The Relationship between Herbaceous Plant Age and Rooting Ability

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Abstract

The research was conducted to find the best developmental stage when herbaceous plant cuttings create the most new roots. (※1)　If we can find the best stage to make cuttings of plants, we will apply it to other plant species and help improve productivity in agriculture.　Our hypothesis is that the older parent plants are, the less likely their cuttings will be to create new roots.

(※1) In this study, the best stage is measured by how many days have passed after seeding.

Introduction

Plant cutting is a way to clone plants with the same genes from their parent plants. As far as trees are concerned, it has been proposed that the older parent plants are, the less likely cuttings can create new roots.　However, the relationship between herbaceous plants' age and rooting ability (※2) has not been scientifically proven.　That is why we decided to start this research, to confirm that theory in the case of herbaceous plants. Our purpose is to find the best developmental stage when herbaceous plant cuttings create the most new roots.

(※2) Rooting ability means the plants' potential of rooting.

Hypothesis

Our hypothesis is the same as that in the theory for trees: the older parent plants are, the less likely cuttings will be to create new roots.

Experiment A

The investigation between the age of parent plants and the rooting ability of their cuttings, and measurement of the concentration of the hormone in them.

Method

First, we grew herbaceous plants as parent plants.　We used sweet basil because it is easy to prepare because of its low cost.　And it is also easy to grow and make cuttings. We sowed the seeds every two weeks for eight weeks to get more samples of different ages.　After they grew 5 cm tall, we made cuttings from the top of each rootstock at the same time.　We grew the cuttings in small containers.　Each container was supplied with indole acetic acid solutions of different concentrations : 0 ppm, 0.01 ppm, 0.1 ppm, and 1 ppm.　And by calculating the number of cuttings which rooted over the number of all cuttings, we determined the rooting ability.　Indole acetic acid is a kind of auxin, which is a

plant hormone, and it promotes the growth of plants at a particular concentration. However, at too high a concentration, it suppresses plants' growth. To make use of this characteristic, we measured the concentration of the auxin and calculated the hormone concentration of the plants indirectly.

Result 1

According to result 1, the cuttings of the oldest rootstocks rooted most easily, as more cuttings of the oldest rootstocks rooted than those of any other group. This is contrary to our hypothesis.

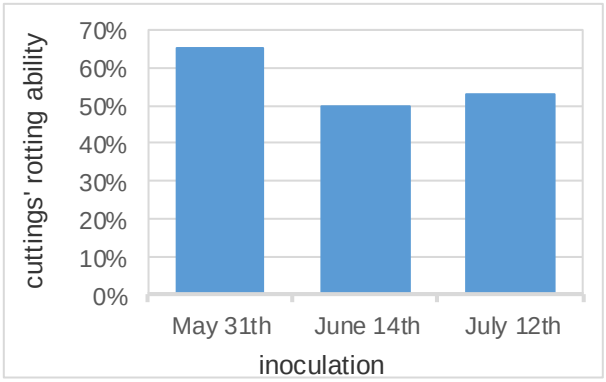

Figure1

Discussion 1

We think the result of Experiment A comes from the fact that the oldest rootstocks were blossoming when we made cuttings. When plants blossom, the hormones such as auxin concentrate at the top of them because of Apical dominance. Since we made cuttings from the top of each rootstock, the cuttings must have contained a large amount of auxin, and this caused the cuttings to grow more roots.

Result 2

Figure 2 shows that all of the youngest rootstocks rooted well at a concentration of 1.0 ppm.

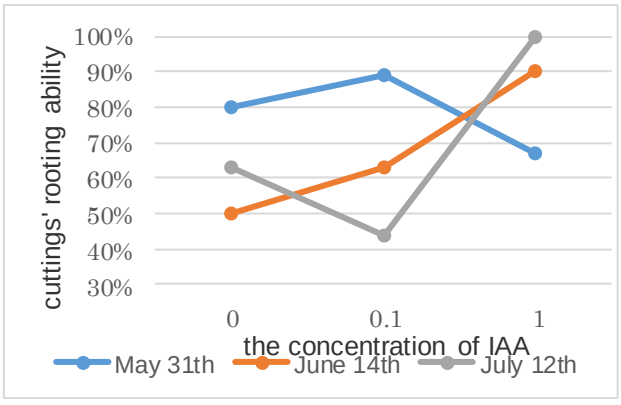

Figure2

Discussion 2

We think there are two causes of the result. One is the young plants' high sensitivity to auxin, and the other is that in young plants, the concentration of auxin was low.

However, we couldn't find the concentration of indole acetic acid at which the growth of

the plants becomes impaired. To determine this, we should conduct experiments using indole acetic acid solution at higher concentrations.

Entire Discussion

The results of Experiment A show that the flowering period of the parent plants might be related to their cuttings' ability to grow roots. However, "the flowering period" is not exactly measured by the age of the plant. To consider the plant age, we realized we need to use perennial herbs.

We conclude that we should have focused on the relationship between the flowering period of the parent plants and rooting ability of their cuttings as we used a short-day plant such as basil. Based on the above findings, we designed the following experiment:

Experiment B

Based on the above findings, we planned a second experiment. Our method is as follows. First, we sowed all the basil-seeds at the same time. Second, we made cuttings from the top of some rootstocks every ten days. We put them in distilled water. This process was performed to determine how many cuttings grew their roots.

In our second experiment, we did not pay attention to the relationship between the concentration of indole acetic acid and the cuttings' rooting ability. This experiment was carried out only to find a relationship between their parent plants' age and their own rooting ability. The purpose of this process was to get more accurate results by increasing the number of cuttings.

Result 3

According to this graph, the 35-day-old group and the 96-day-old group tended to grow their roots easily. 25-day-old group, whose parent plants had just sprouted, did not root very much. We estimated that this was because the cuttings of this group were too young to be considered as normal cuttings, but just a top of the rootstock.

In conclusion, our present study has demonstrated that young or near flowering rootstocks are more suitable to make the cuttings.

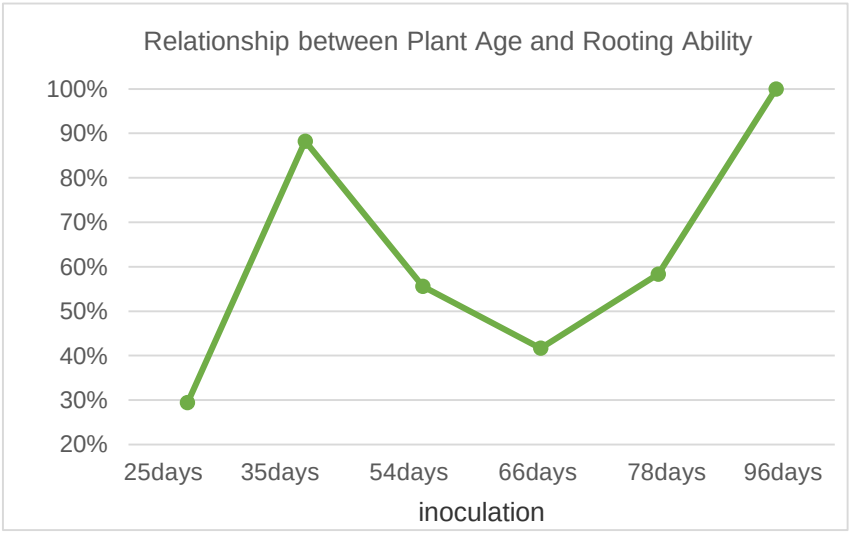

Figure3

Conclusion

In conclusion, the present two studies have determined that younger rootstocks which are not sprouts before flowering tend to create more roots.

References

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