

**GERMINATION RATE OF WHITE RADISH, BUCKWHEAT AND QING-GENG-CAI UNDER  
LOW PRESSURE IN CLOSED ENVIRONMENT**

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(Abstract)

In order to investigate influence of low pressure on a germination of a plant, the germination rates of white radish, buckwheat and qing-geng-cai were measured under low pressure in pure oxygen. The results of germination experiments show that the germination rate of buckwheat is the highest in three species of plant at 4kPa. The tolerance of buckwheat to the low pressure environment is the highest in this stage. Germination rates of buckwheat were also investigated at different temperature. As a result, the germination rate at 20°C was higher than that at 25°C.

(Key words)

Germination, White radish, Buckwheat, Qing-geng-cai, Low pressure, Closed environment, Temperature

**Introduction**

In future space development, space agriculture is necessary for food supply. In the space agriculture, as plants will be cultivated in a low pressured dome, the plant cultivation technique under low pressure is very important.

In the previous experiments, the germination rates of white radish were investigated under low pressure, low oxygen partial pressure and low pressure in pure oxygen [1, 2, 3]. The result of these experiments showed that the germination rate was affected by oxygen partial pressure. From this fact, it was possible to lower total pressure by using only the pure oxygen in the stage of germination. Furthermore, the germination rates of buckwheat and qing-geng-cai were also investigated in pure oxygen for the comparison. Consequently, though the tendency of germination rate of white radish was similar to that of qing-geng-cai, it was different from that of buckwheat.

In this study, the comparison of germination rate of buckwheat at different temperature is conducted.

**The comparison between germination rates under low pressure in pure oxygen**

The germination rates of white radish, buckwheat and quin-geng-cai were measured under low pressure in pure oxygen. The experiment equipment is shown in Fig.1. Six stainless vessels with pressure gage and window made of acrylic resin employed for this experiment. The paper with water was laid on the dish, and one hundred seeds were sown there. The dish was put in the cultivation vessel, and inside of the vessel was decompressed by vacuum pump and injected oxygen. Control sample under the atmosphere was prepared to compare the results. Table 1 shows the condition of this experiment.

Figure 2 shows the result of the experiment under low pressure in pure oxygen. As shown in Fig. 2, the tendency to germination rate of qing-geng-cai is similar to that of white radish. In the cases of buckwheat, the tendency is different from those of white radish and qing-geng-cai. The germination rate

of buckwheat at 4kPa is 66%. This germination rate is the highest in three species of plant. The tolerance of buckwheat to the low pressure environment is the highest in this stage.

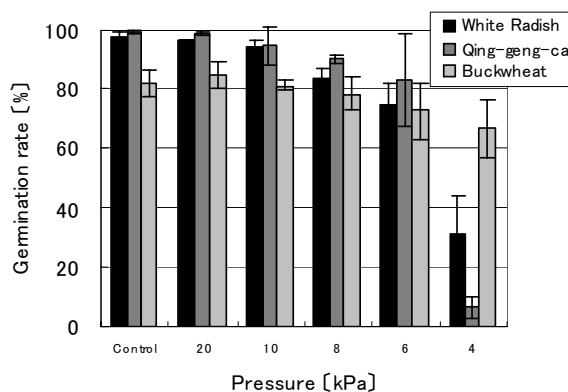
Figure 3 (a) and (b) show the behavior after germination of buckwheat at 4kPa in pure oxygen and qing-geng-cai at 4kPa, respectively. From these pictures, it is clear that there is a difference of the tolerance to the low pressure environment.

**Table 1.** Conditions of the germination experiment in pure oxygen

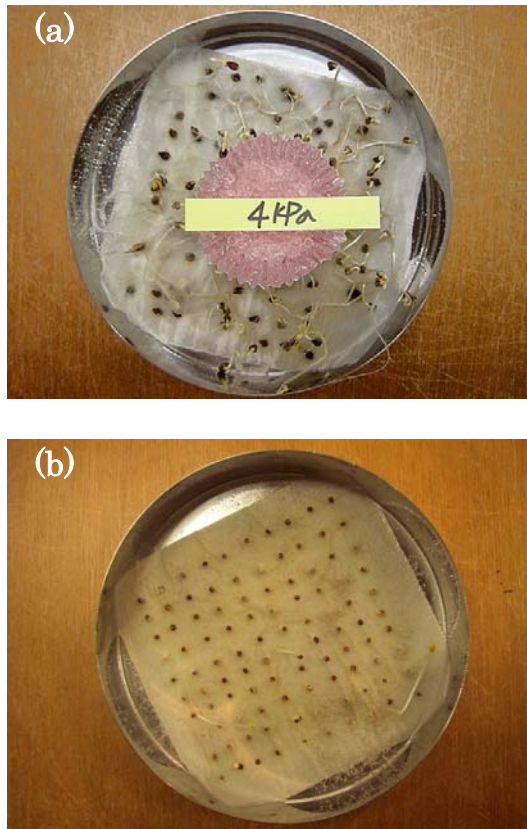
Pressure (kPa)	20, 10, 8, 6, 4
Period (days)	7
Culture medium	Paper and water
Number of samples	100 seeds each vessel



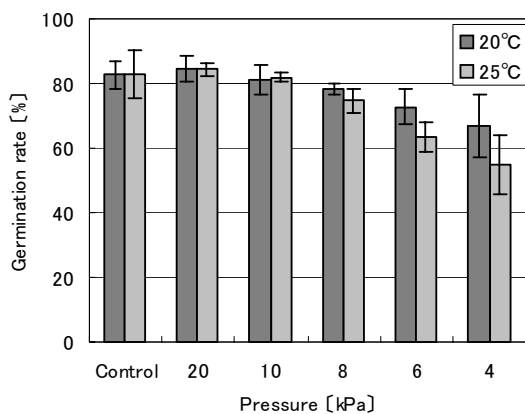
**Figure 1.** Picture of the experiment equipment. The cultivation vessel made of stainless with pressure gage and window for observation.



**Figure 2.** The germination rate of white radish, qing-geng-cai, buckwheat in pure oxygen.



**Figure 3.** The comparison of behavior after germination. (a) Buckwheat at 4kPa. (b) Qing-geng-cai at 4kPa.



**Figure 4.** The germination rate of buckwheat at 20°C and 25°C.

### The comparison of germination rate of buckwheat at different temperature

The germination rate of buckwheat was investigated under low pressure in pure oxygen at 20°C and 25°C. The other experimental conditions were the same as those in the case of the pure oxygen experiment.

Figure 4 shows the result of the germination rate at 20°C and 25°C. As shown in Fig. 4, in the pressure of over 8kPa, the germination rates at 20°C are almost same as those at 25°C. In the pressure of 6kPa or less, the germination rate at 20°C is different from that at 25°C. The germination rate at 4kPa is 67% at 20°C, which is higher than that at 25°C.

### Conclusion

The germination rates of white radish, buckwheat and qing-geng-cai were measured under low pressure in pure oxygen. The tolerance of buckwheat to the low pressure environment is the highest in this stage. Germination rates of buckwheat were also investigated at different temperature. As a result, the germination rate at 20°C was higher than that at 25°C.

### References

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