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Seedling Growth of Some Forages from their Aged Seeds

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ABSTRACT

The seeds were studied to know their seedling growth of forages preserved during 9 years, 15 years and 23 years. The experimental period was the autumn in the year of 2006. The results were as follows; alfalfa or lucerne (*Medicago sativa* L.) only, among the forages produced on the year of 1983 and lived 23 years in a glass-bottle, appeared their seedlings. White clover (*Trifolium repens* L.) and sorghum (*Sorghum bicolor* (L.) Moench), produced on 1991 and lived 15 years in a vinyl (plastic) bag, showed their seedling growth. Sorghum Sudangrass hybrid (*Sorghum bicolor* x *S. sudanense*), birdsfoot trefoil (*Lotus corniculatus* L.) and white clover, produced on 1997 and lived for 9 years in Petri-dish, developed their seedlings. It is considered that the three species: white clover, sorghum hybrid and alfalfa or lucerne have the longest longevity among the investigated forage seeds by the current experiment.

Key words: 23 years-old seed, Autumn growth, establishment, longevity

INTRODUCTION

Seed storage life varies among crop species and is determined by the initial seed quality, seed moisture and storage condition (Ching and Calhoun, 1968; Jayasuriya *et al*., 2012). A journal showed a photograph that an aquatic plant naturally germinated from an 8,000-year-old seed (Korea Herald, 2007). Germination rate and viability are terms expressing for seed vitality (Yamada *et al*., 1960; Nihon Sochigakkai (Society of Japanese Grassland Science), 1985; Kandil *et al*., 2012; Rajashekar *et al*., 2012) and for pollen vitality (Baloch *et al*., 2000, 2001; Kwon *et al*., 2005; Raeisi *et al*., 2011; Tamnet *et al*., 2011; Youmbi *et al*., 2011). And also the longevity or viability of forage seed is an important factor for seeding and establishment of legumes and grasses (Smith, 1981; Park *et al*., 1990).

It is common sense that forage seeds should be preserved in a cool and dry condition. And there are big difference in adapting climatic environment among forage species (Kim *et al*., 1989, 1999). Therefore, it is considered valuable to study how many years the forage seeds can be maintained as living. Lucerne or alfalfa (*Medicago sativa* L.) is a well-known species for its nutrition composition and its growth (Park *et al*., 2005). And during the experimental period in spring time, sorghum hybrid (*Sorghum bicolor* (L.) Moench) produced in 1991 had grown up to 2-3 cm, germinated lucerne grew around 0.5-1.0 cm long (An *et al*., 2007).

Some researchers have studied the seed vigor with a method of nullifying seed vigor (Hongm, 1994; Choung, 1996). On the present experiment we directed to know the length of seed preservation. Therefore, we carried out the present experiment in an autumn, to investigate the seedling growth of some species of aged forage seeds. That is to estimate the longevity of the species.

MATERIALS AND METHODS

The seeds of 1983 were preserved in the glass-bottle packed with tight gum plug, the seeds of 1991 in vinyl bag and the seeds of 1997 in Petri-dish, respectively.

The experiment was carried out under air temperature condition. The experimental place was a laboratory room of the Department of Companion Animal and Animal Resources Science. As shown in our previous report (Park *et al*., 2007), this experiment was carried out in a laboratory and Petri-dish was used for the present test. While being different from our previous experiment (An *et al*., 2007), the Petri-dishes were preserved in a drying oven (FO-600M, Jeio Tech Co. Ltd., Daejeon). The purpose was in order to keep temperature about 20-25°C at daytime and its period of warming the seed was from October 3 through October 26, 2006.

Forage species produced in 1983 were as follows; lucerne (*Medicago sativa*), birdsfoot trefoil (*Lotus corniculatus*), white clover (*Trifolium repens*), Kentucky bluegrass (*Poa pratensis*), reed canarygrass (*Phalaris arundinacea*), sorghum hybrid (*Sorghum bicolor* (L) Moench), tall fescue (*Festuca arundinacea* Schreb) and weeping lovegrass (*Eragrostis curvula* Schrad). And the species produced in 1991 were white clover, Kentucky bluegrass, reed canarygrass, sorghum hybrid. The forage species produced in 1997 were as follows; birdsfoot trefoil, white clover, sorghum hybrid, sorghum Sudan hybrid (*Sorghum bicolor* x *S. sudanense*), tall fescue and weeping lovegrass.

Forage seeds produced in 1983 were seeded on October 9-13, 2006, those of 1991 were seeded on October 17, 2006 and those of 1997 were seeded on September 29, 2006, respectively. Seed number of 100 was used, except for sorghum hybrid (Pioneer 931) of 1991 and 1997 (50 grains, two times), were weighed, bedded and watered in Petri-dish (the diameter was 10 cm). The duration of the present experiment ranged from October 13 through November 23, 2006 (both some forage seeds produced in 1983 and 1997), from October 20 through November 23, 2006 (seeds produced in 1991), respectively.

And by a camera (Aiptek 3200, China) we have taken a picture. The photograph was there in order to make show the preserving method for lucerne seeds which had been produced in 1983 (Fig. 1).

Fig. 1: The seed-bottle for preserving lucerne (*Medicago sativa*) seeds which had been produced in 1983

RESULTS AND DISCUSSION

This experiment is to know the results on forages growth from the old seeds, as was shown in our previous reports (An *et al*., 2007; Park *et al*., 2007). The site and the temperature of the place was as follows; *Kumsan*-gun, where Joongbu University situates, ranged geographically about E 127° and N 36°. The data of daily mean temperature were taken from Korea Meteorological Administration (home page: www.kma.go.kr). The mean daily temperature ranged from 18.7°C to 1.7°C both on the period from October 9 through November 23, 2006 (Table 1) and on the period from September 29 through November 23, 2006 of *Kumsan*-gun district (Table 3). And the mean temperature on the period from October 17 through November 23, 2006 of the district ranged from 17.9°C to 1.7°C (Table 2).

Table 1 shows the seedling length of several species which seeds were produced in 1983. As was shown in our previous result (Park and Kim, 2009), alfalfa or lucerne (*Medicago sativa*) only showed appearance of seedlings.

Table 2 shows the seedling length of some species which seeds were produced in 1991. Seedling (s) was (were) observed on white clover and sorghum hybrid.

Table 3 shows the seedling length of some species which seeds were produced in 1997. There are several species which have grown well. While Sorghum hybrid (*Sorghum bicolor* (L.) Moench), tall fescue (*Festuca arundinacea*), weeping lovegrass (*Eragrostis curvula*) were not grown at all. Among the species, birdsfoot trefoil (*Lotus corniculatus*), white clover (*Trifolium repens*), sorghum Sudan hybrid (*Sorghum bicolor* x *S. sudanense*) were well grown.

Establishment is one of the most important things for forages but it's not easy to know it on the condition of germination test. At first, we have done an experiment on the seedling growth of the species in order to know the possibility of its establishment. In the present experiment, by observing the length of seedling growth, we wanted to estimate the possibility of longevity of forages.

Our previous study (Park *et al*., 2007) during autumn with several forage seeds for germination test showed that alfalfa or lucerne (*Medicago sativa* L.), have been produced in 1983, germinated 5-8% and sorghum hybrid (*Sorghum bicolor* (L) Moench), have been produced in 1991, showed 6-11% germination rate. The seedling length of some species which seeds have been produced in 1991 were shown (Table 2) and seedling(s) was(were) observed on white clover and sorghum hybrid. As shown in our previous result (Park *et al*., 2007), only one plant of white clover which seeds have been produced in 1991, germinated. Both experiments were carried out on the same experiment. The seed size is important for keeping longevity for alfalfa (lucerne) and sorghum hybrid, while the size of white clover was small (Park *et al*., 2007).

Table 1: Seedling length of some species which seeds were produced in (1983)

Species	Produced year	Seedling length (cm)
Leguminous species		
Lucerne (*Medicago sativa*)	1983	2.0-5.0
Birdsfoot trefoil (*Lotus corniculatus*)	1983	0.0
White clover (*Trifolium repens*)	1983	0.1
Gramineous species		
Kentucky bluegrass (*Poa pratensis*)	1983	0.0
Reed canarygrass (*Phalaris arundinacea*)	1983	0.0
Sorghum hybrid (*Sorghum bicolor* (L.) Moench)	1983	0.1
Tall fescue (*Festuca arundinacea*)	1983	0.0
Weeping lovegrass (*Eragrostis curvula*)	1983	0.0

Seeds were seeded in petri-dish on October 9-13, 2006 and investigated from October 13 through November 23, 2006

Table 2: Seedling length of some species which seeds were produced in (1991)

Species	Produced year	Seedling length (cm)
Leguminous species		
White clover (*Trifolium repens*)	1991	0.2
Gramineous species		
Kentucky bluegrass (*Poa pratensis*)	1991	0.0
Reed canarygrass (*Phalaris arundinacea*)	1991	0.0
Sorghum hybrid (*Sorghum bicolor* (L) Moench) (Pioneer 931)	1991	0.2 - 5.0

Seeds were seeded in petri-dish on October 17, 2006 and investigated from October 18 through November 23, 2006

Table 3: Seedling length of some species which seeds were produced in (1997)

Species	Produced year	Seedling length (cm)
Leguminous species		
Birdsfoot trefoil (*Lotus corniculatus*)	1997	5.0 (thin)
White clover (*Trifolium repens*)	1997	0.5-3.0
Gramineous species		
Sorghum hybrid (*Sorghum bicolor* (L) Moench)	1997	0.0
Sorghum Sudan hybrid (*Sorghum bicolor* x *S. sudanense*)	1997	0.3 - 5.0
Tall fescue (*Festuca arundinacea*)	1997	0.0
Weeping lovegrass (*Eragrostis curvula*)	1997	0.0

Seeds were seeded in petri-dish on September 29, 2006 and investigated from October 13 through November 23, 2006

Table 3 shows the seedling length of some species which seeds were produced in 1997. There were several species which had grown well. As was shown previously in our germination test (Park *et al*., 2007), some species showed their growth, for example, birdsfoot trefoil (*Lotus corniculatus*) white clover (*Trifolium repens*), sorghum Sudan hybrid (*Sorghum bicolor* x *S. sudanense*) on 9 years after the seed production. Sorghum hybrid, in Table 3, was not good for the seedling growth and as written in our previous report (Park *et al*., 2007) the preserving method is important for the longevity of forages. Among the three preserving methods, the glass-bottle packed with tight gum plug is the best one (Fig. 1).

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