

## Research Article

# The Effect of Different Sodium Hypochlorite Concentrations on Seed Germination of *Dracocephalum Moldavica L.*

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## Abstract

*Dracocephalum moldavica L.* is an annual herbaceous plant, aromatic, medicinal, annual and is a member of the Lamiaceae family. The aim of this research is to find the best concentration and best exposure time of sodium hypochlorite solution with seeds of *Dracocephalum moldavica* for evaluation on seeds germination. Five different concentrations (0.5, 1, 2, 3, 4 and 5%) in different exposure times (2, 4, 6 and 8 min) were used. For germination of *D. moldavica L.* seeds the basal MS medium was used. This study was performed by random completely design with three replications for each treatment and analyzed with completely randomized design. Follow by the sterilization in different conditions, the seeds were completely placed on MS medium under sterilized conditions and the germination percentage was measured after one month. The best germination percent obtained at 4% of sodium hypochlorite solution concentration in 8 min exposure time (up to 90%) and the lowest germination percent obtained while used the concentration 0.5 and 5% of sodium hypochlorite solution in all mentioned time (without any germination).

**Keywords:** *Dracocephalum moldavica L.*; Germination; Sodium hypochlorite concentration

## Introduction

*Dracocephalum moldavica L.* is an aromatic, medicinal, annual and herbaceous plant and is a member of the Lamiaceae family [1,2] and identified by its dark violet or pink flowers. This plant is named Dragonhead also refers to the appearance of flower. This plant has purple stem, which is due to anthocyanins and has leaves are cut. Another feature of this plant is the flowers of the process with sharp and jagged cuts situation is quite different.

The main Percent of plant oil are non-cyclic oxygenated monoterpenes. Granyal, Geranyl Acetate, Nral, Geraniol and Nryl Acetate collectively comprise about 90% of essential oil. Also there are Tannins and Flavonoids in this plant. Due to have essential oils is an anti-microbial and antiseptic and due to have Geraniol is an anti-spasmodic. *D. moldavica* uses in food industry, cosmetics industry and also is an antioxidant. This plant uses for the treatment liver disorders, headaches, stomachache. This plant is a sedative or tranquilizer and painkillers because of aerial organs are containing essential oil with treatment properties [1].

For sterilization of seeds surface, sodium hypochlorite solution commonly be used [3] but the suitable concentration of sodium hypochlorite depends on the type of plant.

## Materials and Methods

### Plant material

*D. moldavica* seeds were obtained from Pakkanbazar Company Isfahan, Iran. Macro and micro elements and vitamins were prepared from sigma to supply the medium.

### Seeds sterilization and germination

The seeds surfaces of *D. moldavica* were sterilized by using different concentrations of sodium hypochlorite (0.5, 1, 2, 3, 4 and 5%) for (2, 4, 6 and 8) min, and then rinsed three times with sterilized distilled water. The laminar air flow were sterilized by using 70% ethanol and UV tubes for 20 min. 12 seeds were placed on MS medium (Murashige and skoog,1962). The basal medium consisted of macro elements, microelements, amino acids and vitamins with 7 gL<sup>-1</sup> agar and 20 g sucrose and the pH of the medium was adjusted to 5.8 by addition of HCl or KOH before autoclaving. Then MS medium sterilized by autoclaving at 121°C for 20 min under pressure 1.5 Atmosphere. Cultures were maintained in a growth chamber at 25°C under white fluorescent tubes with a flux rate of 35 μmols<sup>-1</sup>m<sup>-2</sup> and 16/8 (light/dark) photoperiod for germination.

### Statistical analysis

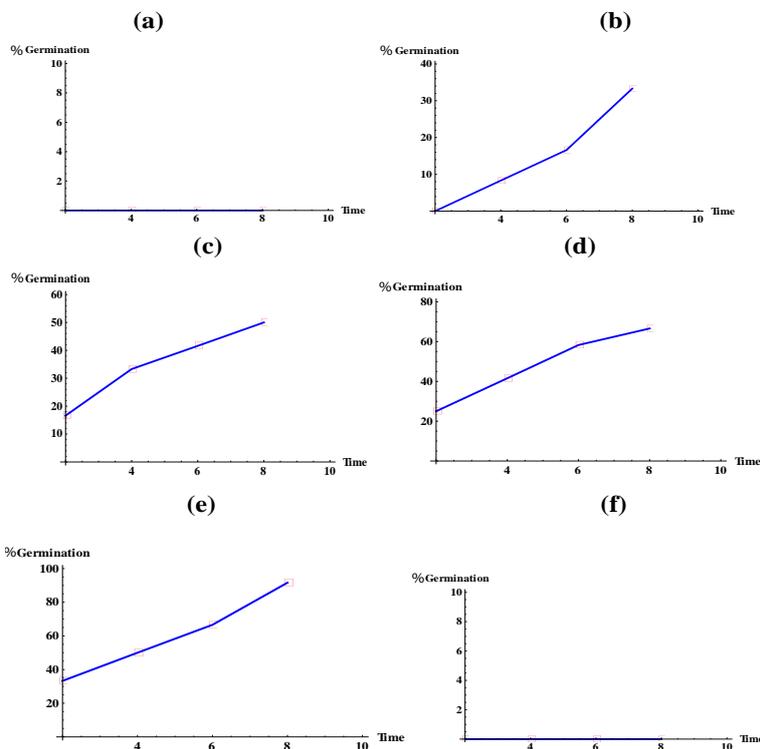
The research were set up in a completely randomized design with three replicates per treatment for study seeds germination percentage of *D. moldavica L.* by using of different concentration sodium hypochlorite solution. Statistical analysis was carried out with the Mathematical software.

## Results

Results showed that the best concentration of sodium hypochlorite solution for seeds germination of *D. moldavica L.* medicinal plants were concentration 4% in 8 min exposure time.

## Discussion

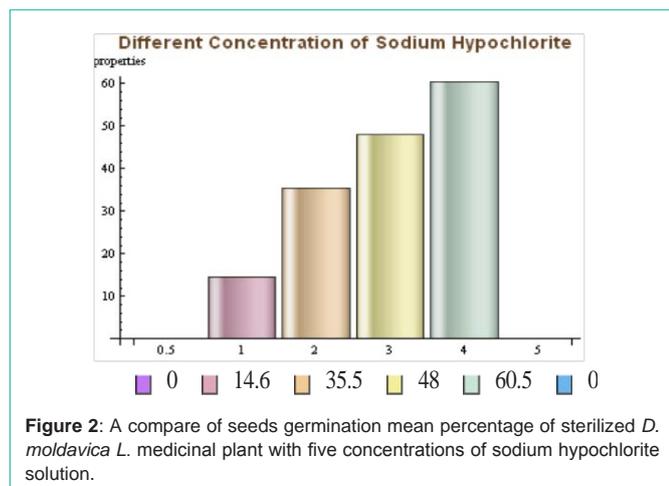
In the current study, the effects of different concentration



**Figure 1:** The effect of different concentration of sodium hypochlorite solution on seeds germination of *D. moldavica L.* medicinal plant. (a) 0.5% concentration at time 2,4 ,6 and 8 min. (b) 1% concentration at time 2, 4, 6 and 8 min. (c) 2% concentration at time 2, 4, 6 and 8 min. (d) 3% concentration at time 2, 4, 6 and 8 min. (e) 4% concentration at time 2, 4, 6 and 8 min. (f) 5% concentration at time 2, 4, 6 and 8 min.

**Table 1:** The effect of different concentration of sodium hypochlorite solution in 2, 4, 6 and 8 min exposure time on percentage seeds germination percentage of *D moldavica L* medicinal plant. (a) Concentration 0.5% (b) Concentration1% (c) Concentration2% (d) Concentration3% (e) Concentration 4% (f) Concentration 5%.

	Sodium hypochlorite Concentrations	Time (min)	Germinated seeds number	Total seeds number	Germination percentage
(a)	0.5%	2	0	12	0
	0.5%	4	0	12	0
	0.5%	6	0	12	0
	0.5%	8	0	12	0
(b)	1%	2	0	12	0
	1%	4	1	12	8.3
	1%	6	2	12	16.6
	1%	8	4	12	33.3
(c)	2%	2	2	12	16.6
	2%	4	4	12	33.3
	2%	6	5	12	41.6
	2%	8	6	12	50
(d)	3%	2	3	12	25
	3%	4	5	12	41.6
	3%	6	7	12	58.3
	3%	8	8	12	66.6
(e)	4%	2	4	12	33.3
	4%	4	6	12	50
	4%	6	8	12	66.6
	4%	8	11	12	91.6
(f)	5%	2	0	12	0
	5%	4	0	12	0
	5%	6	0	12	0
	5%	8	0	12	0



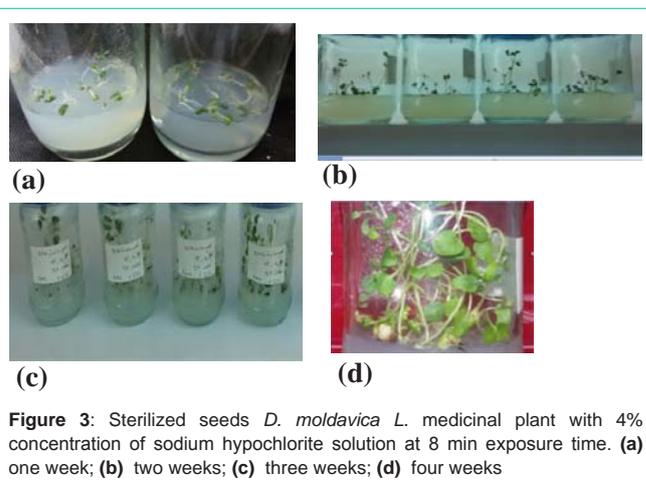
**Figure 2:** A compare of seeds germination mean percentage of sterilized *D. moldavica L.* medicinal plant with five concentrations of sodium hypochlorite solution.

of sodium hypochlorite solution at different exposure time were investigated on seeds germination of *D. moldavica L. medicinal* plant (Table 1).

The results showed that the highest percentage of germination was found in 4% concentration at 8 min exposure time (up to 90%) and the lowest rate of germination percentage obtained in 0.5 concentration and 5% of sodium hypochlorite solution (without germination) (Figure 1). *Angelica gigas* seeds surface were sterilized by using 4.5% concentration of sodium hypochlorite solution in 10 min of exposure time [4], *Agastache foeniculum* seeds by 2.5% concentration in 10 min exposure time [5], *Glycyrrhiza glabra L.* seeds by 1% concentration in 20 min exposure time [6], *Soybean* seeds in 4% concentration in 15 min [7,8] (Figure 2). In another research, used of two concentrations 5 and 10% of sodium hypochlorite solution at time 1, 2, 4 and 6 h on germination percentage *Lactuca sativa L.* seeds. The best percentage germination obtained at concentration 10% for time 2h exposure time [3] (Figure 3).

## Conclusion

Results of this study showed that seeds germination of *D. moldavica L.* was improved by increased concentration sodium hypochlorite solution. Sodium hypochlorite treatments at 4% concentration at 8 min exposure time are more effective in seeds germination percentage of *D. moldavica L. medicinal* plant.



**Figure 3:** Sterilized seeds *D. moldavica L.* medicinal plant with 4% concentration of sodium hypochlorite solution at 8 min exposure time. (a) one week; (b) two weeks; (c) three weeks; (d) four weeks

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