Biology of germination of *Salvia miltiorrhiza* Bunge in the laboratory conditions

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Summary

A three-year cycle of monthly germination analyses of *Salvia miltiorrhiza* Bunge seeds was carried out. The best germination was observed in autumn (October, November) and in spring (April, May). After 10 years of storage at the temperature of 5°C the diaspores of *Salvia miltiorrhiza* germinated in about 20%.

Key words: *Salvia miltiorrhiza*, germination, seeds

INTRODUCTION

*Salvia miltiorrhiza* Bunge (*Labiatae = Lamiaceae* family) is a valuable medicinal plant in Asian countries. This perennial plant grows in wild in China and Japan [1]. It is also mentioned in flora of Vietnam and Korea. *Salvia miltiorrhiza* Bunge was introduced to cultivation in China [2]. *Salvia miltiorrhiza* root is a herbal raw material (*Salvias miltiorrhizae radix*) [3]. The main components of the raw material are phenolic acids and diterpenes with phenanthrenequinone structure [4]. There are also triterpenes, steroids, coumarins, flavonoids, tannins and nitrogen-containing substances [5, 6, 7]. In Asian phytotherapy the major significance is attributed to various activity of *Salvia miltiorrhiza* on a circulatory system, which is proved by its cardiotonic effect and protection of myocardium from hypoxia induced by cardiac contractile failure [4, 5, 6, 8].

This study is the continuation of the research on the biology of germination of *Salvia miltiorrhiza* Bunge carried out in the Garden of Medicinal Plants of the Research Institute of Medicinal Plants in Plewiska near Poznań [9].
MATERIAL AND METHODS

Seeds of Salvia miltiorrhiza originating from the own cultivation (Garden of Medicinal Plants of RIMP in Plewiska near Poznań) was the subject of presented research. Investigations were done in the years 1996-2005. Diaspores were stored at the temperature of 5°C. Analyses of germination were carried out according to the methodology of estimation of seeds worked out by ISTA [10]. A Jacobsen apparatus and blotting chromatography paper (Whatman 3) as a basis were used in the laboratory investigations. Physical conditions of germination were as following: light + changing temperature (30°C for eight hours and 20°C for 16 hours).

RESULTS

The schizocarp divided into four mezocarps (seeds) is the fruit of Salvia miltiorrhiza Bunge. Brown mezocarps are elliptic. Their surface is verrucose and slightly brilliant. Back side of the seed is convex, longer than abdominal sides. Lateral edges are blunt, the abdominal one is sharp. The length of seeds is 2.50–3.40 mm, the width is 1.45–2.05 mm, and the thickness is 1.10–1.90 mm. The mass of 1000 mezocarps ranges from 1.32 to 1.70 g.

The root in the germinating seed is quite thick and curved. In the initial phase of germination almost the whole surface of the root is covered with hairs. Cotyledons are grey-green, fleshy, ovate or kidney-shaped. The cotyledon blade is entire, with the obtuse or obcordate apex and cordate base. The first leaves are light-green and ovate. Their blade is sinuate, with the rounded base and the obtuse apex. The whole seedling is hairy.

During previous investigation it was found that the germination of diaspores of Salvia miltiorrhiza in laboratory analysis does not depend on the influence of light and temperature within the range 18–35°C. It depends on the atmospheric conditions during blossoming and maturation of seeds [9].

The results of this research, carried out in daylight and changing temperature conditions, are presented in Figure 1. The curves of germination capacity in the particular years show differences but also some regularities. In October and November the seeds of Salvia miltiorrhiza germinated well. In December the number of germinating seeds decreased. Next the germination ability began to increase slowly. It reached its next maximum in April and May. From May a decrease in germination ability was observed again. The seeds collected in 2001 germinated the best (in April the germination rate reached 76%). In that year the weather during the time of setting fruit was advantageous. It was relatively warm and sunny. From the beginning of July to the first decade of August the average air temperature was 19.6°C and the total insolation time was 300.6 hours.
The results of studies on viability of *Salvia miltiorrhiza* seeds are given in Figure 2. After two years of storage at the temperature of 5°C the germination capacity of *Salvia miltiorrhiza* seeds was about 50%. These diaspores can be used as seed material of standard value. After three years of storage the germination capacity of diaspores is only about 40%. In the next years after harvest the viability of stored seeds decreased slowly. After 10 years of storage at the temperature of 5 °C the germination rate of diaspores of *Salvia miltiorrhiza* is only about 20%.

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REFERENCES


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S t r e s z c z e n i e

Przeprowadzono trzyletni cykl comiesięcznych badań zdolności kiełkowania nasion szalwii czerwonokorzeniowej. Odsetek nasion kiełkujących był najwyższy jesienią (październik, listopad) i wiosną (kwiecień, maj). Około 20% materiału nasiennego szalwii czerwonokorzeniowej kiełkowało po 10 latach przechowywania w temperaturze 5°C.

Słowa kluczowe: *Salvia miltiorrhiza*, kiełkowanie, nasiona