The Eurasia Proceedings of Science,
Engineering & Mathematics (EPSTEM)
ISSN: 2602-3199

The Eurasia Proceedings of Science, Technology, Engineering & Mathematics (EPSTEM), 2018

Volume 2, Pages 167-178

ICRES 2018: International Conference on Research in Education and Science

Dormancy Breaking Studies of Dodder (Cuscuta spp.) was Problem in Greenhouse Tomato

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Abstract: Tomato cultivation was in the first place with 619.877 tons in the glass greenhouse in the Mediterranean region. Tomato production was ranked first with 437 tons while cucumber production ranked second with 48 tons in Kahramanmaras (Anonymous 2015a). Many problems such as diseases, weeds and pests are encountered in greenhouse tomato cultivation. One of the most important of these problems is the weeds. One of the foreign weeds, Dodder (*Cuscuta* spp.) is a parasite plant and the most difficult to control. When you do not control with Dodder (*Cuscuta* spp.), economic loss occurs 100% in tomato yield and quality. It has been diagnosed that it is a dodder (*Cuscuta campestris* Yunck.) in tomato growing in the glass greenhouse of the Agriculture Faculties. Since the dodder seeds have dormancy, various attempts have been made to break this dormancy. Methods of breaking dormancy on dodder seeds; low temperature application was carried out at 3.5°C for 80 days, in deep freezer at -200^{0}C for 24 hours, in pure water for 72 hours, kept at room temperature 26^{0}C for 284 days and 1% Sulfuric acid (H_2SO_4) was applied to the seeds of the dodder for 3 minutes. From these applications dodder seed germination was observed only in sulfuric acid applications.

Keywords: Greenhouse tomato (F1 yaren tomato), Dodder, Dormancy and breaking methods

Introduction

Tomato is one of the most commercially produced vegetables in the world (Gaware et al. 2010). Total tomato production in the world has risen to over 159 million tons in 2015. Turkey, in tomato production in the world with 11.0034 million tons in China, India and the United States took place after the fourth (Anonymous 2015b). Mediterranean region in terms of greenhouse tomato production in Turkey with 619 877 tonnes in 1st, while cucumber production took place in 2nd with 328 889 tonnes. In Kahramanmaras, greenhouse tomato production was ranked first with 437 tons while cucumber was ranked 2nd with 48 tons (Anonymous 2015a).

Feeding the rapidly increasing world population depends on sustainable growth of agricultural production, which depends not only on cultural practices such as selection of varieties, fertilization and irrigation but also on the protection of crops from pests and weeds. (Özer et al. 2001). Therefore, it is not possible to achieve the desired level of efficiency without controlling plant protection factors including disease, insects and weeds. Weeds in the most important plant protection factors are defined as plants that are grown in the place where the human beings do not want it (Uygur et al. 1984). Thanks to their competitiveness, allelopathic effects, vegetative and generative reproduction and genetic diversity, weeds can adapt to very different ecosystems and cause great productivity and quality losses in agricultural areas.It also affects culture plants with its parasitic effects and damages the cultivated plants by interfering with diseases and harmful organisms.By entering the competition of light and water with weeds, the weeds delay the ripening of the tomato juice.In addition, the nutrients such as nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg) and iron (Fe) are consumed in the soil more than weeds in comparison to the tomatoes thus negatively affecting tomato yield and quality.Parasitic plants are plants that require a host vegetable in some part of their life. Cuscuta species (*Cuscuta* spp.) are, belonging to Cuscuta genus, Convolvulaceae family, Solaneles team and plant kingdom,

- Selection and peer-review under responsibility of the Organizing Committee of the Conference

annual and complete parasitic plant. Cuscuta species are holo parasitic plants with white flowers that do not have leaf and chlorophill.The yellow-orange 0.3 mm diameter strands attach themselves to the shoots and leaves of the host plants with houstorium, which satisfies all nutritional needs.A dodder species gives 3,000-25,000 seeds (Dawson 1984-1994, Fang et al. 1995).

Cuscuta (*Cuscuta* spp.) is a complete parasitic plant that surrounds the plant and prevents it from physiological activities such as sunning, aeration, development and growth, thus causing the crop plant to become weak and yield and quality decrease considerably.Dodder has been reported to damage the trunk and leaves of several dicotyledon plants, and sometimes monocotyledonous plants.It has also been found that a mature berry cultivated seed can survive for 10-20 years in the soil, replicating with seeds and plant parts. Technically, there are many ways to increase production in agricultural products. One of them is the ability to control weeds with modern plant protection methods.It has been reported that the weights and the prevalence levels of weeds' biology, ecology, relations with culture plants, and control methods of weeds should be well known (Özer 1993, Özer et al. 1998, Türe and Köse 2000).

Davis (1978) in a study conducted in Turkey, where the taxon Cuscuta 21, the two types of Kahramanmaras was reported to spread naturally. Because it lives as a parasite, it causes the growth of the culture plant to be impaired, stopped or even killed. It prevents the activities such as growth and growth by wrapping the plants around (Lubenov 1985; Kadıoglu 1992). According to the results of the researches on the spreads of host species of dodder and the hosts in Anatolia; The different three were found to be parasitic on culture plants. such as (*Cuscuta campestris* Yunck., (*C. approximata* Bab. and *C. monogyna* Vahl.) in addition to these, *C. arvensis* was also found and the hosts were found to be sugar beet, onion, clover and cottage vegetables (Nemli 1986). Calı et al. (1993) reported that dodder plays a role in the transport of some viruses by forming a bridge between diseased plants and healthy plants. In Anadolu, 55 hosts of *C. campestris* have been identified. It was determined that 27 of the plants, mostly grassy, are agricultural plants.The most common types are hosts of Dodder; *Beta vulgaris* L. (beet), *Medicago sativa* L. (clover), *Trifolium* spp. (onion), *Daucus carota* L. (carrot), *Pimpenalla anisum* L. (anise), *Carum carvi* L. (cumin), *Vicia faba* L. (bean), *Capsium annuum* L. (pepper), *Allium cepa* L.), *Nicotiana tabacum* L. (tobacco), *Vicia sativa* L. (vetch), *Solanum melongena* L. (eggplant), *Cicer arietinum* L. (chickpea), *Asparagus officinalis* L. (asparagus), *Vitis vinifera* L.(grape), *Cucumis melo* L. (melon), *Solanum tuberosum* L. (potato), *Lycopersicon esculentum* Mill. (Tomato) and some ornamental plants (Nemli 1978, Paker and Riches 1993, Dawson et al. 1994). In the Isparta region, weeds, which are also a problem in tomatoes; *Chenopodium album, Portulaca oleraceae, Agropyron repens, Echinochloa cruss-galli, Xanthium strumarium, C. campestris* and *Sinapis arvensis* (Yardımcı et al. 2000). Weed species that are problematic in Tokat province tomato planting areas; It has been reported that 49 species belong to 25 families. These species are *Convolvulus arvensis, Amaranthus retroflexus, E. cruss-galli, Cyperus rotundus, P. oleracea, C. album, Sorghum halepense, Setaria viridis, Orobanche* spp., *Solanum nigrum* and *Cuscuta* spp.(Sırma et al. 2001). Single annual broadleaf in general in both field and greenhouse tomatoes in Turkey should constitute weed problem. Propolisamide, which is licensed in alfalfa and sugar beet together with cultural precautions in the domesticated Broomrape (*Orobanche* spp), dodder (*Cuscuta* spp.). Challenge, only chlorpromine is used, which is licensed in the Alfalfa. However, these herbicides are not licensed in domestication in our country (Güncan and Karaca 2014).32 species belonging to 17 families were detected in the tomato surveys in the Lice district of Diyarbakır.In the region;*A. retroflexus* L. (4.63 plant/number m^2), *C. arvensis* L. (4.09), *S. halepense* (L.) Pers. (4,06), *S. nigrum* L. (3.37), *E. colonum* (L.) Link. (3.04), *C. album* L. (1.88), *P. oleracea* L. (1.73), *E. crus-galli* (L.) P.B. (1.72) withholo parasitic plants, *Phelipanche ramosa* (L.) Pomel (3,73) and *Cuscuta* spp. (1.61) were detected high dense (Özaslan and Kendal 2014.).

It is stated that the lycopers with parasitic plant characteristics which cause the most economical damage by causing loss of yield in cultivated plants worldwide are most damaging to clover, clover, tomato, carrot, onion, sugar beet, potatoes, legumes, garlic, watermelon and pepper. It has also been reported that this harm occurring in cultivated plants varies between 50-90% in some cases (Nadler-Hassar and Rubin 2003, Lanini and Kogan 2005). There is a very large host mass.These families, Asteraceae, Convolvulaceae, Solanaceae, Fabaceae, Brassicaceae (Lian et al. 2006). Dodder cause 20-57% loss of crops in feed plants, while sugar beet yields decrease by 3.5-4 tons / ha (Aly et al. 2003). Konieczka et al. (2009) reported that it could cause 30-100% loss of product in carrot. Dodder also causes significant yield reductions in different cultivated plants,yield decreases were 60-65% in red berry, 86% in chickpea, 60-70% in alfalfa and 87% in lentil (Mishra 2009). There are over 200 varieties of 70 varieties all over the world (Costea and Stevanovic 2010).

C. campestris, which has a wide geographical distribution in the world, causes severe damage to carrots, clovers, sugar beets, onions, legumes, melons, watermelons, potatoes and many other cultivated plants (Dawsonet al.1994, Holm et al.1997, Parker and Riches 1993, Press et al. 1990).

C.campestris has spread all over the world from North America. Dodder seen in such as Asian continent (Afghanistan, Bahrain, Bangladesh, China, India, Indonesia, Iran, Iraq, Israel, Japan, Kazakhstan, Korea, Kyrgyzstan, Malaysia, Pakistan, Qatar, Saudi Arabia, Syria, Taiwan, Turkey and Yemen), in Africa (Alabama, Arizona, California, Florida, Kansas, New Jersey, New York), Central America and the United States of America (Algeria, Cameroon, Egypt, Kenya, Libya, Uganda) In the Caribbean (Bahamas, Cuba, Jamaica), South America (Argentina, Chile), Europe; Austria, Belgium, Bulgaria, Cyprus, France, Germany, Greece, Italy, Romania, Slovakia, Spain, the United Kingdom and Oceania; Australia, Victoria, Fiji, New Zealand (Alfarhan 1994, Holm et al. 1997,Irum et al. 2011, Khan and Halim 1990, Gwoinget al. 2005, Lorenzi and Jeffery 1987, Morita, 1997, Parker and Wilson 1986,Parsons and Cuthbertson 1992, Racasens and Conesa 1990, Pier 2008, Yuncker 1932,Zerman and Saghir 1995, Zharasov et al. 2009).

Dodder prevalence of species that are expected to significantly across the world may lead to a significant loss of yield and quality of crops in Turkey. When assessed in these respects, it is of great importance to determine the levels of yield and quality in tomato production areas (*Cuscuta* spp). Bu amaçla, Yaren F1 Tomato planting and Küsküt (*Cuscuta* spp.) Plantations were planted in the planting area of the Kahramanmaras Sütcü İmam University Agricultural Faculty in the greenhouse area. In this study, it was tried to remove the dormancy by applying the directions of breaking the dormancy to the seeds of the dodder.

Materıal and Method

Material

The materials of this research; Yaren F1 Tomato andDodder (*C. campestris*Yunck.); under normal conditions, dodder seed kept at low temparature (at 3.5^{o}C, -20 ^{o}C, Sulfuric acid (H_2SO_4), purified water and kept at room conditions (Figure 1, 2).

Figure 1. Yaren F1 tomato seedling in general

Figure 2. Sulfuric acid application to the dodder seed

Method

In Greenhouse Yaren F1 tomato trial pattern; Coincidence is planned according to trial design. Experimental design, 3 blocks and 6 blocks of each blot (Figure 4, 5). The size of the parcels is planned as 5x2 m.Each parcel has a margin of 2m between 1m blocks.

Each parcel is planned to have 4 rows and a row spacing of 45 cm and a row of 40 cm.

Planting Tomato Seedling

Tomatoes, peppers and eggplants in the summer vegetables group are one year in warm climates and several years in tropical climates.Tomato seedling was planted in places previously prepared with hand-hoe and then juice was given (Figure 3).

Figure 3. Greenhouse Yaren upper throat F1 fertilizing the roots of tomato seedlings

Determining aid intensity scale of dodder: Tomato scavenging rate by Tepe et al. (1997) as the 1-5 scale used is adapted by us on the basis of the tomato plants.Observational evaluations were made on the ground according to the following criteria for this:

(1) No dodder,
(2) Less dense (healthy tomatoes and no loss of yield)
(3) Middle dense (visible damage to the tomato started)
(4)Dense (significant loss of yield in tomatoes)
(5) High dense (tomato plant is dead).

In this study, it was aimed to break down dormans with 6 different applications as the seeds of dodder seeds had dormancy.dodder seed collected from 2016 have been subjected to different applications such as;

1-Low temperature to one-dodder seed (3.5^0C) application;Dodder seed collected from 2016 for 80 days (January 24 - 14 April 2017) duration 3.5^0C refrigerator was maintained.

2-Dodder seed in the freezer (-20^0C) application;Dodder seed collected from 2016 for 24 hours (15 April 2017) of the freezer.

3- Pure water application to dodder seed;Dodder seed collected from 2016 for 3 days (12-15 April 2017) of the purified water.

4- Kept at room temperature dodder seed;Dodder seeds collected from 2016 for a period of 284 days (from October 2016) at room temperature (26^0C) was maintained.

5- Dodder seeds in 1% sulfuric acid (H_2SO_4) application;2016 dodder seed collected from 3 minutes to a sulfuric acid was applied.

6- Dodder seeds in 1% sulfuric acid (H_2SO_4) application: Dodder seed collected from 2016 6 min with sulfuric acid was performed.

7-Control plot;There is no application in the control parseline.

Different applications to dodder seed (Table1);

Table 1. Greenhouse different dodder compliance test plan

I.Blok	N.T	L.T.	F.A.	P.W.A.	K	S.A(3dk)	S.A.(6dk)
II.Blok	L.T.	N.T	P.W.A.	F.A.	S.A(6dk)	K	S.A(3dk)
III.Blok	F.A.	K	S.A	N.T	L.T.	P.W.A.	C

Abbreviations:
N.T: Normal temperature application
S.A: Sulfuric acid application (3-6 min)
C: Control
L.T.:Low temperature application
F.A.:Freezer application
P.W.A.:Pure water application

Try Someone Different Dodder Compliance Plan in Pots

Yaren F1 test pattern tomatoes in pots;The coincidence is planned according to the trial design.Experimental design, 3 blocks and 6 rows of pots (Table 2).The length of the parcel is planned as 5x2 m.The side effects from each plot from 1m to 2m blocks share allowed. Each parcel is planned to have 6 rows of pots.

Minimum, maximum and average temperature values and average humidity values during the greenhouse tomato growing season are given in Table 3.

Table 2. Greenhouse minimum, maximum, average temperature, humidity and sunshine duration

PARAMETERS	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**
Average minimum temperature (^{0}C)	17,4	18,3	23,5	26,8	27,9	26.4	21.8	19,7
Average maximum temperature (^{0}C)	32,1	33,0	38,7	39,3	40,5	32.7	30.6	23,5
Average temperature (^{0}C)	24,75	25,65	31,1	33,05	34,2	29,5	26,2	21,6
Average Humidity (%)	70,9	74,6	59,3	60,1	63,4	58.4	54.7	46,2
Monthly total sunbathing time (Hour)	1735,2	188,1	196,5	197,4	199,6	185.3	170.8	162,5

In the greenhouse pot experiment cabin seedling planting and tuber planting are given in Figure 4.

Figure 4. Dodder seed planting with soil and Yaren F1 tomato seedlings

Weeds that are Problematic in Tomato

Income at the beginning of the most irrigated crops during the growing period of tomato.For this reason weeding of weeds can be continuous in tomato growing. Weeds interfere with the tomato juice and nutrients in common and cause yield and quality deterioration.

Holo Parasitic Weeds

Dodder (*Cuscuta* spp.) Definition and Biology

Dodder (*Cuscuta* spp.) Cuscutacea family and is located in a complete plant parasites (Yuncker, 1932). The plant is an orange-yellowish color, thready and leafless body. Flowers 2-3 mm long, pedisel (flower stalk), short from flower neck, flowers are collected in compact flower buds. Calyx lobes ovate or orbiculate, obtus gently overlap each other.Staminal brackets, fibriates (fringed), long corolla tubular.The stamens are shorter than the corolla lobes, the anthers are the average filament neck.The stylist is a fine, stigma-shaped round ball. Capsule 3.0-3.5 mm in diameter rounded, with permanent permanent corolla. The cycle of life is seen in three phases, namely the cycle of seed germination, the stage prior to host immobilization, and the stage of parasitic development (host development).In most species of dodder seed shirt it is thick.Seeds remain dormant for 5-15 years in the soil. In order for the seeds to germinate, it is necessary to have the necessary soil in the soil.

During germination, the embryo is fed from the endosperm. When the nutrients in the endosperm are exhausted, the root will die and the filamentous body reaching a certain length enters the search for the host.If the hostess finds the host and keeps it, he will continue his life. It is known that the seeds need 3-5 weeks to grow on host germination. The body wrapped on the host end of the hour hand reaches dodder acting in the opposite direction. From the host-facing surface of the retained gland, the parasite develops hostile eczema, and these haustoriums contact the host's floem and xylem. Thus the host takes the water, organic and inorganic substances necessary for his life.

Dodder Seed

Dodder seed brings several sayıdaöyle of from 3.000 to 25.000 is a yellow-brown seeds occurred (Figure 5).Seeds spilled on the ground are not capable of germinating immediately.Because the seedlings are very hard and thick structure also has dormancy.When the dormancy is broken and the host's hormone reaches the tohuma, it can be germinated at optimum temperature and humidity.When the body emerging from the germinated seeds reaches the soil surface, it is held with forked shoot tips at the lowest branch of the host.

Figure 5. Overview of the dodder seeds

Dodder Root

Dodder does not have roots.The orange body is fed with nutrients from the seed embryo until it reaches the soil surface.When it reaches the surface of the soil, the host begins to feed on the hosts and branches of the host plant through the houstorium.For this reason, this weed lives on many host plants, especially tomatoes, as parasitic plants.

Dodder Stem

The dodder stems are threadlike and have no leaves. Therefore it does not contain chlorophyll. Hostorium is attached to the body and branches of host plants. They are full-parasitic clitoral plants without chlorophyll fed from their bodies by sending houstoriums to the host transmission bunches (Figure 6).

Figure 6.After the exit of dodder host to the orientation of tomato roots

Tomatoes in pots in the greenhouse conditions completely diffused state dodder (Figure 7).

Figure 7.Domates saksı olgunlaşma evresindeki küskütün genel görünümü(12.06.2017)

Dodder plants cling to branches and tomatoes to the problem under field conditions are the result of feeding on the leaves of tomatoes is completely hostarium die (Figure 8).

Figure 8.The overall look of the death of dodder and tomato plants under field conditions (12.06.2017)

Dodder flowers

The flowers are small and are collected in the case of kimos flowers.The flower crown is white in color.In flowers, sepals are often combined; usually in five parts and rarely in four or three parts(Figure 9).The stamens are attached to the corolla tube, and most of the species are found in the staminal bracing under the stamens.The ovarium is two carpels, and each carpel has two seeds.The stylus may be combined or discrete, stigmatic, round, disc-shaped, or extended.

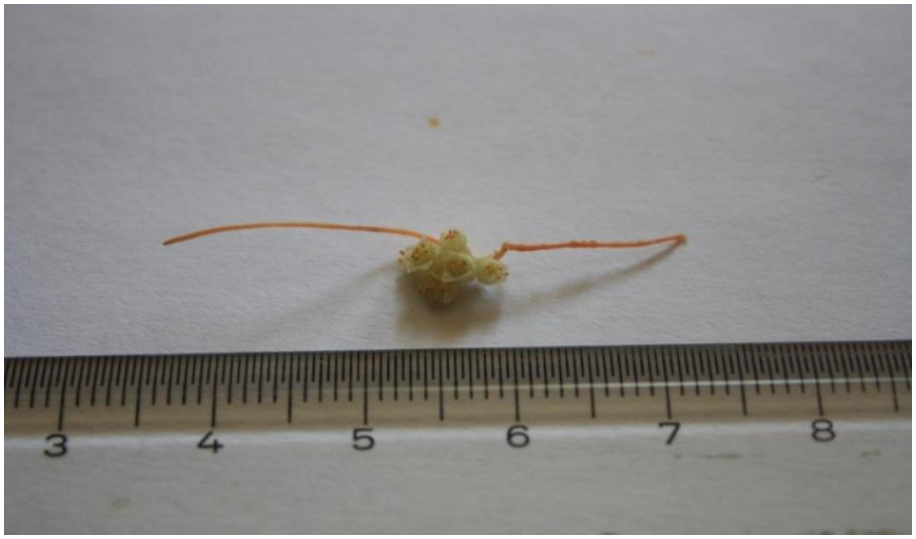

Figure 9. General view of the dodder flowers

Results

This dodder seed, have been identified by us as by examining the flowers and the body features *C. campestris*Yunck. Also in the parcel dodder density is calculated as 30.9. This result is evaluated intensively according to scale 1-5. It has been observed that tomato fruit yield and quality are not very effective when there is little or little density. It was observed that the duration of vegetation of chilled tomatoes was shorter than that of uninfected ones by 2 months.In addition, inflorescences in infected tomatoes were lower than those without infections. At the same time infected domatates fruit diameters were found to be lower. Infected tomato weights were found to be lower. It is not only effective in tomato color and moisture content.

Different applications have been made to remove the dormancy feature in the harsh greenhouse and field conditions that are a problem in Yaren F1 tomato production. To dodder seed dormancy breaking of dormancy aimed with 6 different applications. In the research, the seedlings collected from the year 2016 were subjected to different applications. These applications include; -3.5°C, which break the dormancy of -20 °C and room temperature and held dodder seed germination was observed, although it is appropriate host. However, only 1% of these applications Sulfuric acid (H_2SO_4) for 3 minutes with the application made dodder seed germination was observed. only 1% of these applications Sulfuric acid (H_2SO_4) for 6 minutes with the application made dodder seed germination was observed. In this application, Sulfuric acid was observed to be completely dried within 3-4 days after reaching to the soil surface because the endosperm in the seed was damaged due to the thinning of the sultanate seed husk which had been kept in Sulfuric acid for 6 minutes. These seedlings are germinated but because the seed coat is too thin, the endosperm does not provide positive results because the nutrients present in the endosperm continue to develop and are not used to inject the seed into the host's body.

As a result, the dormancy of the seedlings can be broken by different methods. In this study, only 1% of these applications gave positive results for Sulfuric acid (H_2SO_4) for 3 minutes with the application.

Discussion

Different applications have been made to remove the dormancy feature in the harsh greenhouse conditions that are a problem in Yaren F1 tomato production.To dodder seed dormancy breaking of dormancy aimed with 6 different applications.These applications include; -3.5°C, -20 °C and room temperature and held dodder seed germination was observed, although it is appropriate host. However, only 1% of these applications Sulfuric acid (H_2SO_4) for 3 minutes with 1% of these applications Sulfuric acid (H_2SO_4) for 6 minutes was applied on dodder seed. Only Sulfuric acid (H_2SO_4) for 3 minutes with the application made dodder seed germination.

In the other dormancy breaking methods; C. campestris (Lados 1999, Benvenuti et al. 2005), C. trifolii (Lados 1999), C. monogyna and C. planiflora (Salimi and Shahraeen 2000), C. chinensis (Marambe et al. 2002), C. gronovii**,** C. umbrosa**,** C. epithymum and C. epilinum have dormancy (Costea and Tardif 2006). However, the percentages of hard seeds at dispersal can vary from plant to plant C. campestris and C. chinensis (Marambe et al. 2002). In seeds of many species with PY, it serves as the environmental signal detector for germination and, once dormancy is broken, as the initial route of water entry into the seed (Baskin and Baskin 2000). However, a water gap has not been identified in the genus Cuscuta (Convolvulaceae), the only holoparasitic taxon with PY (Baskin et al. 2000). It probably does not have the capacity to change dormancy states, and as such cannot undergo dormancy cycling (Baskin and Baskin 2004).Meulebrouck et al. (2008) found that scarified seeds of C. epithymum require a period of cold stratification to break physiological dormancy (PD) of the embryo. Germination of C. europea seeds was not facilitated by mechanical scarification or by complete removal of the seed coat.

H_2SO_4 was used to break PY the entire seed coat was damaged (Liu et al. 1981). Cuscuta campestris seeds would not be exposed to such high concentrations of H_2SO_4 in nature. Therefore, acid scarification is not the natural way by which dormancy is broken in seeds of this species. Seeds of C. australis require a period >2 weeks of dormancy-breaking treatment to release them from dormancy, as found for seeds of clover species in Australia (Taylor 1981, Revell et al.1999).

Only 17 % of non-treated C. australis seeds took up water, and thus only 17 % of the seeds germinated during a 6-d incubation period. However, all manually scarified seeds took up water rapidly and germinated. Thus, it is concluded that a high percentage (>80 %) of the fresh seeds of C. australis used in this study were physically dormant (Baskin and Baskin, 2004).Benvenuti et al. (2005) reported cycling of dormancy in initially physically dormant seeds of C. campestris**.** Their interpretation of dormancy cycling in this species seems to be that seeds cycle between PD and nondormancy (PD↔ND) after breaking of PY. Thus, we suggest that the cyclic pattern of germinability of C. campestris seeds may be explained by sensitivity cycling. Thus, seeds of C. campestris may have undergone cycling of sensitivity during burial in soil, and their dormancy-breaking requirements may have been fulfilled when they were incubated at 30 °C. Hence, seeds showed a cyclic pattern of germination at 30 °C. Sensitive seeds of I. Lacunosa respond quickly to dormancy-breaking treatment (Jayasuriya et al. 2008), requiring only 3 h at 35 °C and RHs >90 % to become nondormant. Alebrahim et al. (2009) investigated the effects of sulfuric acid on the seeds of two different populations of the Prosopis strain (Borazjan and Kashmar). For the application of sulfuric acid, the seeds were placed in a 98% acid solution for 10, 20, 30, 40, 50 and 60 minutes. In the Borazjan and Kashmar populations, germination rates of 72.8-54.2% were observed after application of sulfuric acid, respectively. Pipinis et al. (2011) reported that in the control of *Cercis siliquastrum*

L. plant, there was a germination rate of 31-65% in the seeds subjected to sulfuric acid application (20 and 60 min) without any germination.

The results obtained in the study of dormancy-breaking in dodder seed and the results obtained in other investigators were found to be partially similar. Of course, this is because the time and dosage used in the methods are different.

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