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Research Paper

The influence of cold treatment on germination characteristics and primary seed growth of two forage species of *Lolium rigidum* Gaudin. and *L. prenne* L.

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Abstract
Lolium rigidum Gaudin. and *L. prenne* L. species, which are from poaceae category are two forage species of high importance in terms of palatability and production. In this investigation, a factorial experiment based on a completely randomized design with three replications was performed, 4, 6, 8 weeks and seeds at 22° C was used as control. Subsequently, parameters such as germination percentage (GP), germination rate (GR), germination value (GV) and germination index (GI) of *Lolium rigidum* Gaudin. and *L. prenne* L. were evaluated. The results showed that the effect of cold treatment was significant ($p \leq 0.01$) on GP, GV, GI and GR of two species. In general, it can be concluded that cold treatment in the positive way to improve the performance and to increase the seed germination of *Lolium rigidum* Gaudin. and *L. prenne* L.

Key words: Cold treatment, Germination percentage, Germination rate, *Lolium rigidum* Gaudin., *L. prenne* L.

Introduction
Germination is a critical stage in the life cycle of crops and they often controlled vehicle (Keller and Kollmann, 1999). It is the onset of seedling growth and the followed seedling establishment is the most important stage in the life cycle of plants (El-keblawy *et al*., 2007, BELLO and Igbokwe, 2013). *Lolium rigidum* Gaudin and *L. Prenne* L. are the members of poacea family. *Lolium rigidum* Gaudin is found in the Mediterranean, Central Asia, North Africa, North and South America, Australia and Iran (Jore, 2010, Javanmiri Pour et al, 2013). *L. Prenne* L. species are distributed in the Himalayas of 3000-4000 m in Europe, the Mediterranean, Central Asia, Africa, America and Iran.This grasses are well-know pasture and grassland for sheep and other livestocks (Jore, 2010; Karimi, 2008). Germination of this species is somewhat difficult due to physiological sleep, therefore, appropriate treatments should be used in order to break it. Investigations showeds that to break dormancy of *E. angostifolia* seed chold treatment more than a period of 10 to 15 weeks can be useful (Parmenter *et al*., 1992, Ghaffari et al, 2014). Sundaralingam *et al*. (1999) reported cold treatment increased percentage germination *Carrot Sp* .In addition Nasiri (2008) found that chilling increase percentage germination of 33 for the seed *Acer monospessulunm* L. .Zare et al (2011) indicated that chilling seeds in temperature of 4°C for 33 days could germinate 38% for *Pinus geradiana* seeds.
The aims of this research are to investigate the effect of chold treatment on the geremination of *Lolium prenne L* and *Lolium rigidum Gaudin.*

Materials and Methods
Lolium rigidum Gaudin. and *L. prenne* L. seeds were taken from Genetic Bank, Research Institute of Forests and Rangelands, Iran and this study was carried out during March 2012 in the laboratory of Mahmoud Abad Caspian Forest Seed Centre.
Germination test were conducted by four replications of 25 seed on filter paper in Petri dishes (Azarinvand *et al*., 2004; Azarinvand and jafarain, 2004) Seeds were kept at the temperatures 2-5 ° C for 4, 6 and 8 weeks. Seeds at 22° C was used as control. Germination was assumed to occurr when radicles were 2 mm long. Germination percentage was recorded every 24 hours (Tavili *et al*., 2010; Ellis and Roberts, 1981). The end of this period, final germination percentage (GP) was calculated according to the following equation (1) from Camberato and Mccarty (1999):

$$GP=\sum G/N*100 \quad (1)$$

Where GP is the germination percentage, $\sum G$ is the number of germinated seeds and N is the total of seeds.

Germination rate (GR) was calculated according to the equation (2) of Khan and Gulzar (2003):
$GR= \sum (G/t)$ (2)
Where GR is the germination rate, G is the germination seeds in every day and t is the day.
Germination value (GV) was calculated according to the following formulae (3) of Czabator (1962):
$GV= MDG *PV$ (3)
Where GV is the germination value, MDG is the mean daily germination and PV is the maximum of mean daily germination.
Germination index (GI) was calculated according to the following formulae (4) of Abdulbaki and Anderson (1975):
$VI= GR\% *MSH/100$ (4)
Where VI is the germination value, GR% is the germination percentage and MSH is the mean seeds length.

Experimental data was analyzed by SPSS Ver.17 programes. The differences between the means values were compared using Duncan's multiple range tests at 5% level of probability.

Results

Analysis of variance presented in Table 1,shows that all of the under studied traits including germination percentage (GP), germination rate (GR), germination value (GV) and germination index (GI) are statistically significant indicating that cold treatment can be used to efficiently enhance the values of abovementioned parameters (at all 0.01 level of probability).

Table 1. Analysis of variance on the studied traits

Treatment	df	GP	GR	GI	GV
Cold	3	15.158**	118.97**	152.219**	27.627**
Species	1	9.272**	306.670**	201.565**	191.226**
Cold* Species	3	18.654**	264.06**	390.149**	78.600**
Sig		0.000	0.000	0.000	0.000
CV		0.78	0.98	0.98	0.93

** significant at 0.05 probability level.

Physiological Characteristics *Lolium rigidum* Gaudin***. and*** *L. prenne* L***. species***

chold treatment increases geremination of *Lolium rigidum* Gaudin**.** and *L. prenne* L. seeds at 8 weeks (see Table 2). It can be seen in Figure 1 and Figure 2 germination percentage (GP) of *Lolium rigidum* Gaudin**.** and *L. prenne* L. seeds increase by 80.66% and 88%, respectively with regard to to the control.

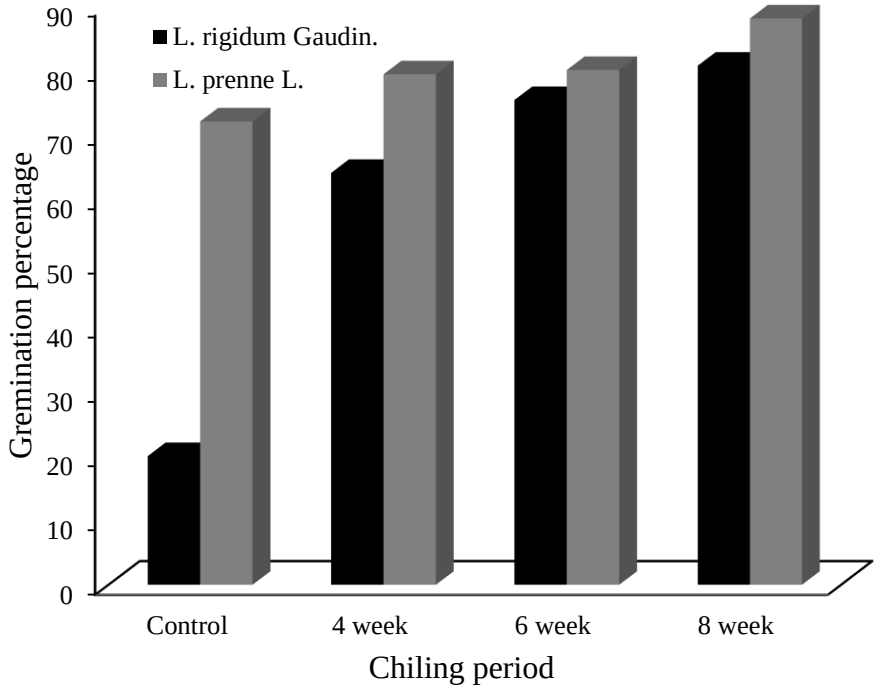

Figure 1. The effect of chilling treatment on germination percentage of *Lolium rigidum* Gaudin. *and L. prenne* L. *species*

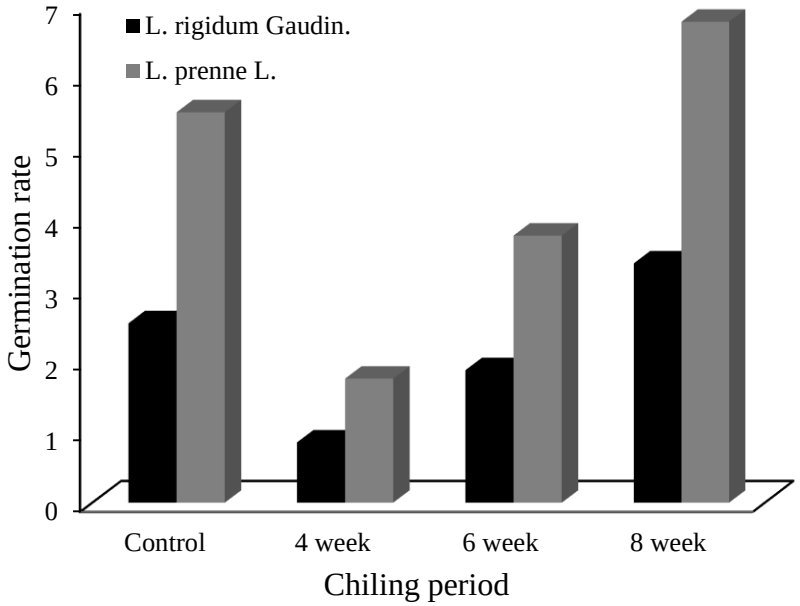

Figure 2. The effect of chilling treatment on germination rate of *Lolium rigidum* Gaudin. *and L. prenne* L. *species.*

Figure 3 and Figure 4 show the enhancement of GV and GI values of species by chiling treatment rather than of controls.

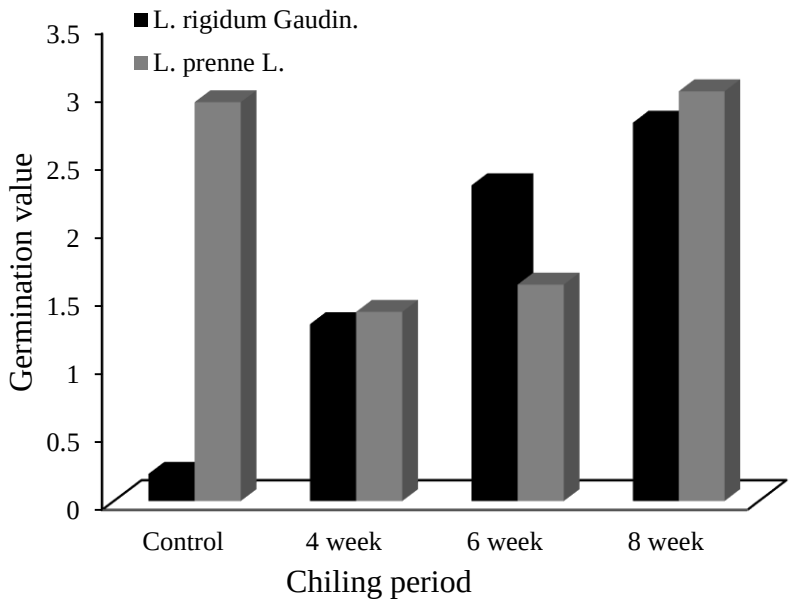

Figure 3. The effect of chilling treatment on germination values of *Lolium rigidum* Gaudin. *and L. prenne* L. *species.*

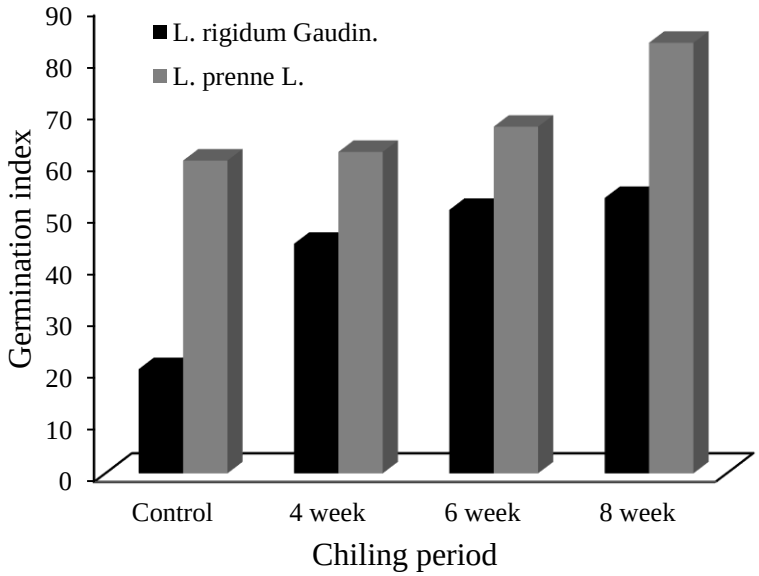

Figure 4. The effect of chilling treatmnet on germination index of *Lolium rigidum* Gaudin. *and L. prenne* L. *species.*
Table 2 summerizes the mean values of the traits under chilling treatment of *Lolium rigidum* Gaudin**.** and *L. prenne* L**.** species. One can find that the rate of germination increases due to chiling treatment of *Lolium rigidum* Gaudin. and *L. prenne* L. Seeds by about 3.37 and 6.67, respectively, comparing to the control.

Table 2. Means comparis of the traits under chiling treatment *Lolium rigidum* Gaudin**.** *and L. prenne* L**.** *species*

Chilling	**GP**	**GR**	**GI**	**GV**
Lolium rigidum Gaudin.				
Control	20.00 b	2.53 a	20.08 b	0.20 a
4 weeks	64.00 b	0.85 a	44.27 b	1.30 a
6 weeks	75.33 c	1.87 ab	50.82 c	2.32 ab
8 weeks	80.66 c	3.37 b	53.11 c	2.78 a
L. prenne L.				
Control	72.00 c	5.21 b	60.33 c	2.93 b
4 weeks	79.33 b	1.75 a	62.00 b	1.39 a
6 weeks	80.00c	3.76 b	66.87 c	1.59 a
8 weeks	88.00 c	6.76 b	83.07 c	3.01 b

Mean values with the different letters are significantly different in each column (the level of probability of 0.05).

Discussion

According to the results, chold treatment the can improved *Lolium rigidum* Gaudin. *and L. prenne* L. *species* performance. For all of studied traits the best results due to the chilling treatments were obtanined. The Results showed that the germination characteristics were significantly enhanced, so that the higest germination was 8 weeks. The obtained results are in agreements with (keshtkar *et al*., 2010) work in which it was reported that the chilling treatment increased the germination characteristics of *Ferula gummosa* and *Ferula assa-foetida* L. seeds. In addition (Hojate *et al*., 2008) also reported that the chilling treatment increased the germination rate and the germination time. Chilling active factore that increased rate of germination. cold is usually reduced deterrents levels Abscisic acid in seeds and plant growth regulator is increased levels (Tipirdamaz and Gomurgen, 2000). The rate of germination was stressed as one of the important aspects of vigor seed (Pederson *et al*., 1993) and (Perry, 1978). The outcomes of this study are in line with the results of (zare *et al*., 2011) work where the chilling treatment increased the germination index and germination seeds. Because of the positive effect of chilling treatment on germination characteristics, it is recommend toreproduce this processby applying the method of chilling step is taken to provide forage for livestock.

Conclusion

Overally, the present study revealed the effect of chilling treatment on *Lolium rigidum* Gaudin and *L. prenne* L. performance under. Further, the Lolium showed good responses to trestment. Chilling treat ment improved Lolium seeds performance , Therefore, Chilling treatment can be used as one of the efficient methods to improv the performance of *Lolium rigidum* Gaudin and *L. prenne* L. seeds.

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