Study on the Cutting Propagation of *Lonicera cuminata* and *Lonicera macranthoides*

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Abstract: With the branches of *Lonicera cuminata* and *Lonicera macranthoides* used as materials, the rooting effects of the cutting season, plant growth regulators and their concentrations and processing time on stem cuttings are investigated. The factors mentioned above the rooting effects of stem cuttings form cutting *Lonicera cuminata* in spring and autumn are better than that of *Lonicera macranthoides*. In spring, cutting propagation the annual hardwood of *Lonicera cuminata* and *Lonicera macranthoides*, best result is 200 mg/L ABT No.1 to 2 h, with *Lonicera cuminata* rooting rate and average root length being 85.6% ~ 98.00%, 17.9 ~ 22.6 mm. *Lonicera macranthoides* rooting rate and average root length were 69.7% and 10.3 mm. In Autumn, cutting propagation the biannual hardwood of *Lonicera cuminata* and *Lonicera macranthoides*, best result is 100 mg/L ABT No.1 with 2 ~ 4 processing hours.

1. Introduction

*Lonicera japonicas* is an entwined semi-evergreen vine shrub of *Lonicera* [1]. The main breeding method of honeysuckle is cutting seedlings, and there are many research reports [3-6]. However, due to the wide variety of *Lonicera* genus, the distribution is wide, the climate, ecological environment and geological background vary greatly, and the habits of different kinds of plants are also different. Breeding ability of *Lonicera* is also very different [7]. At present, there are few reports on cutting propagation techniques of other species of *Lonicera* [7-9]. Due to the low survival rate of four superior materials, the seedling’s number is less, which affects their promotion and development. In this experiment, the four-materials of *Lonicera acuminata* Wall and *Lonicera macranthoides* Hand-Mazz are used as the test materials to study the effects of different cutting periods, auxin types and treatment concentrations on the rooting and survival of different species of Lonicera in open field environment. Plant seedling breeding provides practical technical support.

2. Materials and method

2.1. Materials

The test materials are three excellent materials “Cuilei 001”, “Cuilei 003” and “Dabaihua” and Muchuan County Yizhichun Tea Industry from the dominant population of *Lonicera edulis* in Muchuan County. The superior variant "Cuilei 109" is selected from the variety.

2.2. Method

Cuttings treatment seasons are divided into spring, summer and autumn. Root effect index is
calculated with reference to Zhongying, Ren.[10]. It included rooting rate, root number, root length, etc. Data statistics are performed using Excel software, analysis of variance and multiple comparisons using SPSS data statistics software.

3. Results and analysis

3.1. Effects of different concentrations of ABT on rooting of Lonicera.

Table 1 Effects of different concentrations of ABT in spring on cutting rooting of Lonicera

| Germplasm name | ABT1 concentration (mg/L) | Rooting rate (%) | Number of roots | Length of roots (mm) | Root effect index |
|----------------|---------------------------|-----------------|-----------------|---------------------|------------------|
|                | 100                       | 60.66g          | 19.25d          | 21.3d              | 82.01cd          |
|                | 200                       | 85.60c          | 17.90de         | 23.7a              | 84.74e           |
|                | 300                       | 80.33d          | 14.02g          | 14.7d              | 41.36g           |
| Dabaihua Water (CK) | 53.33h                   | 13.23g          | 12.4ef          | 32.86h             |
| Cuilei 001 Water | 71.33e                    | 21.15c          | 14.9d           | 62.94e             |
| Cuilei 003 Water | 98.00a                    | 17.90de         | 22.4ab          | 80.12d             |
| Cuilei 003 Water | 83.67c                    | 17.49e          | 18.4c           | 64.33e             |
| Cuilei 003 Water | 49.67i                    | 15.74f          | 11.6f           | 36.55h             |
|                | 100                       | 72.00e          | 24.08a          | 18.7c              | 89.87b           |
|                | 200                       | 90.00b          | 22.62b          | 24.5a              | 110.79a          |
|                | 300                       | 77.67d          | 15.82f          | 15.8d              | 50.02f           |
| Cuilei 109     | 100                       | 33.33j          | 8.06j           | 9.3g               | 15.05j           |
|                | 200                       | 69.67f          | 10.34h          | 10.6f              | 21.82i           |
|                | 300                       | 51.33h          | 9.13i           | 9.9g               | 18.06j           |

Note: Different letters in the same column indicate significant differences (P<0.05). Same as below.

In the spring, the biennial branches of 4 parts of Lonicera acuminata Wall and Lonicera macranthoides Hand.-Mazz. are treated with different concentrations of ABT No.1. The rooting conditions of the cuttings are shown in Table 1. It can be seen that the rooting conditions of the two-year-old branches of the four materials of Lonicera acuminata Wall and Lonicera macranthoides Hand.-Mazz. are significantly different.

The rooting effect of four pieces of honeysuckle cuttings treated with 100~300 mg/L ABT No.1 showed high consistency, and the best rooting effect is achieved by soaking with 200 mg/L.

3.2. Effects of different concentrations of ABT on the growth of rooting cuttings of Lonicera.

In the spring, biennial shoots of Lonicera acuminata Wall and Lonicera macranthoides Hand.-Mazz four materials are treated with different concentrations of ABT1, and the growth of shoots and shoots of rooting cuttings are shown in Table 2.

It can be seen from Table 2 that the growth of Lonicera acuminata Wall and Lonicera macranthoides Hand.-Mazz four materials is significantly different from that of living branches.

The results of Table 2 and Table 3 show that the treatment of biennial branches of Lonicera acuminata Wall and Lonicera macranthoides Hand.-Mazz with 200 mg/L ABT1 in spring can significantly promote the rooting and sprouting of cuttings.
Table 2 Effects of different concentrations of ABT on shoot growth of *Lonicera* in spring

| Germplasm name | ABT concentrations(mg/L) | Rooting rate (%) | Number of new shoots (bars) | Length of new roots (mm) |
|----------------|--------------------------|------------------|----------------------------|--------------------------|
| Dabaihua Water(CK) | 52.67g | 4.16b | 358.67 | 358.67 |
| 100 | 58.00f | 3.57b | 161.07c | 161.07c |
| 200 | 83.67c | 2.57cd | 88.73d | 88.73d |
| 300 | 80.00cd | 1.63d | 34.58e | 34.58e |
| Cuilei 001 Water(CK) | 59.33f | 4.85a | 358.77a | 358.77a |
| 100 | 67.00e | 3.38b | 278.36b | 278.36b |
| 200 | 96.67a | 2.43cd | 187.91c | 187.91c |
| 300 | 82.67c | 2.88c | 76.78d | 76.78d |
| Cuilei 003 Water(CK) | 49.00h | 4.33ab | 332.98a | 332.98a |
| 100 | 69.33b | 4.29b | 237.93b | 237.93b |
| 200 | 89.33b | 2.33cd | 152.70c | 152.70c |
| 300 | 77.00d | 2.13cd | 54.83d | 54.83d |
| Cuilei 109 Water(CK) | 20.67j | 4.11b | 191.02c | 191.02c |
| 100 | 32.00i | 3.00c | 142.11c | 142.11c |
| 200 | 68.33e | 2.86c | 84.40d | 84.40d |
| 300 | 52.00g | 1.44d | 32.42e | 32.42e |

3.3. Effects of rooting agents, treatment concentration and treatment time on Rooting of *Lonicera*.

The effects of concentration and time of Different Rooting agents on the rooting of lignified branches of *Lonicera acuminata* Wall and *Lonicera macranthoides* Hand.-Mazz are shown in Table 3.

The extreme difference analysis shows that the materials, rooting agent, treatment concentration and treatment time have significant effects on the root effect index of cuttings. The greater the extreme difference R of the mean K of each factor is, the higher the effect of the factor on the root effect index is; the greater the mean K of different levels of the same factor is, indicating that this level of the factor has a higher impact on the root effect index.

Table 3 Effects of rooting agent types, concentration and time on Rooting of *Lonicera* in autumn

| Treatment name | Germplasm name | Rooting agent | concentration (mg/L) | Treatment time (h) | Rooting rate (%) | Number of new shoots (bars) | Length of new roots (mm) | Root effect index | Number of new shoots (bars) |
|----------------|----------------|---------------|----------------------|-------------------|-----------------|-----------------------------|------------------------|-----------------|----------------------------|
| 1              | Cuilei 001     | NAA           | 100                  | 2                 | 70.67           | 8.70c                       | 231.3b                 | 40.25b          | 4.52a                      |
| 2              | Cuilei 001     | IBA           | 200                  | 4                 | 78.67           | 10.95b                      | 109.1f                 | 23.88d          | 4.19a                      |
| 3              | Cuilei 001     | ABT1          | 300                  | 6                 | 46.67           | 5.06g                       | 190.0c                 | 19.23f          | 4.89a                      |
| 4              | Cuilei 003     | NAA           | 200                  | 6                 | 72.33           | 9.00c                       | 196.5c                 | 35.36c          | 3.30b                      |
| 5              | Cuilei 003     | IBA           | 300                  | 2                 | 86.00           | 11.91a                      | 135.6e                 | 32.29c          | 2.74c                      |
| 6              | Cuilei 003     | ABT1          | 100                  | 4                 | 91.00           | 12.40a                      | 286.8a                 | 71.13a          | 3.89b                      |
7 Cuilei 109 NAA 300 4 56.67 6.00f 103.4f 12.40g 5.11a
8 Cuilei 109 IBA 100 6 61.00 8.04d 136.4e 21.94e 3.48b
9 Cuilei 109 ABT1 200 2 58.00 7.25e 183.8d 26.66d 5.00a
K1 27.79b 29.34b 44.4a 33.07a
K2 46.26a 26.04c 28.63b 35.80a
K3 20.33c 39.00a 21.31c 25.51b
R 25.93 12.96 23.13 10.29

4. Conclusions
In the summer of this experiment, *Lonicera acuminata* Wall and *Lonicera macranthoides* Hand.-Mazz. open field cuttings are carried out. In the absence of any shading and fertilizer management, the highest survival rate of all processed cuttings is only 2.68%. Because the test site is located at the top of the mountain at an altitude of 1200 m, the soil layer is shallow and the local summer is hot, and the cutting seedlings are extremely difficult to survive under natural conditions. Therefore, it is not suitable for cutting seedlings in the natural conditions of the area in summer.

In the spring cutting test, the survival rate and rooting quality of the cuttings treated with different concentrations of ABT No.1 are better than that of the clear water control. When ABT No.1 is 200 mg/L, the survival rate of the four materials of *Lonicera* is the highest, and is significantly higher than other concentrations. Among them, “Cuilei 001” has the highest rooting rate when treated with 200 mg/L ABT No.1; “Cuilei 003” had the best rooting quality when treated with 200 mg/L ABT No.1; “Dabaihua” had the highest rooting rate and rooting quality when treated with 200 mg/L ABT No.1, which is 2.27 times and 1.39 times of the water control respectively; the "Cuilei 109" cuttings are the most sensitive to ABT No.1. As the concentration of ABT No.1 increases, the inhibition of the number and length of new shoots gradually increases, but it can increase its survival rate. It is also found that there is no significant difference in the growth of all treated plants after 180 days of cutting, indicating that the inhibitory effect of ABT No.1 rooting powder on cutting new shoots is no longer apparent in the late growth stage, and the reasons need further study.

In the autumn, cuttings *Lonicera acuminata* Wall and *Lonicera macranthoides* Hand.-Mazz with lignified branches are consistent with the rooting effect of spring cutting. The rooting and seedling formation of cuttings varied with the type of material. The rooting ability of *Lonicera acuminata* Wall is stronger than that of *Lonicera macranthoides* Hand.-Mazz. ABT promotes rooting effect better than NAA and IBA and 100 mg/L of ABT rooting agent soaking treatment cuttings with 2~4h has good rooting effect.

The results of this experiment showed that the roots of the spring and autumn cuttings of "Cuilei 109" belonging to the *Lonicera hypoglauca* are lower than those of "Cuilei 001", "Cuilei 003" and "Dabaihua" belonging to *Lonicera acuminata* Wall. The biannual shoots of Lonicera genus in spring are treated with 200 mg/L ABT No.1, and the hardwood shoots in the autumn are treated with 100 mg/L ABT No.1 for 2~4h. *Lonicera* is not suitable for cutting seedlings under natural conditions of summer in open field.

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