Pak. J. Agri. Sci., Vol. 47(4), 317-319; 2010
ISSN (Print) 0552-9034, ISSN (Online) 2076-0906
http://www.pakjas.com.pk

EFFECT OF INCUBATION TEMPERATURE, SEED AGE AND SCARIFICATION ON GERMINATION AND EMERGENCE OF PERSIAN SHALLOT

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Persian shallot grows as a wild plant in some mountains of Iran, The aim of our research was to study the relationship between different temperatures, seed age and duration of sulfuric acid treatment on Persian shallot seed germination. The interactive effect of incubation temperature, seed age and scarification treatments had a significant effect on the germination and emergence percentage of Persian shallot. It is concluded that suitable condition for Persian shallot seed germination is scarification of one year old seeds with sulfuric acid for 15 min, and stratification at 4°C. In fact Persian shallot seeds need both scarification and stratification for germination enhancement.

Keywords: Persian shallot, *Allium aflatunense* L., germination, scarification, stratification

INTRODUCTION

Persian shallot (*Allium aflatunense*) locally called as ''Mooseer'' belongs to Alliaceae family and is one of the important edible alliums in Iran. It is native and endemic of Iran and grows as a wild plant in the Zagross Mountains (Rechinger, 1984). It is different from common shallot (*Allium ascalonicum* L.) for many characteristics. The storage tissue of Persian shallot is bulb like, white skinned and usually consists of a single main bulb or rarely a small bulblet attached to main bulb, the weight of each bulb being 8–15 times of garlic clove (Salunkhe and Kadam, 1998). Persian shallot is originated from cold mountains of Iran, but common shallot is originated from warm regions of west Asia (Salunkhe and Kadam, 1998).

Persian shallot is a nutritive plant with special taste and its dried bulb slices are used as an additive to yogurt and also pickling mixtures. It's powder is used as a tasty additive or spice for foods in Iran. In addition, it has crucial medicinal effects; aqueous extract of Persian shallot has shown antibacterial effects (Ashrafi *et al*., 2004) and suppresses the growth of *Trichomonas vaginalis* (Rahbar *et al*., 2006). Ebrahimi *et al*. (2009) observed that the mean dry matter of mooseer was higher than other alliums except garlic. They also concluded that persian shallot was rich in Cu as well as Zn and Mn elements. As linolenic acid and linoleic acid was higher in persian shallot than common shallot and onion, so it's a good source for human diet.

Persian shallot is typically propagated by seeds. Our preliminary research showed that its seeds can remain dormant for a considerable period of time before reaching maturity.

As demonstrated by many studies, seasonal variations in temperature regulate the timing of germination in some species (Welling *et al*., 1988; Baskin *et al*., 1996; Brenchley and Probert, 1996, 1998; Mata and Moreno-Casasola, 2005). Various physical, mechanical, chemical and biological measures are utilized to overcome plants seed dormancy (Cook and Dolby, 1981). Bulter (1985) evaluated effect of pre-drying, potassium nitrate, and pre-chilling on relieving the seed dormancy in buffel grass. While pre-drying was useful in promoting germination (7-37%), pre-chilling had negative effects and potassium nitrate had no effects, suggesting very little commercial benefits of these treatments.

Chemical treatment, such as sulphuric acid (H_2SO_4) has been successfully used for breakdown of dormancy in various crops (Gonzalez-Castaneda *et al*., 2004). Salehi and Khosh-Khui (2005) found a remarkable increase in seed germination of four turf grass genera using H_2SO_4. Persian shallot seeds may respond to H_2SO_4 treatment in the similar way, hence the aim of this study was to develop methods for enhancing Persian shallot seed germination by breaking seed dormancy.

MATERIALS AND METHODS

Persian shallot seeds of 1, 2 and 3 years old were collected from native regions. Each sample of 100 seeds was weighed to confirm that the seed samples for every treatment were similar. At first all seeds were scarified with sulfuric acid for 0, 15, 20 and 25 min then washed carefully with water for a houre. After sowing a mixture of wet perlite and seeds were incubated at 4 and 25^{o}C in an incubator for a week.

In this paper the effect of incubation temperature, seed age and scarification on seed germination were evaluated in which the treatments were arranged as a CRD in lab. Each treatment consisted of 100 uniform seeds and replicated three times. Germination and emergence is not possible in petri dishes were recorded 60 and 90 days after seed establishment in petri dishes. We add enough water to all petri dishes when it was needed during experiment. Data were subjected to ANOVA in SAS (ver. 9.1, SAS Institute, Inc.). Appropriate means were separated using the Duncan's multiple range test.

RESULTS AND DISCUSSION

Interaction between examined factors had a significant effect on the germination and emergence percentage after 60 and 90 days (Table 1). Germination of Persian shallot was increased by scarification with sulfuric acid for 15 min incubated at 4^{o}C for one year (Table 2). In fact, Persian shallot seeds need both scarification and stratification for germination improvement. Salehi and Khosh-Khui (2005) presented a remarkable increase in seed germination of four turf grass genera using H_2SO_4. Persian shallot seeds respond to H_2SO_4 treatment in the similar way.

As demonstrated by many studies, seasonal variations in temperature regulate the timing of germination in some species (Welling *et al*., 1988; Baskin *et al*., 1996; Brenchley and Probert, 1996, 1998; Mata and Moreno-Casasola, 2005). It seems that low temperature stratification is needed for Persian shallot germination. In other hand the natural growing area for this plant is Zagros Mountains that have a suitable temperature curve for the plant seed germination. However, this plant seeds loss their vigor during years and must be restored annually.

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Table 1. ANOVA regarding treatment effects on seed germination and emergence of Persian shallot

S.O.V	d.f.	Mean of square			
		Germination after 60 days (%)	Germination after 90 days (%)	Emergence after 60 days (%)	Emergence after 90 days (%)
Incubation temperature (A)	1	0.008**	0.051**	0.049**	0.097**
Seed age (B)	2	0.212**	0.292**	0.049**	0.097**
A×B	2	0.021**	0.049**	0.038**	0.097**
scarification period	3	0.260**	0.282**	0.038**	0.064**
A×C	3	0.008**	0.018**	0.038**	0.064**
B×C	6	0.212**	0.244**	0.038**	0.064**
A×B×C	6	0.021**	0.033**	0.038**	0.064**
Error	48	0.001	0.001	0.001	0.002

** significant at P≤0.01, ANOVA**.**

Table 2. Effect of incubation temperature, seed age and scarification time on seed germination and emergence of Persian shallot

Incubation Temperature (°C)	Seed age (year)	Scarification time (min)	Germination after 60 days (%)	Germination after 90 days (%)	Emergence after 60 days (%)	Emergence after 90 days (%)
4	1	0	0[d]	4[c]	0[b]	4[b]
4	1	15	62[a]	75[a]	38[a]	55[a]
4	1	20	0[d]	0[e]	0[b]	0[c]
4	1	25	0[d]	0[e]	0[b]	0[c]
4	2	0	0[d]	0[e]	0[b]	0[c]
4	2	15	0[d]	0[e]	0[b]	0[c]
4	2	20	0[d]	0[e]	0[b]	0[c]
4	2	25	0[d]	0[e]	0[b]	0[c]
4	3	0	0[d]	0[e]	0[b]	0[c]
4	3	15	0[d]	0[e]	0[b]	0[c]
4	3	20	0[d]	0[e]	0[b]	0[c]
4	3	25	0[d]	0[e]	0[b]	0[c]
25	1	0	0[d]	0[e]	0[b]	0[c]
25	1	15	30[b]	30[b]	0[b]	0[c]
25	1	20	0[d]	0[e]	0[b]	0[c]
25	1	25	0[d]	0[e]	0[b]	0[c]
25	2	0	0[d]	0[e]	0[b]	0[c]
25	2	15	2[c]	2[d]	0[b]	0[c]
25	2	20	0[d]	0[e]	0[b]	0[c]
25	2	25	0[d]	0[e]	0[b]	0[c]
25	3	0	0[d]	0[e]	0[b]	0[c]
25	3	15	0[d]	0[e]	0[b]	0[c]
25	3	20	0[d]	0[e]	0[b]	0[c]
25	3	25	0[d]	0[e]	0[b]	0[c]

Values in a column followed by the same letter are not significantly different at P≤0.01, Duncan test.

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