussion

- The length of the stems and the overall masses grew more when the light was blocked for a long time, but an opposite trend was seen on the leaves.
 - It was related to plant's nature with the light.
- Overall masses didn't grow well when the light was blocked for 9 days.
 - It was related to the leaves being too small.
- There was no difference on the length of the stems when the light was blocked for 5 more days.
 - It was related to the nourishment of the seeds.
- The size of the leaves didn't grow more than the store-bought ones.
 - It was related to the low oxygen concentration.

Conclusion

- White radish sprouts grown under conditions of longer shading time tended to have longer stems and more overall masses, and smaller size of leaves.
- It is difficult to make leaves larger than the store-bought ones.

Future experiments

1. Increase oxygen's partial pressure.
2. Do with reduced pressure during germination.
3. Liquid fertilizer should be used.

References

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