Research on the Effects of Silicon on Regeneration of Kiwifruit Callus

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***Abstract*—The stems of *Actinidia Qinmei* were taken as explants and induced callus formation. On the screened optimal medium, the different concentrations of silicon were added into the media to screen optimal concentrations of silicon on regeneration and rooting of Kiwifruit callus. The results showed that rate of regeneration and rooting of Kiwifruit callus can be enhanced distinctly in proper concentration of silicon.**

Keywords—Kiwifruit, silicon, callus, plantlet regeneration

I. INTRODUCTION

Kiwifruit (*Actinidia Qinmei*) is of medical and economic value woody plant. Its cultivation breeding technology has been paid high attention. Traditional seedling propagation of kiwifruit due to time consuming, low survival rate and unstable properties, could not meet the requirements. The tissue culture became an important way to rapid propagation of Kiwifruit [1]. In this paper, the different concentrations of silicon were added into the media to establish optimal concentrations of silicon on regeneration and rooting of Kiwifruit callus, lay a foundation for studying the mass production, genetic transformation and the variety improvement of Kiwifruit.

II. METHODS

A. Callus Induction

The stems were washed with tap water for 2h, dipped in 70% ethanol for 30s, surface sterilized with 0.1% HgCl2 for 12min and then rinsed thoroughly (3~5times) with sterile distilled water. The stems were cut (1~1.5cm in length) and inoculated on MS medium (25mL) in Erlenmeyer flasks (100mL). The induction medium was MS containing 3% (W/V) sucrose and 0.8% (W/V) agar, 0.5 mg/L 6-BA, 0.1 mg·L-1NAA, and the pH was adjusted to 5.8 with NaOH or HCl solution before autoclaved at 121℃for 20 min. Erlenmeyer flasks were sealed with aluminum foil paper. The cultures were kept in a dark room. The callus induction rates were evaluated after 3 weeks of the culture.

B. Regeneration of Kiwifruit Callus

3 weeks later the callus formation, the hand yellow green calli with rough surface were cut and placed on regeneration medium. Each flask had 5 calli, under a 13h photoperiod of 2000 lx light intensity at (25±1) ℃. The basic medium was MS containing 3% sucrose and 0.8%(W/V) agar, 3mg/L 6-BA, 0.2 mg/L NAA, supplementing with 10 combinations of silicon (0, 20, 40, 60, 80, 100, 120, 140, 160and 200 mg/L). The number of regenerated shoots was recorded after 35d of culture

C. Rooting of Regeneration Plants

When the regeneration plants of Actinidia Qinmei in regenerated culture grow well 2~4 cm in length, the plants were transferred in rooting medium. The 1/2MS medium was used, containing 3% sucrose, 0.8%(W/V) agar and 1.0 mg/L NAA, supplementing with 10 combinations of silicon (0, 20, 40, 60, 80, 100, 120, 140, 160and 200 mg/L). One week later roots were formed directly from the base of shoots. The number of regenerated shoots was recorded after 10d, 15d and 20d of culture.

III. RESULTS

A. Callus Formation

The hand yellow green callus can been found when the stem explants were cultured in a dark room after one week of culture (Fig. 1~3). 2 weeks later the hand yellow green calli with rough surface were cut and placed on regeneration medium.

B. Effects of Different Concentrations Silicon on Shoot Regeneration of Actinidia Qinmei

The results showed that all regeneration medium could induce regenerated shoots at different degree (Fig. 4 and 5). The suitable regeneration medium was MS containing 100 mg/L silicon, it obtained the highest frequency (83%)of regenerated shoots(Fig. 6). It was showed that the regeneration rate of Kiwifruit callus can be increased distinctly on the medium with silicon content of 20~100 mg/L. But the effects were decreased correspondingly in medium containing silicon content of 120~200 mg/L.

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C. Effects of Different Concentrations Silicon on Rooting of Shoot of Actinidia Qinmei

On the screened optimal rooting medium, the different concentrations of silicon were added into the media to screen optimal concentrations of silicon on rooting of Kiwifruit callus (Fig. 7). The results showed that rates of rooting of regeneration plants can be increased distinctly on the medium with silicon content of 20~80 mg/L. The suitable rooting medium was MS containing 80 mg/L silicon, it obtained the highest frequency (80%) of regenerated shoots after 10d of culture (Fig. 8). But the effects were decreased correspondingly in medium containing silicon content of 100~200 mg/L. After 20d of culture there was no obvious difference in rates of rooting of regeneration plants in different silicon concentration

Fig.1 the stem explants

Fig. 2 induction of Kiwifruit callus

Fig. 3 proliferation of Kiwifruit callus

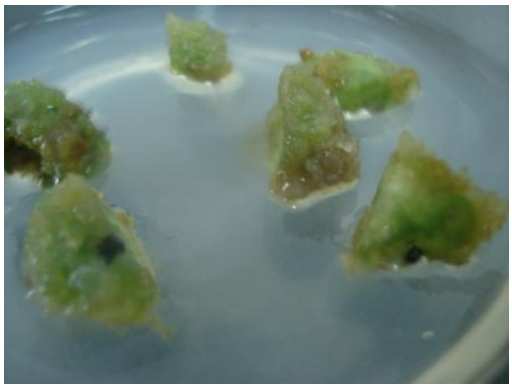

Fig. 4 regeneration of Kiwifruit callus

Fig. 5 the regenerated shoots

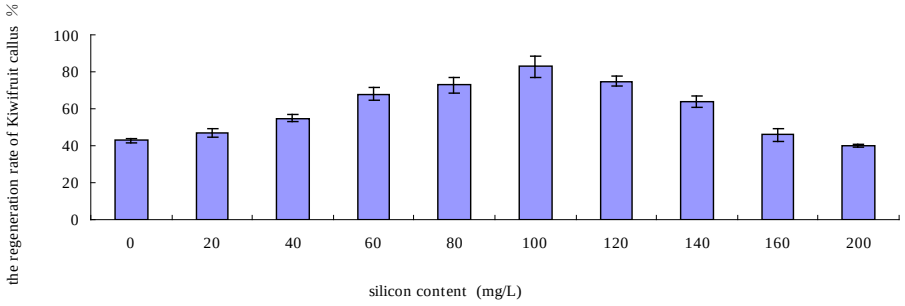

Fig. 6 Effects of different concentration silicon on the regeneration rate of Kiwifruit callus

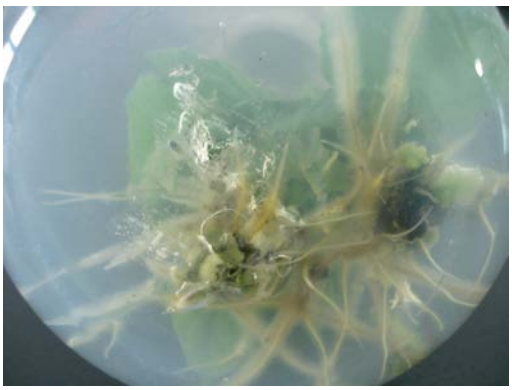

Fig. 7 rooting of regeneration plants

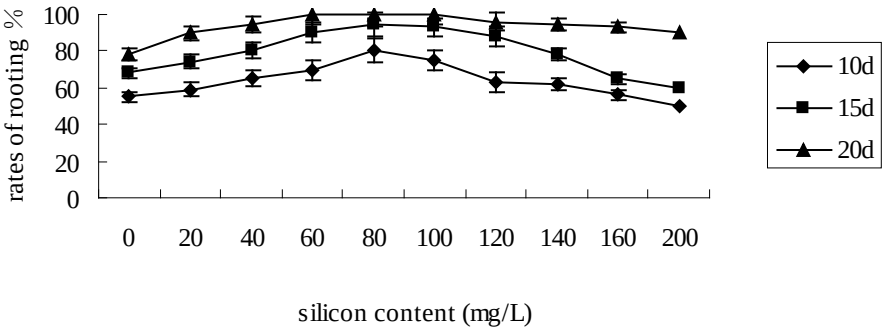

Fig. 8 Effects of different concentration silicon on rates of rooting of regeneration plants at different time

IV. SUMMARY

Silicon is the second most abundant constituent in soil. It constitutes 28% of the total weight in soil，which is only lower than oxygen that is 47%[2]. Numerous experiments have shown that silicon deposited in the plant tissues can improve yield, lodging resistance, and biotic and abiotic stress tolerance of rice plants[3,4]. Silicon can improve the regeneration rates of rice callus and the rates of rooting of regeneration plants can be increased distinctly. This result was consistent to research result of Zhang[5]. In this paper, to establish an efficient regenerated and root medium with optimal content of silicon. This method will facilitate the application of genetic transformation in Kiwifruit.

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