

Effect of Seed Coating Methods on Germination Speed of *Onobrychis sativa* at Different Drought Stress Levels and Sowing Depths

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Abstract. Seed enhancement methods are applied to eliminate or decrease adverse environmental stresses effects and increase seed germination rate and vigor of rangeland plants. The aim of this study was to assess different methods of seed coating effects on germination speed of *Onobrychis sativa* at different sowing depths and soil moisture levels. The experiment was conducted at growth chamber to apply a better control on environmental factors. So the intact effects of different seed coating treatments were better distinguished by eliminating the interfering environmental factors. The treatments were set up in factorial arrangement based on a Randomized Complete Block (RCB) design with three replications. Factor A: treatment of drought stress treatment at three levels of 9%, 14% and 21% of soil moisture content and factor B: sowing depths of range plants at two levels of leaving the on soil surface and sowing the seed in the soil at 3 times of its thickness and finally factor C: seed coating material with four levels of control (no coating), organic coating, hydro gel coating and mineral coating. Parameter such as germination speed parameter were measured. Results showed that range species seeds coated with different coating materials created in this experiment, significantly performed better germination speed in both normal and drought stressed situations

Keywords: seed coating, *Onobrychis sativa*, early growth and germination speed

1. Introduction

Now a days importance of rangeland improvement and development is obviously more that past because of effect of climatic change and human factor on degradation of ranges in Iran .So methods of seeding are very important. every year do time and cost in country for seeding in rangeland but because of some reason such as soil erosion, not suitable depth of soil climate change drought wet stress and increase of mean temperature of niches caused that in some project of seeding even native seed plants of rangeland after germination can not establish or can not easily establish. For this reason reseeding method in rangeland, for delete or decrease of environmental stresses effects and increase speed and vigor important by using methods of seed vigorous.

One of the methods of seed vigorous is seed coating aim of this method is different such as increase amount of regeneration and speed, avoid of degradation by disease and pest, easy doing seedling process, seed homogenous distribution (Especially by air seeding) humidity conservation around of seed increase of productivity, doing in regeneration avoids eating seed by animal and increase of speed and ability in plant establishment.

In 1984, researchers of seed technology in beat seed improvement and production research institute destroyed and improved star ship and additional piece of beet by seed coating. Majority of researches about seed coating are related to cultivate and there is little research for rangeland plant seed coating especially effect of covering matter for establishment of rangeland plant. Johansson et al. (2004) showed that the most density, establishment and production of canola is related to controller treatment in grass habitat when they

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investigated on effects of seed coating by a kind of polymer and date of cultivation of Canola on establishment and production of this species. Sommer and Larik (2002) tested effect of see covering matter on soil fauna by nutrient layers. They showed that effect of its دفع on many soil biotic around seed by increasing of seed coating matter density. Trener and Havard (1965) coated seeds of some grasses such as; Agropyron sp., Elymous sp. and Phluem sp. and legume such as; Clover and Alfalfa and used their in rangeland seeding. His results showed that seed coating has been caused increasing of more germination and establishment of seeds. Referenced showed that there is no any research about seed coating according to increasing of germination and establishment of plant. In other research seed coating used mainly for cultivate plant too. For this reason there is many aspect of unknown such as; main effects and non main effects of seed coating, kind and suitable composition of seed coat for rangeland plants with situation of Iran ecology and so on. The aim of this study is making a suitable matter for seed coating, innovation in methods of seed coating and lately reorganization of effect of coating matter on germination speed of rangeland species in moisture stress situation and in different depth cultivation.

2. Material and Methods

Sampling and seed and base cultivation to prepare according to this study for the first in Iran, so tried to using rangeland spices which are very important by using in seedling project and very using. One of the best species in range according to palatability and forage production is *Onobrychis sativa*. This species can use in artificial rangelands, forage production, changing low productivity fallow to artificial rangelands and development and improvement of rangelands. Seed samples selected randomize from pack storage of *Onobrychis sativa* seeds in rangeland those seeds. plant seed bank of Damavand station to seed technology laboratory of forest and rangelands Institute for clearing seeds from non matter and trash matter.

According to most relation between affectivity of seed coverage matter and cover, used soil of Damavand rangeland for base cultivation because of more homogenous germination environment with natural niche situation. For decreasing error soil was homogenized and soil placed into plat. For reach to effect of seed coat matter in growth and establishment plant from the soil, we used to light (16 hour light and 8 hour darkness) and temperature (21-22 degree of centigrade) and air humidity (45-50 percent).

3. Experiment Plan

This study was conducted factorial by Randomize Complete Block (RCB) with three repeat. The moisture treatment (drought stress) was three level 9%, 14% and 21% of dry soil weight, and the depth cultivation treatment with two levels, 3 times of seed diagonal and on soil surface and seed coating treatment with four levels: non coat, organic coat, hydro gel coat and mineral material coat. The test was placed in germinator and during of study germination speed of indexed were measurement.

4. Result and conclusion

Results showed that germination speed there was different significant between seed coat, drought stress and depth cultivation treatments in *Onobrychis sativa* that was significant ($p < 0.01$). Bilateral effect of kind of seed coating matter and cultivation depth, drought treatment and kind of seed coating, cultivation depth and drought treatment on germination speed was significant ($p < 0.01$). Bilateral effect of moisture percent, cultivation depth and kind of seed coating on germination speed was significant ($p < 0.01$). (Table 1).

Table 1. variance analysis effect moisture different level, depth and seed coating on germination speed and speed of *Onobrychis sativa*

Mean Square	d.f	Source
Germination speed		
0/29**	2	moisture percent
0/22**	1	Planting depth
0/44**	3	Cover seed
0/011**	2	moisture percent * Planting depth
0/0573**	6	moisture percent* Cover seed

0/24**	3	Planting depth* Cover seed
0/01234**	6	moisture percent* Planting depth* Cover seed
5/127		CV

* and ** is significant in level of percent 5 and 1 and ns is non significant

Results showed that the most germination speed was in treatment of mineral matter coat with 0.7 and the least germination speed was in treatment non cover with 0.4.

With increasing many percent of moisture, germination speed was with a trend increasing that in 9% moisture the least germination speed 0.43 and in 21% moisture the most germination speed was 0.71 (Table 2).

Table 2.comparison of means effect of treatment on properties under study in *Onobrychis sativa* by using Duncan test with 0.05 probability level.

Germination speed	adjectives	Treatment
0/42583c	9% weight of dry soil	moisture percent
0/67333b	14%"	
0/71292a	21%"	
0/56861b	on soil	Planting depth
0/63944a	3 time of diameter of seed	
0/40556c	non coating	Cover seed
0/64278b	Organic material	
0/66722b	absorbent material	
0/70056a	Mineral material	

Bilateral effect of kind of seed coating matter and planting depth on germination speed in, *Onobrychis sativa* showed that most germination speed (0.71-0.67), was in treatment of mineral matter coat (CC), and hydro gel matter coat (HC). Least germination speed was in treatment non cover with 0.3 (Figure 1).

Results showed that bilateral effect of kind of seed coating matter, cultivation depth and drought treatment at soil moisture levels of 14% and 21% on germination speed was significant (Figure 2).

seed coating is affect on germination speed without according to kind of cover. These results are alike with research of other researcher such as; Larik and Sommer in 2002 which they studied effect of seed coating on fauna of soil and analyzed by nutrient sheets. And researches of Hvard and Trener (1995) are alike with this study witch they tested kind of loam seed coating material on some grass such as; Agropyron sp., Elymos sp., Phloum sp., and legumes such as Alfalfa and Clover.

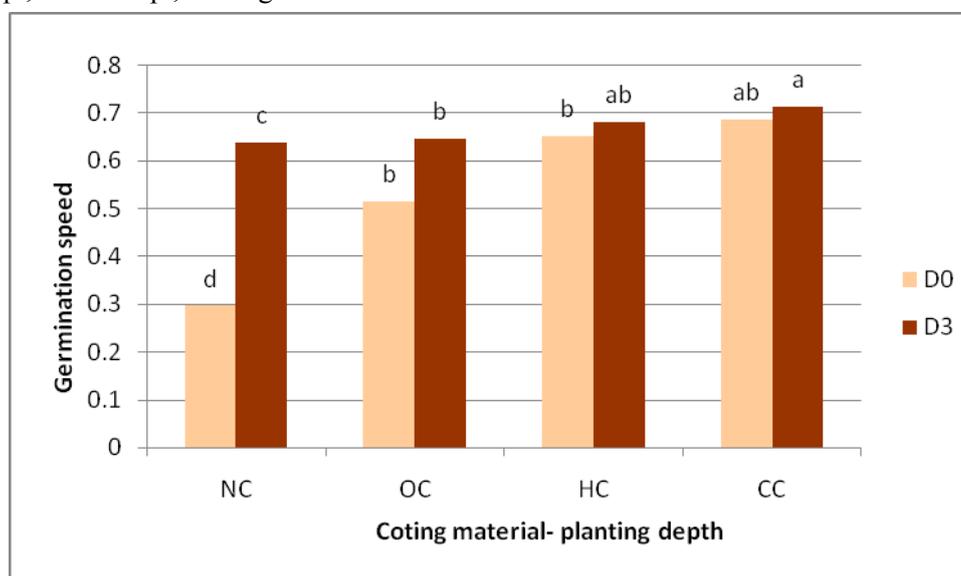


Figure 1. Bilateral effect of kind of seed coating matter and planting depth on germination speed in, *Onobrychis sativa*

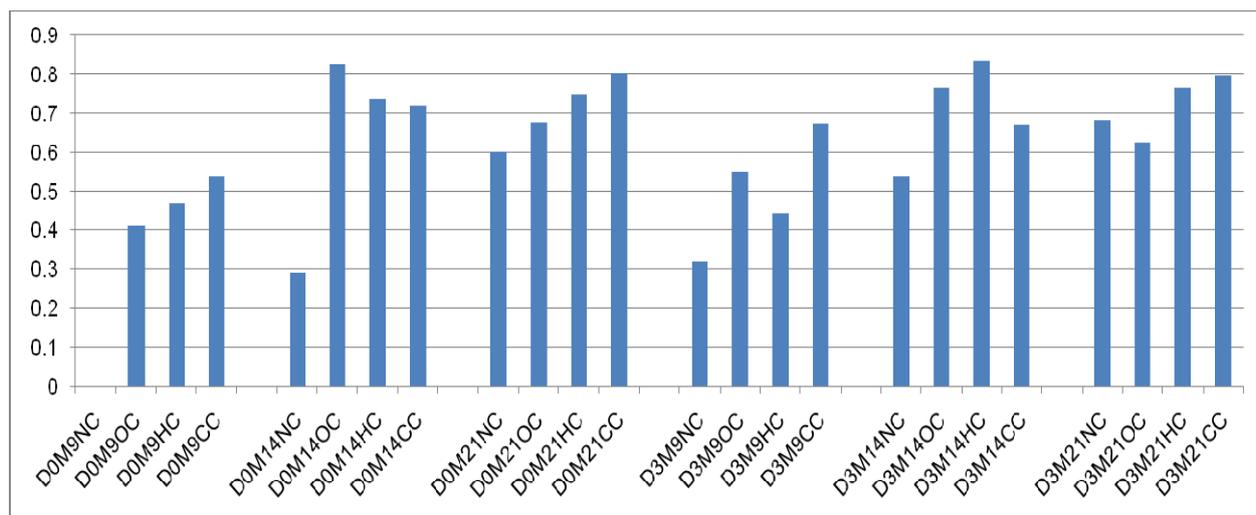


Figure 2. Bilateral effect of kind of seed coating matter, soil moisture and planting depth on germination speed in, *Onobrychis sativa*

5. References

- [1] Adams, A., Akram, A., Briscoe, B.J., Lawrence, C.J. and Parsonage, D., "Nan indentation of particulate coatings", *J. Mater. Res.*, v14 n6, (1999), p 2344-2350
- [2] Bendeli, A., "Theory and Operation of the Ultra Micro Indentation System", (1999 Division of Telecommunications and Industrial Physics, CSIRO, Australia.
- [3] British Materials Handling Board (BMHB), "Particle Attrition: State-of-the-Art Review", *Series on Bulk Materials Handling*, v5, (1987), Belgium
- [4] Capes, C.E. "Particle Size Enlargement", (1980), Elsevier Scientific Pub. Co., New York
- [5] Conceição Filho, R.S. et. al., "The use of a Spouted Bed in the Fertilizer Coating of Soybean Seeds", *Drying Technology*, v16 n9 (1998), p 2049-2064
- [6] Golchert, D. J., Liu, L. X. and Litster, J.D., "Characterization Tests for Coated Seed", (1999), Department of Chemical Engineering, University of Queensland, Unpublished.
- [7] Johnson, L., Ennis, B. J., "Measurement of Particle Material Properties and Their Relation to Attrition Phenomena in Solids Handling", *1st Int. Particle Tech. Forum*, Part II, (1994), American Institute of Chemical Engineers, USA
- [8] Kage, H., et. al., "Coating Efficiency of Seed Particles in a Fluidized Bed by Atomization of a Powder Suspension", *Powder Technology*, v86 n3 (1996) p243-250
- [9] Liu, L.X. & Litster, J.D., "Spouted Bed Seed Coating: The effects of process variables on maximum coating rate and elutriation", *Powder Technology*, v74 n3 (1993) p215-230
- [10] Mittal, K.L., "Adhesion Measurement of Films and Coatings: A Commentary", *Adhesion Measurement of Films and Coatings*, (1995), p1-13, VSP BV, The Netherlands
- [11] Perry, R.H. & Green, D.W. (ed), "Perry's Chemical Engineer's Handbook", 7th Ed. (1997), Section 20, McGraw-Hill Companies Inc., United States of America
- [12] Scott, D, "Effects of Seed Coating on Establishment", *New Zealand Journal of Agricultural Research*, v18 (1998) p59-67
- [13] Scott, J.M., "Delivering Fertilizers through Seed Coatings", *Nutrient Use in Crop Production*, (1998) p197-220
- [14] Valli, J. & Mäkalä, U., "Applications of the Scratch Test Method for Coating Adhesion Assessment", *Wear*, v115 (1987), p215-221