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Determination of Different Seed Germination Applications on *Scolymus hispanicus*

Neval Gül ÖĞRETMEN, Olcay ARABACI, Uğur TAN, Feride YAŞAR
Adnan Menderes Univercity, Faculty of Agriculture, Field Crops, 09100 Aydın,
Sorumlu yazar: ugur.tan@adu.edu.tr

Abstract

Golden thistle belongs *scolymus* genus of Asteraceae family. Species which belongs to scolymus species are *Scolymus maculatus* L., *Scolymus grandiflorus* Desf. and *Scolymus hispanicus* L. in Turkey. *Scolymus hispanicus* L. is known as altın dikeni, sarıdiken, akkız, sarıcakız and akdiken. Golden thistle is consumed as food but also used as medicinal plants. Also it is one of rare plants which used as licensed drugs in Turkey. There is drugs which made from its root called "Lityazol Cemil" and it has been licensed. It was proofed that this drugs have effect on kidney stones, renal pelvis stones, ureter and bladder stones. There are golden thistle in almost everywhere in Turkey but it is only used at Aegean region especially at İzmir as vegetables. In this region, plant population were reduced because of intense gathering. In recent years, due to importance of this plant was increased and population of plants were reduces, study of cultivation of this plants were accelerated. Seed germination studies of this species have great importance in the determination of manufacturing strategy of production. In this study *Scolymus hispanicus* was conducted to determine the effects of various chemical applications (ethylene, gibberellin, mannitol, seaweed and cold pre-treatment). Experiment was established according to randomized design with 3 replications at Adnan Menderes University, Faculty of Agriculture, Field Crops Laboratory. Germination rate and germination power values have been determined that there are significant differences between applications.

Key Words: Seed germination, *Scolymus hispanicus.,* Asteracea, Chemical applications

Introduction

In recent years there are increase demand to medicinal plant due to interest to natural products. Needed products at medicinal and aromatic plants obtain through nature or cultivation (Telci vd. 2011). There are medicinal plants both in our garden or flowerpot (basil, marjoram, geranium, rosemary, rose, mint, jasmine, marshmallow, etc.) and nearby nature (thyme, lemon balm, nettles, daisies, poppies, yarrow, mullein, lime, bay, golden thistle, etc) (Daşıran, 2010). Golden thistle belongs *scolymus* genus of *Asteraceae* family. There are three type of *Scolymus* genus in Turkey. These are *Scolymus maculatus* L., *Scolymus grandiflorus* Desf. and *Scolymus hispanicus L.*. Species are separated from each other by the hair features, the continuity of the body to the wings and flowers surrounding the pulse plate leaflets (Phyllary) (Davis, 1975). *Scolymus hispanicus L.* is known as altın dikeni, sarıdiken, akkız, sarıcakız and akdiken (Baytop, 1999; Başer, 1993). Aegean, Mediterranean, Black Sea, Central Anatolia and the Marmara regions are natural range of this plant and it has adapted quite well to Mediterranean climate.

Warm and rainy winter periods are opportune for plant growth, hot and dry summer months are opportune for seed maturation. Plants generally can not live at high altitudes, mostly below 600 m more proper for plants and rarely it may found at 900-1000 m. (Çiçek and Karık, 2013). There are golden thistle in almost everywhere in Turkey but it is only used at Aegean region especially at İzmir as vegetables. In this region, plant population were reduced because of intense gathering. In recent years, golden thistle plants which collected from around Balikesir is known to be brought to İzmir market. Beneficial portions of the plant are stem bark and fresh rosette leaves. In some places, it is consumed veins of rosette leaves as scraped from middle of the leaf blade. Form of consumption usually is boiled lamb seasoned then yogurt might be add or can be consume as simple. (Sarı vd. 2011). It is used as food and also medicinal plants.

Roots and aerial parts used as increasing urine and stone-reducer (Baytop, 1999). Also it is one of rare plants which used as licensed drugs in Turkey. There is drugs which made from its root called "Lityazol Cemil" and it has been licensed. It was proofed that this drugs have effect on kidney stones, renal pelvis

stones, ureter and bladder stones. Lityazol Cemil produced in Manisa for a long time, then was dropped from production due to shortages of raw materials. Manufacturer of laboratory need 30 tons golden thistle root per year, but reported that it encountered difficulties in providing it (Başer, 1993). In recent years, due to importance of this plant was increased and population of plants were reduces, study of cultivation of this plants were accelerated. In this research different pre-treatment was applied to determine the effects of germination of golden thistle seeds.

Materials and Methods

This study was conducted at Adnan Menderes University, Faculty of Agriculture, field crops Department in 2014. In this study holy thistle seed obtained from the Aegean Agricultural Research Institute and they were used as material for germination in different environments (Table 1). Germination tests was carried out at petri dishes and in a totally dark closet that stable at ambient temperature (25 ± 1ºC). Research was established according to randomized design with 3 replicates and 20 seeds in each repetition. As a germination container it was used plastic petri dish in size as the 8,5 x 8,5x 1,5 cm. Germination Whatman No. 1 paper moistened with distilled water and was placed into the Petri dish. Seeds are held preliminary treatment for two hours in petri dishes due to not to touch each other. Since the establishment of the experiment, seeds were counted every day and radicle length of 2 mm were considered germinated seeds. Ratio of germinating seed that after being placed in germination ambient up to 7 days to total seeds was calculated as a germination rate (%). Ratio of germinating seeds that first day to until 21. Day to total seeds was calculated as a rate germination power. Result of the data obtained was used according to randomized design software package TARİST analysis of variance (Açıkgöz et al., 1994), the LSD test was used for comparison of means.

Table 1. Germination Stimulating Pretreatment

Application No.	Applied Pretreatments	Doses and Durations
1	Exposed to Hormone **(Ethylene)**	100 ppm
2	Exposed to Hormone **(Ethylene)**	200 ppm
3	Exposed to Hormone **(Ethylene)**	300 ppm
4	Exposed to Hormone **(GA_3)**	100 ppm
5	Exposed to Hormone **(GA_3)**	300 ppm
6	Exposed to Hormone **(GA_3)**	500 ppm
7	Exposed to Sugar Alcohol **(Mannitol)**	0.3 M
8	Exposed to Sugar Alcohol **(Mannitol)**	0.5 M
9	Exposed to Sugar Alcohol **(Mannitol)**	0.7 M
10	Alginic acid stress **(Seaweed)**	0.10%
11	Alginic acid stress **(Seaweed)**	0.20%
12	Alginic acid stress **(Seaweed)**	0.40%
13	Cold pre-treatment	5 minutes duration -10°C
14	Cold pre-treatment	5 minutes duration -15°C
15	Cold pre-treatment	5 minutes duration -20°C
16	Control	No Aplication

Table 2. Characteristics of the results obtained by analysis of variance mean square values

Source of Variation	7. Day		21. Day	
	Degrees of Freedom	Mean Square	Degrees of Freedom	Mean Square
Treatments	15	159.076	15	244.410**
Error	32	138.354	32	90.104
General	47	144.968	47	139.351

Results

Mean square values which obtained through variance analysis that belongs to seeds of golden thistle's pre-treatments indicated at Table 2. In study pre-treatments of 21. Day (germination vigor) values found significantly important. 7. and 21. Day germination mean values are shown at Figure 3. According to variance analysis, 7. Day germination rates are not statistically significant but when it was compared between themselves it shows that the highest germination rate is % 46.67 with number 5 (Gibberellic acid 300 ppm).

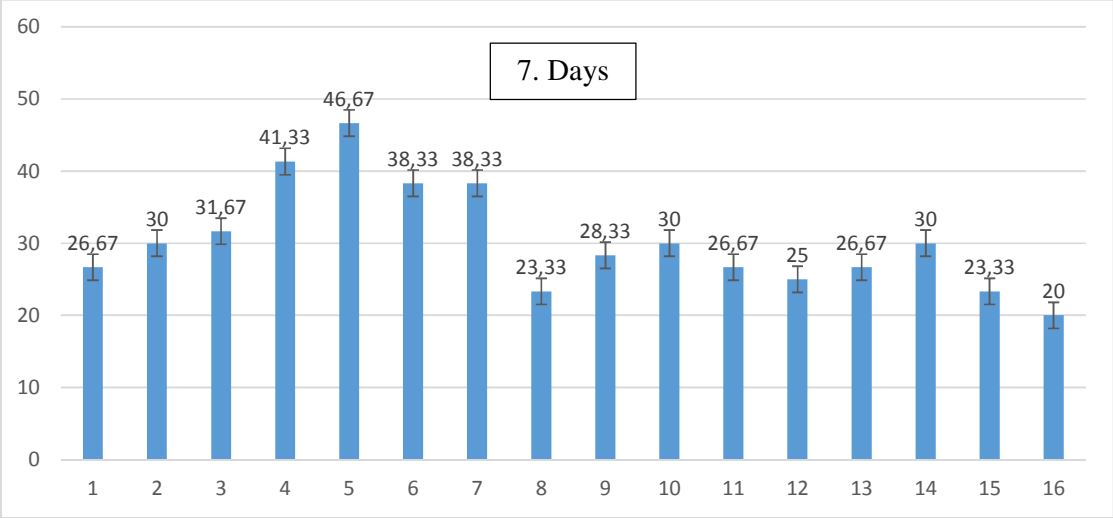

Figure 1. According to different pre-treatments germination rate (%) of *Scolymus hispanicus* L.

Table 3. 7. and 21. day germination values (%)

Application No.	Applied Pretreatments	7. Day	21. Day
1	100 ppm Ethylene	26.67	35.00 **cde**
2	200 ppm Ethylene	30.00	30.00 **de**
3	300 ppm Ethylene	31.67	31.67 **cde**
4	100 ppm GA3	41.33	41.67 **bcd**
5	300 ppm GA3	46.67	55.00 **ab**
6	500 ppm GA3	38.33	43.33 **abcd**
7	0.3 M Mannitol	38.33	45.00 **abcd**
8	0.5 M Mannitol	23.33	36.67 **cde**
9	0.7 M Mannitol	28.33	41.67 **bcd**
10	%0.1 Seaweed	30.00	46.67 **abc**
11	%0.2 Seaweed	26.67	43.33 **abcd**
12	%0.4 Seaweed	25.00	38.33 **cd**
13	5 min. -10°C	26.67	45.00 **abcd**
14	5 min. -15°C	30.00	58.33 **a**
15	5 min. -20°C	23.33	38.33 **cd**
16	Control	20.00	21.67 **e**
Mean		30.4	40.73
LSD		-	15.799

The lowest germination rate is % 23.33 with control, % 23.33 with 5 min cold treatment – 15^0C and 0,5 M Mannitol treatment respectively (Table 3, Figure 1).

Germination vigor values are indicated at Table 3. 5 min cold treatment –15^0C shows highest germination rate with % 58.33. Gibberellic acid 300 ppm treatment followed it with % 55 germination rate. The lowest germination rate is % 21.67 that belong to control (Table 3, Figure 2).

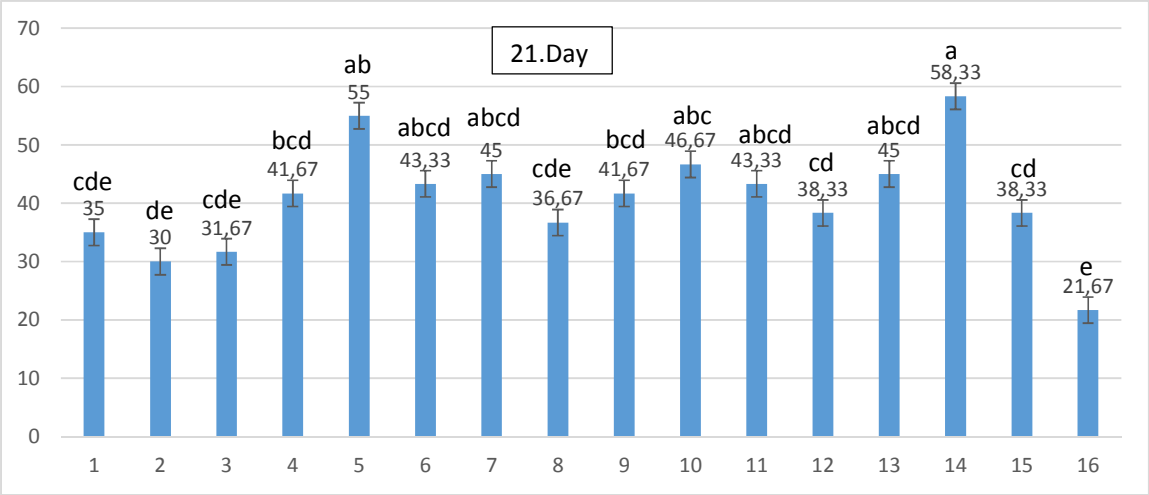

Figure 2. According to different pre-treatments germination vigor (%) of *Scolymus hispanicus* L.

According to the different pre-treatment of *Scolymus hispanicus*, if examined together that seed germination values of 7 and 21 days; the highest germination rate was obtained at 7. Day with Gibberellic acid 300 ppm but at 21. Day 5 min cold treatment –15^{0}C take the lead with %58 germination rate and Gibberellic acid 300 ppm fall behind with %55 germination rate. Cold treatment at 5 min –15^{0}C is low at 7. Day but it is shown highest value at 21. Day which mean cold treatment of 5 min –15^{0}C increased germination rate at 21. Day (Figure 3).

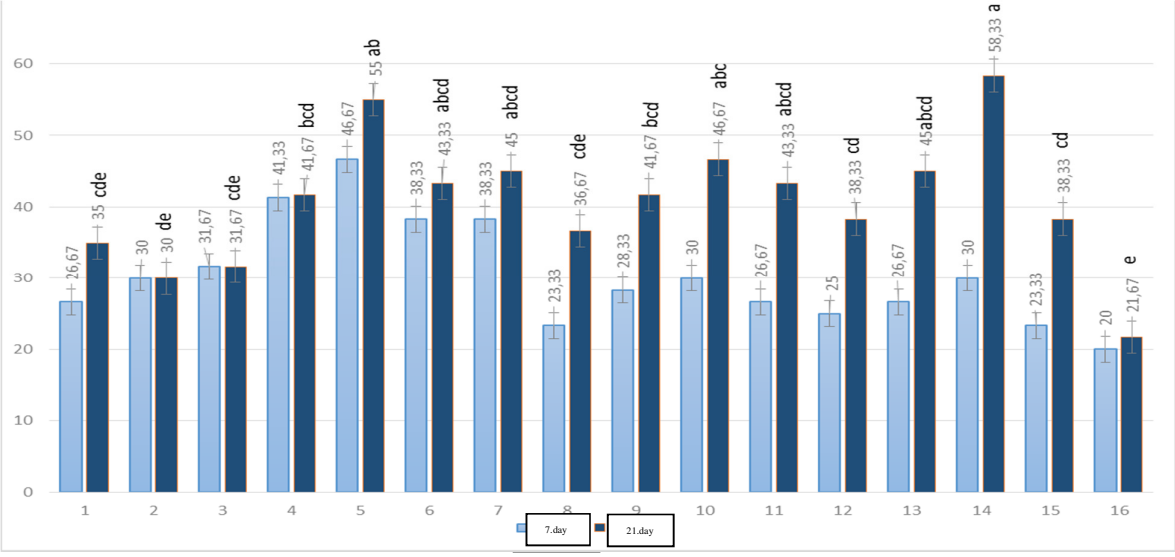

Figure 3. 7. and 21. day germination performans (%) of *Scolymus hispanicus* L. according to different pre-treatments

Sarı and Tutar (2009) recorded that *Scolymus hispanicus* L., seed from two wild-grown and one cultivated source were used to determine the effect of light-dark, cold storage, and selected temperatures on germination of the thistle seeds. The germination of seed was significantly increased by light and cold storage. Germination was significantly higher at 20°C and 25°C than temperatures of 15°C and 30°C.

According to results that obtained from this study, germination values are quite different than report of Sarı and Tutar (2009). The result differences may be caused by genetic structure, ecological conditions and experiment factors.

According to different pre-treatments, the highest germination rate of *Scolymus hispanicus* species were found %58 with 5 min –15^{0}C. This treatment better than control (%21.67) approximately two and a half times. This situation can be used at production as short period cold treatment before sowing for better germination.

According to this study it can be suggest that 5 min cold treatment –15^{0}C which take the lead when

compared with others treatments because it both easy to applied and cheap method.

Resources

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