

EMERGENCE RESPONSE OF FIVE FODDER SHRUBS TO SEED TREATMENT

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SUMMARY

Germination of shrub seeds can be hindered by impermeable seedcoat or by the presence of germination inhibitors. Seed treatments may be required to enhance germination and improve seedling emergence. The objective of this experiment was to improve greenhouse emergence techniques of five shrub species commonly used for revegetating Moroccan rangelands. The species were *Atriplex canescens*, *A. halimus*, *A. lentiformis*, *A. nummularia*, and *Acacia cyanophylla*. Treatments consisted of (1) non-treated seeds, (2) soaking seeds in fresh water for 48 hours, (3) soaking seeds in hot water and cooling to room temperature, and (4) soaking seeds in boiling water for 5 minutes and cooling to room temperature. The experiment was conducted in September 1991 and repeated in December 1991. Both experiments were conducted in a greenhouse at the Aridoculture Center of Settât. Except *A. halimus*, emergence of all the other species increased after seed treatment. The highest emergence of *Atriplex canescens*, *A. lentiformis*, and *A. nummularia* seedlings was obtained when seeds were soaked in fresh water for 48 hours. No treatment tested increased emergence of *Atriplex halimus*. The highest emergence of *Acacia cyanophylla* occurred when seeds were boiled in water for 5 minutes.

KEY WORDS: *Atriplex canescens*, *Atriplex halimus*, *Atriplex lentiformis*, *Atriplex nummularia*, *Acacia cyanophylla*, seed dormancy, germination, forage shrubs.

RESUME

La germination des semences d'arbustes peut être entravée par la présence d'inhibiteurs de germination. Des traitements de semences sont alors nécessaires pour améliorer la germination, et par conséquent la levée. L'objectif de cette expérience est d'améliorer les techniques de levée en serre de cinq arbustes fourragers couramment utilisés dans des programmes

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d'amélioration pastorale au Maroc. Les espèces utilisées sont *Atriplex canescens*, *A. halimus*, *A. lentiformis*, *A. nummularia*, et *Acacia cyanophylla*. Les traitements étaient: (1) semences non traitées, (2) trempage de semences dans l'eau fraîche pendant 48 heures, (3) trempage de semences dans l'eau chaude, (4) trempage de semences dans l'eau bouillante pendant cinq minutes. L'expérience a été conduite en Septembre 1991 et répétée en Décembre 1991. Les deux expériences ont été conduites en serre au Centre Aridoculture de Settat. A l'exception de *A. halimus*, la levée de toutes les autres espèces a été améliorée par au moins un des traitements. La plus haute levée de plantules d'*Atriplex canescens*, *A. lentiformis*, et *A. nummularia* a été obtenue quand les semences ont été trempées dans l'eau fraîche pendant 48 heures. La levée d'*Acacia cyanophylla* a été meilleure quand les semences ont été trempées dans l'eau bouillante pendant cinq minutes. Les semences d'*Atriplex halimus* n'ont nécessité aucun des traitements pour augmenter la levée de cette espèce.

MOTS CLES: *Atriplex canescens*, *Atriplex halimus*, *Atriplex lentiformis*, *Atriplex nummularia*, *Acacia cyanophylla*, dormance, germination, arbustes fourragers.

INTRODUCTION

Shrub species used to revegetate rangelands in Morocco include *Atriplex nummularia*, *A. canescens*, *A. halimus*, *A. lentiformis*, and *Acacia cyanophylla*. Seed germination of these shrubs can be hindered by impermeable seedcoat or by the presence of germination inhibitors such as salt in the case of *Atriplex* seeds. Seed treatments may be required to enhance germination, and various methods are used for this purpose. *Atriplex* seeds are usually soaked in fresh water at room temperature for 24 to 48 hours to remove salts (Le Houérou and Pontanier 1987). Soaking seeds in fresh water for two hours removed salts and improved germination of *Atriplex canescens* (Vories 1981). Also, seeds of *Atriplex canescens* should be dewinged because the bracts contain 10% saponin, a germination inhibitor (Nord and Van Atta 1960). Vora (1989) found that soaking seeds in concentrated sulfuric acid significantly increased emergence of 24 native shrub species in Texas. He showed that soaking seeds in either distilled water or gibberellic acid was not as effective as acid treatments. Shaybany and Rouhani (1976) found that seeds of *Acacia cyanophylla* when treated with concentrated acid for 90 minutes had 99% germination after 6 days. They also reported that soaking seeds in boiling water for five minutes gave 95% germination.

Our objective is to improve greenhouse emergence techniques of five shrub species commonly used for revegetating Moroccan rangelands.

MATERIALS AND METHODS

This experiment was conducted in a greenhouse at the Aridoculture Center of Settat. Five species were used: *Atriplex canescens*, *A. halimus*, *A. lentiformis*, *A. nummularia*, and *Acacia cyanophylla*. *Atriplex* seeds were obtained from the Seed Production Center of Khmis M'touh. *Atriplex canescens* seeds were dewinged to increase germination. *Acacia* seeds were harvested from a nearby plantation. These species will be referred to as ATCA, ATHA, ATLE, ATNU, ACCY, respectively. Treatments consisted of (1) non-treated seeds, (2) soaking seeds in fresh water for 48 hours, (3) soaking seeds in hot water and cooling to room temperature, and (4) soaking seeds in boiling water for 5 minutes and cooling to room temperature. Beakers were filled at a ratio of three-fourths water and one-fourth seeds by volume. The experiment was laid out as a completely randomized blocks design with 5 replications. The treatment design was a 5x4 factorial. Ten treated seeds were sown in plastic pots (12 x 15 cm) at 1 cm depth. Pots were filled with a clay loam soil that was sterilized at 170 °C for 3 h. Plastic pots were irrigated to field capacity every other day. The experiment was conducted in September 1991 and repeated in December 1991. Temperature within the greenhouse varied between 13 and 22°C. Seedling counts started one week after planting and continued every three days over a period of 30 days when no further emergence occurred. Total emergence was expressed as percentage of initial number of seeds planted. No transformation of the data was necessary. A standard analysis of variance was performed on the data, and the least significant difference test (LSD) was used to compare treatment means (Steel and Torrie 1980).

RESULTS AND DISCUSSION

There was a significant treatment effect ($P < 0.05$) on emergence of all species, but a significant date by treatment interaction ($P < 0.05$). September and December experiments were thus analyzed separately (Tables 1, 2).

Species reacted differently to seed treatments. We found that at least one treatment was better than the control for all species except *Atriplex halimus*. Soaking seeds in fresh water for 48 hours was most effective for *Atriplex canescens*, *A. lentiformis*, and *A. nummularia*. Boiling seeds in water for 5 minutes was least effective for *Atriplex* where there was nearly no emergence (Tables 1, 2). No treatment method improved emergence of *Atriplex halimus*. The highest emergence of *Acacia cyanophylla* was obtained when seeds were boiled in water for 5 minutes (Tables 1, 2). Results for *Acacia* were similar to those obtained by Shaybany and Rouhani (1976). These authors did

not find any significant difference between boiling *Acacia* seeds for 5 or 10 minutes.

Table 1. Percent emergence from September 1991 experiment.

Seed treatments	Species				
	ATCA	ATHA	ATLE	ATNU	ACCY
Fresh Water	36.0	32.0	22.7	54.7	5.3
None	24.0	29.3	10.7	26.7	5.3
Hot Water	20.0	29.3	26.7	40.0	80.0
Boiling Water	0.0	0.0	0.0	0.0	81.3
LSD (5%)	10.0	13.1	10.7	8.6	12.8

Table 2. Percent emergence from December 1991 experiment.

Seed treatments	Species				
	ATCA	ATHA	ATLE	ATNU	ACCY
Fresh Water	40.0	17.5	20.0	70.0	2.5
None	22.5	27.5	12.5	50.0	0.0
Hot Water	30.0	27.5	17.5	42.5	12.5
Boiling Water	0.0	0.0	0.0	2.5	57.5
LSD (5%)	16.5	20.3	17.7	17.5	12.8

CONCLUSION

Emergence of shrubs can be improved by seed treatment. Satisfactory results were obtained when seeds of *Acacia cyanophylla* were boiled in water for five minutes. Highest emergence of *Atriplex canescens*, *A. lentiformis*, and *A. nummularia* seedlings was obtained when seeds were soaked in fresh water for 48 hours. Emergence of *Atriplex halimus* was not improved by any of the treatments.

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