Potential of Kentucky bluegrass and perennial ryegrass to form a transient seedbank

Dr. Dave Minner and Andrew Hoiberg, Iowa State University

Introduction: We are interested in the ability of both Kentucky bluegrass and perennial ryegrass to form a transient seedbank in an intensive traffic, sports field situation. Anecdotal reports of seed banking itself in both golf course and sports field settings in conjunction with common recommendations from industry professionals to bank seed for continued germination during favorable periods have caused us to evaluate this phenomenon on a scientific level. Although previous research indicates that annual and perennial grasses are short lived in the soil, we still wish to determine if banked seed can aid in sustaining turf cover in high traffic areas during a traffic season.

Materials & Methods (experiment #1): Two different studies are underway to help increase our understanding of seedbanking with the two predominant cool season turfgrass species. First is a study where a predetermined amount of seed of each species was sealed in permeable nylon bags and buried at 2.5 cm in the soil profile, the same depth that our traffic simulator buries seed. The bags will be extracted three times during a one year period and analyzed. The number of seeds in each bag that have obviously attempted germination will be counted and the remaining seeds will be placed on germination blotter paper to determine viability. The seeds that germinate will be counted as viable and those that do not will undergo a forceps crush test; if they pass, they will then undergo tetrazolium staining to determine if a viable embryo is present.

Results (experiment #1): Only one replication of bags has been evaluated to this point, with one expected to be evaluated during summer 2010 and the last in fall 2010. The tables below shows means from the first round of analysis, performed during early November 2009 at the end of traffic season:

Sample	Total Seeds	Initial Germination (In Field)	Secondary germination (Greenhouse)	Abnormal germination	Dead seeds	Initial germination %
1	400	338	0	0	62	0.845
2	400	337	1	6	53	0.8425
3	400	341	0	1	58	0.8525
Mean	**400**	**338.67**	**0.33**	**2.33**	**57.67**	**84.67%**

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Sample	Total Seeds	Initial Germination (In Field)	Secondary germination (Greenhouse)	Abnormal germination	Dead seeds	Initial germination %
1	400	358	1	0	41	0.895
2	400	353	2	0	45	0.8825
3	400	345	1	0	53	0.8625
Mean	**400**	**352.00**	**1.33**	**0.00**	**46.33**	**88.00%**

Materials & Methods (experiment #2): The same two species were plated at three different seeding rates that we have used in the past to establish turf cover quickly in high traffic scenarios. For perennial ryegrass, 30, 60, and 90 lb/1000 ft^2 were used and for Kentucky bluegrass, 6, 12, and 24 lb/1000 ft^2 were used. Two different seeding schedules were used; a one time seeding done the same day that traffic treatments began and a multiple seeding whereby the same total amount of seed as the one time regime was divided into five separate seeding events, each one week apart, adding up to the same seeding rate as the plots that were seeded once. Traffic was applied on the one time seeded plots at the rates of zero passes or four passes to compare seedbanking in a situation where no traffic was present to work the seed into the soil versus cleated traffic 'banking' the seed into the top 2.5 cm of the soil profile. On the multiple seeded plots, one pass of traffic was necessary to work the seed past the canopy and at least onto or in the soil. At three times during the year, 10 cm plugs will be extracted from each plot (different combinations of seeding schedule, seeding rate, and traffic schedule) to determine where the most seed has been banked. The plugs are scalped down, the top 2.5 cm cut off, broken into fines by hand and planted in 20 cm pots. They are then allowed to germinate for a standardized period of time and seedlings emerged were counted.

Results (experiment #2): Only one set of plugs has been analyzed with the second round due for completion during summer 2010. Below are the tables that show our means for seedlings that grew out of the plugs that were extracted from plots:

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Source		Month
2009		Dec
Seeding regime/Traffic level	df	Seedlings emerged
One - no traffic	1	3.8
One - 4 passes/wk	1	1.7
Multiple - no traffic	1	172.4
Multiple - 4 passes/wk	1	112.1
$LSD_{(0.05)}$		**37.1**

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Source		Month
2009		Dec
Seeding Rate	df	Seedlings emerged
One - no traffic	1	10.6
One - 4 passes/wk	1	4.3
Multiple - no traffic	1	40.7
Multiple - 4 passes/wk	1	36.3
$LSD_{(0.05)}$		**28.1**