

THE EFFECT OF FERTILIZER SEED COATING ON THE GERMINATING CAPACITY AND INITIAL DEVELOPMENT OF SOME TURF GRASS SPECIES AND WHITE CLOVER

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Abstract

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The effect of the iSeed method treatment on germination dynamics, total germinating capacity and the length of above-ground and root parts was studied in laboratory conditions for the Red fescue varieties Darwin and Moccasin, Kentucky bluegrass varieties Yvette and Miracle, Perennial ryegrass varieties Beatrice and Milan, and White clover varieties Pirouette and Pipolina. In the Perennial ryegrass, the iSeed treatment adversely affected the energy of germination in the first days of study. The germinating capacity gradually equalized during the experiment. Red fescue and Kentucky bluegrass did not show any response to the treatment. Similarly as the Perennial ryegrass, the two varieties of White clover exhibited higher energy of germination on the third day from the establishment. A demonstrably positive effect of the iSeed treatment was recorded on the number of germinated individuals. Particularly the variety Pirouette showed significantly higher germinating capacity until the tenth day of monitoring the treated seeds. The iSeed method had no statistically significant influence on the values of total germinating capacity in all tested species and varieties. The effect of the iSeed method treatment on the length of shoot and root parts was not statistically demonstrated. Some varieties showed a positive effect and some showed a negative effect. A significant difference was observed only in the untreated variety Moccasin whose above-ground part was by 14 mm longer as compared with the treated variant.

seed treatment, germinating capacity, iSeed, turf species, microclover

Germination and emergence rate of grasses after sowing are important indicators of the competitive capacity of grasses affecting development and character of the grass stand. The capacity of seeds to germinate fast and evenly is a basic prerequisite for the successful establishment of the turf. Turfs are currently established with using seeds that are treated by various methods in order to enhance their field germination and competitiveness as compared with the untreated seeds. One of such methods is iSeed, which is based on the coating of seeds with fertilizer. According to Nijestein (2008), the used coat layer contains 20% of nitrogen and 4% of phosphorus. Nitrogen is partly in the readily soluble form and partly in the slowly soluble form;

phosphorus is only in the fast release form. Černoch (2009) informs that by contrast to the breeding of varieties focused on the improvement of genetic characteristics of plants, new seed treatment technologies modify conditions for the emergence of seeds so that the potential of the variety can be fully used.

By using the iSeed method, we can supply up to 40 kg of fertilizer per one hectare of the sown area. The advantage of this method consists in easier sowing, better contact with soil; if a damaged turf has to be repeatedly sown, naked grains penetrate better through the above-ground part of the sward and are thus protected from being blown away by wind or eaten by birds (Knot *et al.*, 2008).

Recently, seed producers have started to focus on alternative species for grass mixtures those are more resistant to stress conditions (drought and trampling). One of such species is the increasingly used White clover 'Microclover', which forms minute leaflets not disturbing the turf appearance.

MATERIAL AND METHODS

The experiment was established at the Research Station of Fodder Crops in Vatin in 2011. The effect of the treatment of naked seeds by the iSeed method on the dynamics of germination, total germinating capacity and the length of above-ground and root phytomass was studied in laboratory conditions for the Red fescue (*Festuca rubra* ssp. *commutata* 'Darwin' and *Festuca rubra* ssp. *trichophylla* 'Moccasin'), Kentucky bluegrass (*Poa pratensis* 'Yvette' and 'Miracle'), Perennial ryegrass (*Lolium perenne* 'Beatrice' and 'Milan') and White clover (*Trifolium repens* 'Pipolina' and 'Pirouette'). The experimental variants are presented in Tab. I. The treated and untreated seed used in the experiment was of the same batch. For each variant, twenty seeds were placed on Petri dishes with moistened filter paper in three repetitions. Strips of filter paper provided

for moisture in the dishes. The trial was established on the TZ 8-046 germinator with the adjusted day regime of 16 hours at 25 °C (light on) and the night regime of 8 hours at 15 °C (light off). The number of germinated seeds was counted on Day 3, 7, 10, 13, 16 and 20 from the establishment. Upon the end of the experiment on Day 20, five largest individuals were selected from each variant in order to measure the length of their above-ground and root parts.

Because the germination results were in the form of relative abundance and the detected percentage values could not be expressed by means of Gaussian distribution, a conversion was made by means of the ArcusSinus square root transformation (Gomez and Gomez, 1984). Significance was tested by Anova (Statistika, Version 8) and by the subsequent Tukey test ($p \leq 0.05$).

RESULTS AND DISCUSSION

Results of our experiment with the grass species (Tabs. II, III and IV) show that the treatment of seeds by the iSeed method increased the values of total germinating capacity by 2.3% (Red fescue var. Darwin), 7.6% (Kentucky bluegrass var. Yvette) and 4.3% (Perennial ryegrass var. Beatrice). However, the differences in germinating capacity were in all cases insignificant. Determining the effect of the treatment of naked seeds of meadow grass varieties Yvette and Miracle by using the Proradix method, Knot (2010) observed an insignificantly increased germinating capacity, too, and the treatment of Kentucky bluegrass naked seeds with Headstart and Pregerm methods did not have a significant effect on the germinating capacity either (Knot, 2006). On the other hand, the total germinating capacity was lower in the treated Red fescue var. Moccasin (−7.1%), Kentucky bluegrass var. Miracle (−8%) and Perennial

I: *Experimental variants*

Factor	Level
1. Species (Varieties)	1.1. Red fescue (Mocassin, Darwin)
	1.2. Meadow grass (Yvette, Miracle)
	1.3. Perennial ryegrass (Beatrice, Milan)
	1.4. White clover (Pirouette, Pipolina)
2. Treatment	2.1. Untreated
	2.2. iSeed

II: *Germination dynamics and total germinating capacity (%) of Red fescue*

Variant	Day 3	Day 7	Day 10	Day 13	Day 16	Day 20
Darwin iSeed	0.0 a	52.9 a	58.0 a	60.3 a	60.3 a	60.3 a
Darwin	0.0 a	56.0 a	57.0 a	57.0 a	57.0 a	58.0 a
Mocassin iSeed	0.0 a	38.2 a	45.0 a	47.9 a	48.8 a	48.8 a
Mocassin	0.0 a	46.9 a	48.9 a	53.9 a	55.9 a	55.9 a
Average iSeed	0.0 a	45.6 a	51.5 a	54.1 a	54.6 a	54.6 a
Average	0.0 a	51.5 a	53.0 a	55.5 a	56.5 a	57.0 a

Values characterised by the same letter are not significantly different ($p \leq 0.05$)

III: *Germination dynamics and total germinating capacity (%) of Kentucky bluegrass*

Variant	Day 3	Day 7	Day 10	Day 13	Day 16	Day 20
Yvette iSeed	0.0 a	29.9 a	53.1 a	66.0 a	66.0 a	67.2 a
Yvette	0.0 a	37.2 a	47.9 a	56.3 a	56.3 a	59.6 a
Miracle iSeed	0.0 a	53.8 a	67.4 a	70.1 a	70.1 a	70.1 a
Miracle	0.0 a	53.8 a	73.8 a	78.1 a	78.1 a	78.1 a
Average iSeed	0.0 a	41.9 a	60.3 a	68.1 a	68.1 a	68.7 a
Average	0.0 a	45.5 a	60.9 a	67.2 a	67.2 a	68.9 a

Values characterised by the same letter are not significantly different ($p \leq 0.05$)

IV: *Germination dynamics and total germinating capacity (%) of Perennial ryegrass*

Variant	Day 3	Day 7	Day 10	Day 13	Day 16	Day 20
Beatrice iSeed	0.0 a	90.0 a	90.0 a	90.0 a	90.0 a	90.0 a
Beatrice	18.9 a	85.7 a	85.7 a	85.7 a	85.7 a	85.7 a
Milan iSeed	0.0 a	64.7 a	72.0 a	72.0 a	72.0 a	72.0 a
Milan	36.8 b	71.3 a	73.5 a	73.5 a	73.5 a	73.5 a
Average iSeed	0.0 a	77.4 a	81.0 a	81.0 a	81.0 a	81.0 a
Average	27.9 b	78.5 a	79.6 a	79.6 a	79.6 a	79.6 a

Values characterised by the same letter are not significantly different ($p \leq 0.05$)

V: *Germination dynamics and total germinating capacity (%) of White clover*

Variant	Day 3	Day 7	Day 10	Day 13	Day 16	Day 20
Pirouette iSeed	50.0 b	66.0 b	67.2 b	67.2 a	67.2 a	67.2 a
Pirouette	27.7 a	48.9 a	51.9 a	59.3 a	59.3 a	59.3 a
Pipolina iSeed	52.1 a	54.1 a	54.1 a	55.2 a	55.2 a	55.2 a
Pipolina	42.1 a	50.0 a	51.9 a	52.9 a	52.9 a	52.9 a
Average iSeed	51.1 b	60.1 a	60.7 a	61.2 a	61.2 a	61.2 a
Average	34.9 a	49.5 a	51.9 a	56.1 a	56.1 a	56.1 a

Values characterised by the same letter are not significantly different ($p \leq 0.05$)

ryegrass var. Milan (–1.5%) – although even there the reduction of germinating capacity was insignificant. Exploring the Headstart method under identical temperature conditions, Sobotková (2009) recorded an insignificant influence of the treatment on the total germinating capacity of meadow grass (var. Cocktail). A more rapid germination was detected in all untreated variants this having likely resulted from the absence of the coat layer which may hamper water penetration during the initial stage of germination. The trend was particularly apparent in both untreated varieties of Perennial ryegrass with the difference in the germinating capacity of var. Milan being statistically significant (Tab. IV). Already on Day 7, the differences between the treated and untreated ryegrass variants were very small. As to the individual grass species, a significant difference between the averages of the two varieties was found only in the Perennial ryegrass in which a higher germinating capacity was observed in the untreated naked seed on Day 3 after the establishment.

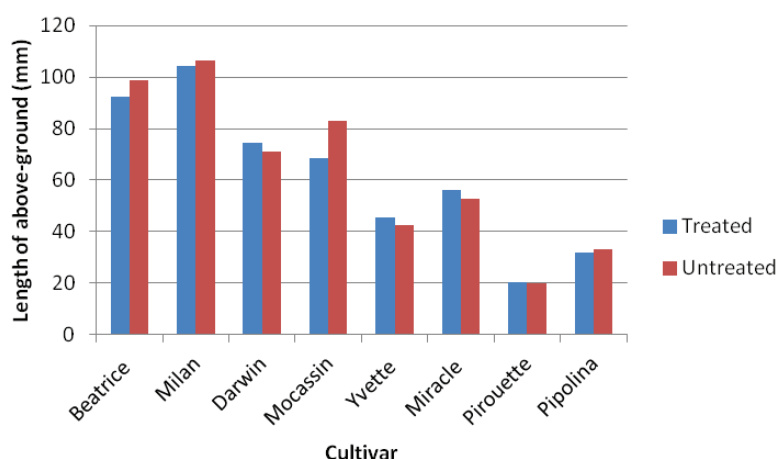
Tab. V shows that the treated seed of White clover exhibited higher values of germinating capacity in the respective days of assessment. Especially the germinating power of the variant Pirouette iSeed was significantly higher until Day 10 from the establishment of the experiment. On Day 20, the total germinating capacity of treated variants was insignificantly higher by 7.9% (Pirouette) and 2.3% (Pipolina). On the average of the two varieties, a positive influence of the iSeed treatment was found on the total germinating capacity as well as on the germinating power with significant differences being recorded only on Day 3 of the trial.

A beneficial effect of the iSeed treatment on the shoot length was recorded in the Red fescue var. Darwin, Kentucky bluegrass var. Yvette and Miracle

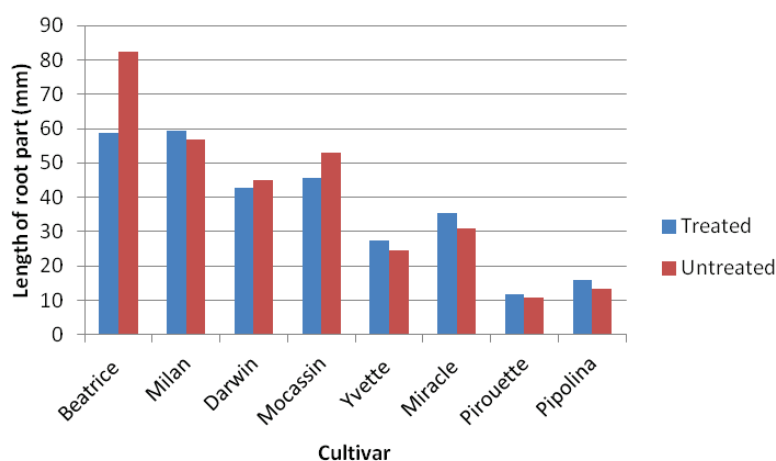
and White clover var. Pirouette (Fig. 1). Vrzalová *et al.* (2008) observed an insignificant effect of seed treatment by the Headstart method on the shoot length in several varieties of Kentucky bluegrass, too. Similarly, the experiment of Vrzalová and Knot (2011) conducted to test the effect of seed coating by the Proradix method revealed a positive, yet insignificant influence of this method on the length of the above-ground and root parts of Kentucky bluegrass. In the Beatrice iSeed, Milan iSeed and Pipolina iSeed, the fertilizer treatment had a negative effect on the phytomass length and the shoot length of the Mocassin iSeed was significantly shorter by 14mm. The treatment reflected as beneficial on the length of roots of the varieties Milan, Miracle, Yvette, Pipolina and Pirouette (Fig. 2). The negative effect of the treatment was detected in both Red fescue varieties (Moccasin, Darwin) and in the Perennial ryegrass variety Beatrice.

CONCLUSIONS

The experimental results demonstrated that the iSeed treatment had a negative influence on the germinating energy of Perennial ryegrass on the third day from the establishment of the trial. Demonstrably higher values were observed in the Milan variety. From Day 7, the course of germination was equable in all grass species and no remarkable differences were detected until the end of the experiment (Day 20). White clover responded to the fertilizer coating by a higher total germinating capacity and by a higher germinating energy (var. Pirouette iSeed) demonstrably until Day 10. No significant effect of the treatment was found on the length of above-ground and root parts. The fertilizer seed coating showed a positive effect on the shoot and root lengths of both meadow grass varieties and



1: The length of above-ground part on day 20 since the trial establishment. Values in the same variety characterised by the same letter are not significantly different ($p \leq 0.05$).



2: The length of root part on day 20 since the trial establishment. Values in the same variety characterised by the same letter are not significantly different ($p \leq 0.05$).

in the White clover variety Pirouette. The Darwin iSeed variant exhibited only a longer shoot and the Milan iSeed and Pipolina iSeed variants exhibited by contrast a longer root part. In the varieties Beatrice and Moccasin, the treatment had a negative

effect on both characteristics. A longer root part was detected in the var. Beatrice and a demonstrably higher was the shoot part of the var. Moccasin.

SUMMARY

The objective of the work was to ascertain the effect of fertilizer seed coating by using the iSeed method on the germinating capacity and length of above-ground and root parts of some grass species and White clover. Species chosen for the experiment were Red fescue (varieties Darwin and Moccasin), Meadow grass (varieties Yvette and Miracle), Perennial ryegrass (varieties Beatrice and Milan) and White clover (varieties Pipolina and Pirouette). The experiment was established in controlled conditions on germinator at the Research Station of Fodder Crops in Vatin in 2011. The iSeed method had for Perennial ryegrass varieties a negative influence on the germinating energy on Day 3 after the establishment but the germinating capacity became balanced on Day 7 of the experiment and the values of total germinating capacity at the end of the experiment were equable without statistical significance. In both White clover varieties, the iSeed treatment had a positive influence on the onset of germination as well as on the total germinating capacity. The iSeed treated variety Pirouette exhibited significantly higher ($p \leq 0.05$) germinating capacity until Day 10 from the establishment of the trial. The effect of the fertilizer seed coating on the length of shoot and root parts was not demonstrated, being positive in some species and negative in other ones. A statistically significant negative effect ($p \leq 0.05$) was observed only in the above-ground part length of the untreated var. Moccasin.

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REFERENCES

- ČERNOCH, V., 2009: *Nové technologie přípravy osiv*. In: HRABĚ, F. et al., Trávníky pro zahradu, krajinu a sport, 1. vyd., Olomouc: Vydavatelství Ing. Petr Baštan, s. 62–64.
- GOMEZ, K. A., GOMEZ, A. A., 1984: *Statistical procedures for agricultural research*. 2nd ed. J. Willey & Sons, New York, Chichester, Brisbane, Toronto.
- KNOT, P., 2006: Vliv abiotických faktorů na klíčivost *Agrostis species* a *Poa species*. *Acta Univ. Agric. Et Silv. Mendel. Brunen.* 54, 5: 57–64. ISSN 1211-8516.
- KNOT, P., VRZALOVÁ, J., HRABĚ, F., 2008: Moderní technologie ošetření obilek lipnice luční. *Zahradnictví: Měsíčník pro profesionální zahradníky*. Odborný recenzovaný časopis. sv. 7/2008, č. 7, s. 40–41. ISSN 1213-7596.
- KNOT, P., 2010: Vliv odrůdy a stáří osiva na klíčivost lipnice luční. *Úroda – Odborný časopis pro rostlinnou produkci*, sv. LVII, 9: 42–44. ISSN 0139-6013.
- NIJENSTEIN, H., 2008: Nutrient seed coating for grasses. In: *1st EUROPEAN TURFGRASS SOCIETY CONFERENCE*. 1. vyd. Pisa, Itálie: Uliva Foa, 2008, s. 145–146. ISBN 978-88-902076-4-8.
- SOBOTOVÁ, H., 2009: *Konkurenční vztahy vybraných druhů trav v trávnících*. Doktorská disertační práce. Česká zemědělská univerzita v Praze. 133 s.
- STATSOFT Inc., 2007: STATISTICA data analysis software system, version 8.0., In: www.statsoft.com
- VRZALOVÁ, J., KNOT, P., HRABĚ, F., 2008: Vliv ošetření osiva lipnice luční přípravkem Headstart na klíčivost a počáteční rychlost růstu. *Úroda, Vědecká příloha „Aktuální poznatky v pěstování, šlechtění, ochraně rostlin a zpracování produktů“*. Referáty z konference ze dne 6.–7. 11. 2008 v Brně, VÚP a Zemědělský výzkum Troubsko. 2008, sv. LVI, 12: 225–228. ISSN 0139-6013.
- VRZALOVÁ, J., KNOT, P., 2011: The effect of seed age and treatment by Proradix method on germinability and initial growth of selected meadow grass (*Poa pratensis*) varieties. *Acta Univ. Agric. Et Silv. Mendel. Brunen.* sv. LIX, č. 5, s. 309–314. ISSN 1211-8516.

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