

Plant Hormones Affected Florescence of *Rhododendron delavayi* Franch

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Introduction

One hundred miles of natural *Rhododendron* (Bailidujuan) in western Guizhou (China) locates in latitude 27°17' to 27°20'N, longitude 105°50' to 106°00'E and elevation 1,500 to 1,900m. It has dry and chilly spring, wet and warm summer, annual mean temperature at 11.8C, extreme low temperature at -10C, and annual precipitation 1,180mm. When Bailidujuan is in full bloom, it attracts many scientists and thousands of visitors to explore and enjoy this natural wonder (Fig.1). *Rh. delavayi* is a dominant species in bailidujuan forests and it is a beautiful ornamental plant with attractive red flowers (Fig. 1 & 2). To extend its flowering duration and bring more visitors, growth regulators were sprayed on its foliage since November. The applications should improve florescence and better promote Bailidujuan as one of the popular tour destinations in Guizhou, China.

Objectives

- Effect of individual hormones on flowering of *Rh. delavayi*.
- Effect of hormone combinations on flowering *Rh. delavayi*.
- The better treatment for extending flowering of *Rh. delavayi*.



Figure 1: Attractive flowers (left), full bloom, and mature plants (right) of *Rh. delavayi*.

Materials & Methods

Exogenous hormones, GA₃, Ethephon (ET), Daminozide (DA), and 2,4-D (The 4th Chemical Factory, Shanghai, China), with various concentrations were sprayed on foliage of *Rh. delavayi* during flower bud initiation or right before flowering. Hormone combinations, GA+DA, GA+2,4-D, ET+DA, and ET+2,4-D, were also applied with mineral water as the control. Plants were sprayed during 9-11am on the 27th September 2008 and the 10th February 2009, respectively. Each treatments were repeated three times and data to the flower initiation, full bloom, and senesce was recorded and the numbers of flowers were counted. The flower initiation stage was defined as the 1st flower into bloom. The full bloom was between 25% and 100% flowering and senesce stage was the 25% or more flowers wilted.

Table 1: Effect of GA₃ and its combinations on flowering time of *Rh. delavayi*.

| Hormone (mg·L ⁻¹) | Bud Initiation (day) | | | Right before Flowering (day) | | |
|-------------------------------|----------------------|------------|---------|------------------------------|------------|---------|
| | Fl. Initiation | Full Bloom | Senesce | Fl. Initiation | Full Bloom | Senesce |
| Control | 0 | 9 | 0 | 0 | 10 | 0 |
| GA(50) | -2 | 10 | -1 | -2 | 10 | -3 |
| GA(100) | -1 | 10 | +2 | -3 | 10 | -3 |
| GA(200) | -4 | 11 | +1 | -14 | 12 | -6 |
| GA(400) | -8 | 13 | 0 | -12 | 13 | -4 |
| GA(100)+2,4-D(50) | 0 | 12 | +1 | 0 | 11 | +1 |
| GA(100)+2,4-D(100) | 0 | 12 | 0 | -3 | 12 | +2 |
| GA(100)+2,4-D(200) | -3 | 12 | +2 | -3 | 12 | +4 |
| GA(100)+DA(50) | +1 | 13 | +4 | -2 | 11 | +2 |
| GA(100)+DA(100) | +5 | 11 | +3 | -4 | 12 | +2 |
| GA(100)+DA(200) | +8 | 12 | +3 | -5 | 12 | +3 |

Results & Discussion:

Hormones did significantly influence the flowering duration and the longest extension of full bloom was five days longer than the regular 9 to 10 days of blossom. The results indicated that the initiation of flowering of wild *Rh. delavayi* was early, when the solution were sprayed at the bud initiated stage. As the GA₃ concentrations increased, both full bloom days and entire flowering season were significantly extended (Table 1). GA₃+2,4-D combination ensured earlier flowering and also sped up flower deceases. Therefore, it had no significant effect on the full bloom time and flowering duration. When applying hormones right before the flowering period, GA₃ had better effect on extending flowering season. After treated with GA₃ of 200 mg·L⁻¹, plants flowered about 14 days earlier. However, it also caused the flowers senesced 6 days earlier. The combined hormone treatments worked better (Table 1).

Table 2: Effect of ethephon and its combinations on flowering time of *Rh. delavayi*.

| Hormone (mg·L ⁻¹) | Bud Initiation (day) | | | Right before Flowering (day) | | |
|-------------------------------|----------------------|------------|---------|------------------------------|------------|---------|
| | Fl. Initiation | Full Bloom | Senesce | Fl. Initiation | Full Bloom | Senesce |
| Control | 0 | 9 | 0 | 0 | 10 | 0 |
| ET(200) | -1 | 11 | +1 | -2 | 11 | +1 |
| ET(400) | -1 | 10 | +2 | -4 | 8 | +1 |
| ET(500) | -2 | 8 | +2 | -4 | 11 | +2 |
| ET(500)+2,4-D(50) | -2 | 12 | +3 | -1 | 10 | -1 |
| ET(500)+2,4-D(100) | -2 | 11 | +1 | -2 | 9 | -2 |
| ET(500)+2,4-D(200) | -3 | 11 | +1 | -4 | 12 | -2 |
| ET(500)+DA(50) | 0 | 11 | +1 | -4 | 12 | 0 |
| ET(500)+DA(100) | -1 | 12 | +3 | -4 | 13 | +2 |
| ET(500)+DA(200) | -4 | 13 | +5 | -5 | 12 | +3 |

Results & Discussion (cont'd):

Ethephon had the similar effect as the GA₃, but not significant on full bloom days. As ET concentrations went up from 200 to 500 mg·L⁻¹, flowering period could be lasted from two weeks to three weeks (Table 2). The combination of ET(500)+DA(200) had better results. In general, application of hormones right before the flowering seasons worked better than that of the flower bud initiation stage (Table 1 & 2). Number of flowers per branches increased and decreased significantly based on the treatments. GA₃ of 200 mg·L⁻¹ alone or mixed with daminozide of 200 mg·L⁻¹ produced 120 or 130 flowers per branch, regardless of application stages (Table 3). Among all treatments, the combination of GA₃+daminozide has better effect on flowering period (including full bloom) & no. of flowers.

Table 3: Effect of hormones on number of flowers per branch of *Rh. delavayi*.

| Hormone (mg·L ⁻¹) | Number of Flowers | | Hormone (mg·L ⁻¹) | Number of Flowers | |
|-------------------------------|-------------------|------------------------|-------------------------------|-------------------|------------------------|
| | Bud Initiation | Right before Flowering | | Bud Initiation | Right before Flowering |
| Control | 80 | 105 | GA(100)+2,4-D(200) | 90 | 100 |
| GA(50) | 80 | 70 | ET(500)+2,4-D(50) | 80 | 80 |
| GA(100) | 85 | 90 | ET(500)+2,4-D(100) | 70 | 60 |
| GA(200) | 120 | 130 | ET(500)+2,4-D(200) | 100 | 80 |
| GA(400) | 130 | 120 | GA(100)+DA(50) | 80 | 85 |
| ET(200) | 80 | 90 | GA(100)+DA(100) | 100 | 90 |
| ET(400) | 90 | 80 | GA(100)+DA(200) | 120 | 120 |
| ET(500) | 100 | 100 | ET(500)+DA(50) | 80 | 65 |
| GA(100)+2,4-D(50) | 60 | 55 | ET(500)+DA(100) | 90 | 100 |
| GA(100)+2,4-D(100) | 85 | 80 | ET(500)+DA(200) | 100 | 110 |



Figure 2: Full bloom plants of *Rh. delavayi*.

Conclusion:

The florescence of natural communities of *Rh. delavayi* could be regulated and the combination of GA₃+ Daminozide is recommended. It extended full bloom time and flowering duration regardless of application stages. Number of flowers per branch greatly increased under this combination. With proper management, we could double the bloom days and bring twice as many tourists to Bailidujuan. Further studies should focus on the mechanism of hormones on flowering of *Rh. delavayi*.

Reference:

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