

Effects of Different Treatment Methods on Seed Germination of Kiwifruit

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Abstract. In order to break the dormancy of kiwifruit seed, accelerate the process of seed germination, to understand the effects of different treatment methods on the germination of kiwifruit seeds. Different treatment methods were set up in this study. The results showed that GA₃ soaked for 18h can make seeds break the dormancy; when only the filter paper is placed on the petri dish, the germination rate is the highest: the most suitable disinfection time is 10min. After dark conditions, the seed germination rate was 73.3%, which was much higher than that under non-dark conditions. In certain range, the higher the concentration of GA₃, the higher the germination rate of kiwifruit seeds.

1. Introduction

This experiment studied the factors affecting the germination of *A. delicious* kiwifruit seeds and explored the germination characteristics of seeds to increase the germination rate of seeds. By comparing the germination potential and germination rate of each treatment, the best method to break the seed dormancy and promote its germination was selected.

2. Materials and Methods

2.1. Material

A. delicious kiwifruit seeds

2.2. Methods

2.2.1 Effects of GA₃ Soaking Time on Germination Rate of *A. delicious* Kiwifruit Seeds. Seeds were soaked in 2.5 g/L GA₃ for 0 h, 6 h, 12 h, 18 h, and 24 h, respectively. Treated 3 times, 30 seeds each time. The seed germination was observed and the germination rate of each treatment was counted after 10d.

2.2.2 Effect of different germination methods on germination rate of *A. delicious* kiwifruit. Use three germination methods: 1) place the seeds on a petri dish covered with wet filter paper; 2) place the seeds on a petri dish with MS covered with a layer of filter paper; 3) The seeds were placed on MS supplemented with 1 mg/L GA₃ and covered with a layer of filter paper. Each treatment was repeated 3 times, 30 seeds each time.



2.2.3 Effect of disinfection time on germination rate of *A.delicious* kiwifruit seeds. Sterilized with 10% NaClO for 5 min, 10 min, 15 min, and 20 min, respectively, and washed four times with sterile water. Repeat the treatment 3 times, 30 seeds each time.

2.2.4 Effect of dark treatment on the germination rate of *A.delicious* kiwifruit seeds. Six times, 30 seeds were used each time, and the petri dish was placed in a tissue culture room at a temperature of 23°C to 27°C, three times of dark culture, and three times of light culture at a photoperiod of 8 hours. The seed germination status was observed and the germination rate under each treatment condition was counted after 10 days.

2.2.5 Effect of different concentrations of gibberellin on germination rate of *A.delicious* kiwifruit seeds. Seeds were soaked in lukewarm water for 1 hour, and then placed in clear water and GA₃ at concentrations of 0.02%, 0.04%, 0.06%, and 0.08%, and were repeated 3 times, 30 seeds each time. The germination rate was counted every two days.

3. Results and Analysis

3.1. Effects of GA₃ soaking time on germination rate of *A.delicious* kiwifruit seeds

Soaking GA₃ solution can significantly increase the germination rate of kiwifruit seeds. As can be seen from Figure 1, the germination rate of seeds soaked in GA₃ after 12h and 18h is high, all of which are above 60%. The germination rate without GA₃ soaking is only 20%. The results showed that for the *A.delicious* kiwifruit, 2.5g/L GA₃ solution soaked for 18h can achieve the ideal effect of breaking the dormancy of kiwifruit.

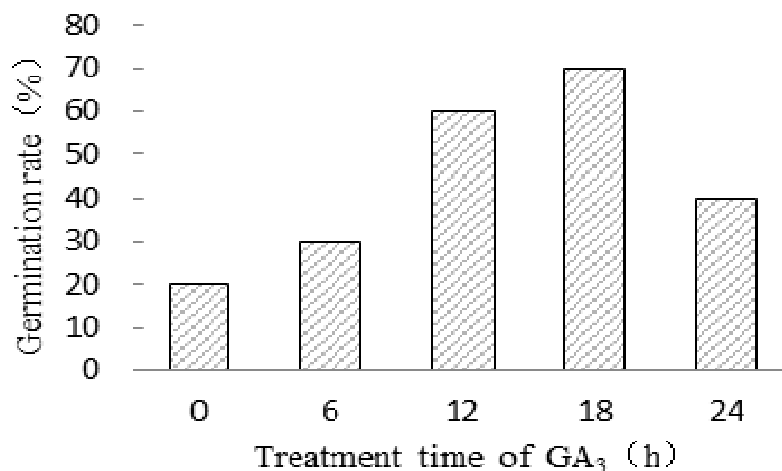


Fig. 1 Effect of GA₃ soaking time on germination rate of kiwifruit

3.2. Effect of different methods on germination rate of *A.delicious* kiwifruit seeds

As can be seen from Figure 2, when the petri dish was only covered with a layer of moist filter paper, the 'fruitful' kiwifruit seeds had the highest germination rate of 76.7%. MS and MS containing 1 mg/LGA₃ did not affect the germination rate of the seeds. The addition of 1 mg/L GA₃ to the medium had little effect on the seed germination, indicating that the seeds of the kiwifruit had been able to break the dormancy of the seeds after soaking for 12 h in the 2.5 g/L GA₃, and the ideal germination effect was achieved.

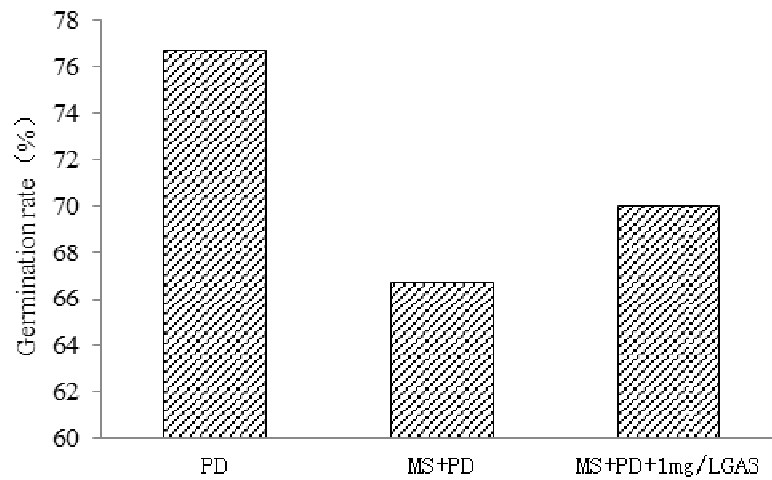


Fig. 2 Effect of different germination methods on germination rate of kiwifruit

3.3. Effect of disinfection time on germination rate of *A.delicious* kiwifruit seeds

The longer the disinfection time, the lower the germination rate. According to Fig. 3, only the kiwifruit that had been sterilized for 5 minutes had the highest germination rate, reaching 60%. However, it was found that there was less contamination in the test. Therefore, the disinfection time should be 10 minutes, which can ensure high germination rate, avoid pollution, and increase efficiency.

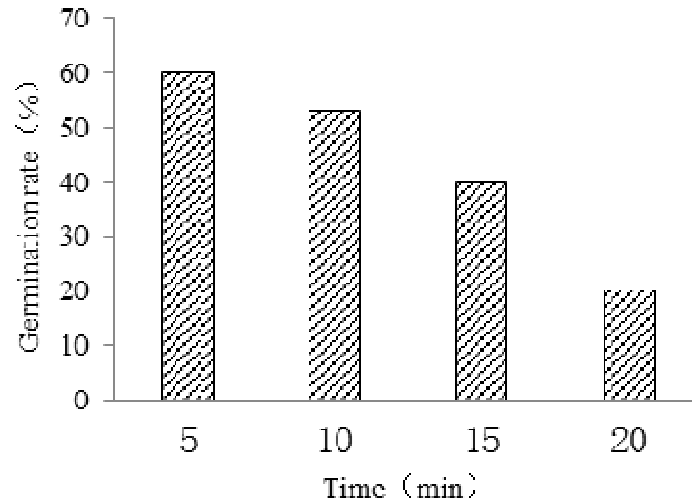


Fig. 3 Effect of disinfection time on germination rate of *A.delicious* kiwifruit seeds

3.4. Effect of dark treatment on the germination rate of *A.delicious* kiwifruit seeds

Figure 4 shows that the germination rate of kiwifruit seeds after dark treatment was 73.3%, which was much higher than the seed germination rate when not dark. Under dark processing conditions, there is a higher germination rate and energy is saved, so dark processing is used.

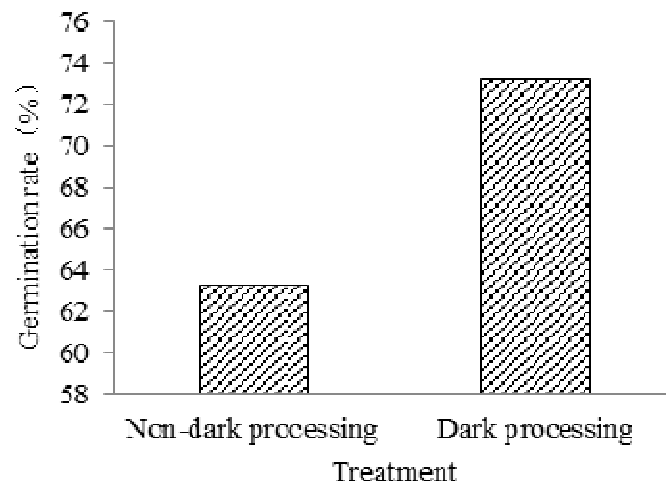


Fig. 4 Effect of dark treatment on germination rate of kiwifruit seeds

3.5. Effect of different concentrations of GA_3 on germination rate of *A. delicious* kiwifruit seeds

That treatment of kiwifruit seeds with GA_3 significantly increased the seed germination rate and germination potential, shortened the seed germination time. The germination rate of seeds not treated with GA_3 was significantly lower than that of seeds treated with GA_3 , but this difference gradually decreased over time. Figure 6 shows that within a certain range, the higher the concentration of GA_3 , the higher the germination rate of kiwifruit seeds. It indicates that GA_3 can effectively break the dormancy of kiwifruit seeds and significantly increase the seed germination rate.

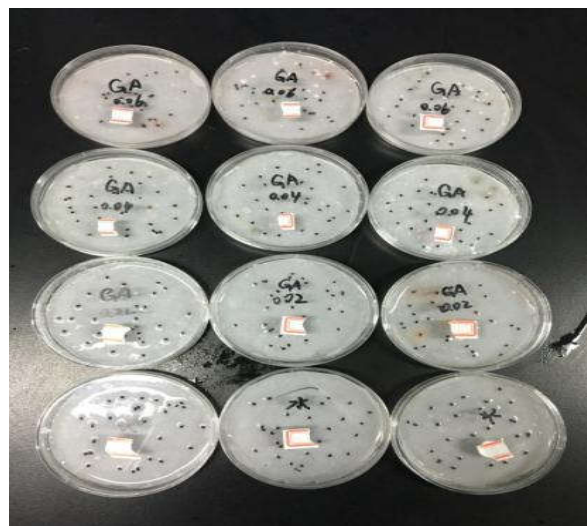


Fig. 5 Seeds treated with different concentrations of gibberellin

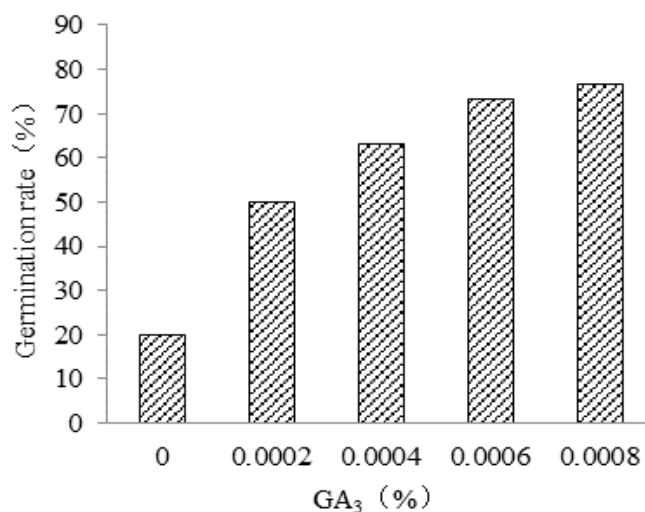


Fig. 6 Effect of different concentrations of GA₃ on germination rate of kiwifruit seeds

4. Conclusion

Different treatments have a great influence on the germination of kiwifruit seeds. Treatment of kiwifruit seeds with GA₃ can break dormancy, promote seed germination, and increase germination rate. The effect of different concentrations on the treatment of kiwifruit seeds is not obvious, with 0.06% and 0.08% being the best. It was found that high germination rates were obtained by soaking seeds with GA₃ for 18 h, disinfecting with 10% NaClO for 10 min, and Dark culture in a petri dish covered with a layer of moist filter paper gave higher germination rates.

Zhu Daoxie and other studies have shown that treatment of kiwifruit seed with 2.5 g/L GA₃ can break dormancy within 5 hours, and the germination rate is above 95%. And Zhou Yanling et al found that the optimal time for soaking seeds of GA₃ was 8 h. In this study, the highest germination rate was reached when the GA₃ was soaked for 18 h. The previous research results are not consistent with the results of this paper, the reason may be that the materials used are different and the basic conditions for the tests are different. In addition, tissue culture experiments using seeds as materials also need to consider the pollution problem. The commonly used disinfectant for kiwifruit seed is NaClO, When the disinfectant concentration is too high or the disinfection time is too long, it is easy to cause damage to the seeds. Zhu Daoyu used a 10% NaClO to study the effect of different disinfection times on the results and found that the disinfection effect could be achieved within 10 minutes. This is consistent with the results of this study.

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