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Effects of Some Applications on Germination Rate of Gelemen Clover Seeds Gathered from Natural Vegetation in Samsun

Ibrahim Aydin and Ferat Uzun

University of Ondokuz Mayis, Faculty of Agriculture,
Department of Agronomy, 55139 Kurupelit/ Samsun/Turkey

Abstract: This study was carried out to determine the reasons for dormancy of Gelemen clover seeds existing in Campus area of the University of Ondokuz Mayis located in Kurupelit area of Samsun, Turkey and the ways of overcoming these reasons. The study was conducted under laboratory conditions. To get over dormancy, various chemical matters such as Gibberellic acid (GA), KNO_3 and H_2SO_4 were used. The other methods used to break dormancy were to sandpaper the seed for a known period, to keep the seeds in airproof plastic bag, to rub the seeds with sand, precooling, preheating, leaving the seeds for olding and application of hot water. According to the results, applications of various chemical matters had a limited effect on breaking dormancy. While germination rate was 7.75% in seeds without any application, this rate rose to a level of 16% in seeds applied to various chemical matters. In this study, the highest germination rate was obtained from the application of sandpaper. Application of rubbing with sand followed this application with a germination rate of 61.25%. Leaving the seed to get old naturally, keeping the seeds in a airproof plastic bag, precooling, preheating and application of hot water had no effect on germination rate.

Key words: Gelemen clover, dormancy, germination

Introduction

In many countries of the world, the most important source of roughage domesticated animals need are natural pasture and grassland.

There are two reasons for seed dormancy. The first is that embryo can not get ripen physically and the second is that bark of seeds is impermeable to water and oxygen. The dormancy of embryo disappear with the effect of natural growing time (Seoñg *et al.*, 1990).

The case of seed dormancy is an important advantage in terms of continuity of plant live. Because, the plants which have dormant seeds can regenerate themselves with their seeds of previous years even if they can not produce any seeds. In many plants, germination period of dormant seeds can be two, three even sometimes more than this. Although they are annual, some plants resemble perennial plant in grassland vegetation (Manga *et al.*, 1995).

Although dormancy characteristics have an advantage for annual plants prevailing in grassland vegetation, it is an unwanted characteristic with regard to cultivation of forages. For that reason, germination rate of used seeds in cultivation of forages should be high (Acikgoz, 1991).

To break dormancy, some operations are applied to the dormant seeds. Main ones of them are physical and chemical treatments (Keyseroglu, 1993). As chemical treatment, mostly GA, KNO_3 and H_2SO_4 are used.

Beyond this, other methods used to break seed dormancy are to store seeds for a given period (natural growing time), mechanical abrade, preheating or cooling and application of hot water (Sehirali, 1997).

Gelemen clover, as understood from this word, derives from Gelemen area of Samsun situated in Black Sea region of Turkey (Genckan, 1983). Gelemen clover which is the plant of wet and productive soils is very productive and have good quality. The characteristic of the plant limiting its usage in field cultivation of forage is that its seeds have generally seed dormancy. Due to the fact that researches conducted to break seed dormancy are limited, it is benefited from researches conducted on other plant seeds as well. Tomer and Maguire (1989) subjected alfalfa seeds which had a germination rate 44.5% for control

applications to 60°C for two hours, H_2SO_4 for 30 minutes and abraded. The researchers determined germination rates to be 87.0, 85.4 and 66.7% respectively. Horowitz and Taylorson (1985) stated that mechanic abrade and application of H_2SO_4 decreased seed dormancy in medic. Mujioa and Rumi (1993) conducted a study to break seed dormancy of *Lotus tenuis* and stated that to get the highest germination rate, to sandpaper and to store in H_2SO_4 for 20 to 30 minutes were the best applications. Gazziero *et al.* (1991) stated that KNO_3 application did not have any effect on germination and the highest germination rate was obtained by H_2SO_4 application for 10 to 15 minutes.

Singh *et al.* (1985) found that to break seed dormancy in seeds of lentil mechanic abrade and H_2SO_4 application had a bad effect on undormant seeds.

According to some researchers, high and low heat applications, boiling water application are useful to break seed dormancy (Seong *et al.*, 1990; Paramathma *et al.*, 1991).

In this study, the effects of chemicals and some other applications on germination rate were examined in Gelemen clover the seeds of which have high seed dormancy.

Materials and Methods

Seeds of Gelemen clover were obtained from natural grassland of OMU in June, 1999. After being harvested, germination rate of the seeds were determined. The determination was carried out 14 months after harvest for seeds left to natural growing time and four months after harvest for the other applications.

Under laboratory conditions, germination rates of the seeds exposed to chemical and some other applications were determined with enumerations made 10 days later.

As chemical applications, 3 different concentrations of gibberellic acid (25, 50 and 100 ppm.) and 3 proportions of KNO_3 and H_2SO_4 (0.1, 0.5 and 1%) were applied for 3 different periods (15, 30 and 45 minutes).

Other applications were to sandpaper (1, 5 and 10 minutes), to store in airproof plastic bag, sand application, precooling (7 days in 3 to 4°C) preheating (7 days in 30°C)

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Table 1: The effects of some chemical applications on germination rates of Gelemen clover (*Trifolium meneghinianum* Clem.) seeds

Treatments	Dose (ppm)	Time (min.)	Germination rate (%)	Treat. (%)	Dose (min.)	Time rate (%)	Germination (%)	Treat. (min.)	Dose rate (%)	Time	Germination
Gibberellic acid (GA)	25	15	10.00 (e-i)	KNO ₃	0.1	15	10.50 (e-h)	H ₂ S ₄	0.1	15	10.00 (e-i)
		30	11.00 (d-f)			30	11.50 (de)			30	9.00 (f-j)
		45	14.50 (ab)			45	16.00 (a)			45	10.50 (e-h)
	50	15	8.00 (l-k)	KNO ₃	0.5	15	8.25 (l-k)	H ₂ S ₄	0.5	15	8.00 (l-k)
		30	9.00 (f-j)			30	9.00 (f-j)			30	7.75 (jk)
		45	12.00 (c-e)			45	13.00(b-d)			45	6.25 (k)
	100	15	11.00 (d-f)	KNO ₃	1.0	15	14.00 (a-c)	H ₂ S ₄	1.0	15	8.75 (g-j)
		30	11.50 (de)			30	14.50 (ab)			30	7.25 (jk)
		45	12.00 (c-a)			45	14.00 (a-c)			45	8.50 (h-j)
	Control		7.75 (Jk)								
LSD 0.01 = 2.05				CV = %10.50							

Table 2: The effects of some applications on germination rates of Gelemen clover (*Trifolium meneghinianum* Clem.) seeds

Treatment	Time	Germination rate (%)	Treatment	Time	Germination rate (%)
Sand paper	1min.	11.75 (e)	Preheating (30°C 40°C	7 day	6.75 (s)
	5 min.	34.25 (c)		15 min.	8.50 (a)
	10 min.	92.75 (a)		30 min.	9.50 (a)
				45 min.	
To rub with sand	5 min	25.00 (d)	Treatment with hot water 60°C		8.25 (e)
	10 min.	40.00 (c)		15 min.	8.25 (e)
	15 min.	61.25 (b)		30 min.	8.50 (e)
To detain in airproof plastic bag	15 min.	4.50 (e)	Natural growing time	45 min.	11.25 (e)
Precooling 13 to 4°C)	7 day	6.75 (e)		18 mount	9.50 (e)
Control		7.50 (e)			
LSD _{0.01} = 7.25		C.V. = %17.75			

and applications of hot water (at 40 and 60°C for 45 minutes). In sand application, it was provided to strach of seeds by rubbing with sand.

For each application 4 × 100 = 400 seeds were placed in petri dishes and germinating seeds were counted for 10 days after applications. Obtained numbers were analysed according to design of randomised plots. Differences among applications were assessed according to LSD test.

Results and Discussion

The germination rates of Gelemen clover seeds applied with different chemical applications were shown in Table 1. Germination rates of Gelemen clover's seeds with no application were very low (7.75%). The effect of chemical applications to break seed dormancy were found to be very significant. The highest germination rate (16%) was obtained from KNO₃ application (0.1% for 45 minutes). Among GA applications, the highest germination rate (%14.50) was obtained from 25 ppm dose applied for 45 minutes. In H₂SO₄ applications, the highest germination (%10.50) was obtained from 0.1% dose applied for 45 minutes.

According to the findings of the present study, effect of chemical matters applied to break seed dormancy was extremely inadequate. Horowitz and Taylorson (1985), Tomer and Maguire (1989) and Mujioa and Rumi (1993) and some other researchers that various chemical matters such as GA, KNO₃ or H₂SO₄ had an important effect on breaking seed dormancy, it may be due that they conducted their studies on other plant's seeds instead of Gelemen clover. According to the results of the study to break seed dormancy of Gelemen clover's seeds by applying chemical matters is very limited.

The effects of other applications, except the chemical ones, on germination rate of Gelemen clover seeds were found to be very interesting (Table 2). The highest germination (92.75%) was obtained from application of sandpapering for 10 minutes. To abrade with sand for 15 minutes followed this (61.25%). In both applications, increasing

germination rate together with increasing application periods was an evidence that the bark of Gelemen clover seed was very hard. As the findings we obtained, some researchers such as Tomer and Maguire (1989), Horowitz and Taylorson (1985) and Mujioa and Rumi (1993) stated that using mechanic methods was very acceptable for breaking seed dormancy.

The other interesting results obtained from the present study was the germination rate of seeds with no application which had a germination rate of 7.50% could reach to a level of 9.50%.

It was determined that applications of storing in airproof plastic bag, preheating and colding and hot water application had no effect on seed dormancy.

The results obtained from the study can be summed up as follows:

1. There was a high seed dormancy, (92 to 93%) in seeds of Gelemen clover
2. It was also determined that the applications of chemical matters were not useful to break seed dormancy in Gelemen clover
3. Natural growing time (1 year) had no significant effect on breaking seed dormancy in Gelemen clover

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