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Effect of La^{3+} on seed germination and seedling growth of *Salvia*

miltiorrhiza

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Abstract: The purpose of this study is to determine the effect of La^{3+} solution on seed germination and seedling growth of *Salvia miltiorrhiza*. Different concentrations of La^{3+} were used on seed by soaking treated to determine which concentration is the most suitable for the growth of *Salvia miltiorrhiza*. Results show that the low concentration of La^{3+} displays the promotion effect on *Salvia miltiorrhiza* seed germination rate and germination potential, and the promotion effect reaches the highest level when the concentration of La^{3+} solution is 30 mg/L, the germination index and vigor index are the highest in 20 mg/L, and it can also increase the contents of soluble sugar, soluble protein and chlorophyll. Meanwhile, the activity of antioxidant enzyme system (CAT and SOD) are improved, thus the photosynthesis and resistance of plant are enhanced. On the contrary, when the La^{3+} concentration is high, La^{3+} can inhibit plant growth. Thus La^{3+} displays the "hormesis effect" on *Salvia miltiorrhiza* growth.

Key words: *Salvia miltiorrhiza*; La^{3+} ; seed germination; seedling growth; Rare earths

1. Introduction

Danshen (*Salvia miltiorrhiza* Bge.) is a kind of lamiaceae perennial herbaceous plant. The dried root of *Salvia miltiorrhiza* has effects of removing stasis, relieving pain, promoting blood flow clearing away the heart-fire^[1]. Danshen root contains tanshinol, salvianolic acid, tanshinone, protocatechuic aldehyde and other bioactive substances^[2]. It has good curative effect in the treatment of coronary heart disease, angina pectoris, and cerebrovascular disease^[3], at the same time it is also antibacterial and anti-inflammatory and used to protect liver and improve renal function^[1,4]. It has been reported in recent studies that Danshen also has antitumor activity^[5].

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