Calculate the pure live seed ratio and save

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It is that time of year once again, and in fact, many golf course superintendents may be in the process of overseeding at this time. Overseed discussions quite often are lengthy and varied with few agreements on methodology, timing, choice of overseed grass, as well as rate and method of planting.

Perhaps this short exercise may help to clarify one aspect of the complex overseed process - seed calculations based on the pure live seed (PLS) concept.

Most overseed rates are based on bulk seed per unit area, which certainly vary among grass species. Bulk seeding rates, however, are misleading as variation among cultivars within grass species may vary up to twofold depending on seed number per unit weight along with differences in purity and germination of each seed lot.

Overseed Rates based on Pure Live Seed Concept

Year	Species[1]	Cultivar	Purity	Germination	PLS	Bulk Seed	PLS	Bulk Rate[2]
			As Percentage			Count per Pound		Lb/1000 Sq. Ft.
1996	PR	Roadrunner	98.2	94.0	92.3	208,640	192,591	37.4
	PR	Livonne	99.0	92.0	91.1	324,285	295,541	24.4
	RB	Fuzzy	97.9	87.0	85.2	1,759,772	1,498,085	9.6
	RB	Pt A	92.6	93.0	86.1	3,492,307	3.007,.505	4.8
1995	PR	2ET-95	99.0	96.6	95.0	208,640	198,191	36.3
	PR	GH94	98.9	88.5	87.2	273,165	239,019	30.1
	RB	Danish Common	92.2	97.0	89.4	1,853,061	1,657,087	8.7
	RB	Winterplay	99.8	96.0	95.8	2,654,970	2,543,419	5.7
	CB	Penncross	98.1	91.8	90.0	5,307,037	4,774,744	4.5
	CB	Penn A-4	99.1	97.0	96.1	7,000,000	6,728,890	3.2

[1]CB = creeping bentgrass; PR = perennial ryegrass; RB = rough bluegrass
[2]Pounds of bulk seed required per 1000 square feet to produce an average stand of 150,100, or 50 seedlings per square inch of creeping bentgrass, rough bluegrass, or perennial ryegrass, respectively.

Table 1 Variable seeding rates within turfgrass species based on cultivar seed size and quality to effect equal overseed rates based on the pure live seed (PLS) concept.

In our annual overseed trials at Gainesville, we have seen seed number per bulk pound vary over the years (*Table 1*).

In our 1996-97 trials, seed number per bulk pound varied from 208,640 to

Effect of seed quality on Pure Live Seed Concept

Lot	Purity	Germination	PLS	Bulk Seed	PLS Seed	Bulk Rate of Seeding[1]
	As Percentage			Count per Pound		lb/1000 sq. ft.
1	98	95	93.1	240,000	223,440	32.2
2	90	80	72.0	240,000	172,800	41.7

1 Pounds of bulk seed required per 1000 square feet to produce an average stand of 50 perennial ryegrass seedlings per square inch

Table 2 Variable bulk seeding rates of perennial ryegrass based on same seed number per unit weight but different quality to effect equal overseed rates based on the pure live seed (PLS) concept

324,285 for 'Roadrunner' and 'Livonne' perennial ryegrass cultivars, respectively. Similarly, seed number per pound varied from 1.7 to 3.5 million for 'Fuzzy' and 'Pt A' rough bluegrass cultivars, respectively.

Is seed number per pound only of academic interest? Absolutely not!

'Livonne' had a much smaller seed than the 'Roadrunner' cultivar. If both cultivars were overseeded on a putting green at a same bulk rate of 20 pounds per 1000 square feet, seeding with 'Livonne' would have resulted in 2,312,900 *more* seed per 1000 square feet than the 'Roadrunner' cultivar, which had much larger seed.

The same logic follows if the *Poa trivialis* cultivars were overseeded at a bulk rate of 5 pounds per 1000 square feet. Because of its smaller seed size, a seeding of 'Pt A' rough bluegrass would have resulted in 8.7 million *more* seed per 1000 square feet compared to the 'Fuzzy' cultivar of rough bluegrass, which had the larger seed.

If one were to use PLS calculations to overseed a putting green with perennial ryegrass at a calculated rate of 50 PLS per square inch, assuming purity and germination of seed lots were equal, it would require 37.4 bulk pounds of 'Roadrunner' compared to only 24.4 bulk pounds of 'Livonne' perennial ryegrass per 1000 square feet (*Table 1*).

Likewise, overseeding a putting green with *Poa trivialis* at a rate of 100 PLS per square inch, would require 9.6 bulk pounds of 'Fuzzy' rough bluegrass to equal only 4.8 bulk pounds of 'Pt A' rough bluegrass. Economic savings should be obvious.

Assuming that agronomic considerations and selling prices per pound are equal, a net savings of 35 and 50% are effected if one chooses to use the smaller seeded perennial ryegrass or rough bluegrass cultivar, respectively.

How does the PLS concept work?

A simple formula using purity and germination is used:

PLS(%) = Purity(%) X Germination(%)

Both federal and state seed laws require that all seed lots must have purity and germination information on the seed tag. Unfortunately, seed number per unit weight is *not* on the seed label. You should request this information from your seed supplier.

Assume that two seed lots of perennial ryegrass have the *same* number of 240,000 seed per bulk pound (*Table 2*).

PLS content of Lot 1 is equal to 0.98 (purity) times 0.95 (germination) or 93.1%, while PLS content of Lot 2 is equal to 0.90 (purity) times 0.80 (germination) or 72.0%. Thus, it required 1.1 versus 1.4 bulk pounds of Lot 1 and Lot 2 respectively, to equal one pound PLS. This was calculated as follows:

For Lot 1, 0.931 PLS content X ? bulk pounds = 1 pound PLS

For Lot 2, 0.720 PLS content X ? bulk pounds = 1 pound PLS.

Note that Lot 1 had 21.1% more PLS than Lot 2 which was due to its better purity and germination. Stated another way, it required 1.3 times more seed of Lot 2 to equal PLS content of Lot 1.

What is the bottom line on this? Assuming that both seed lots sold for $3.00 per bulk pound, there would be a net savings of $28.50 per 1000 square feet. When calculated over an average putting green of 5,000 square feet on an 18 hole golf course, a savings of $2,565 is realized by choosing Lot 1 over Lot 2.

Conclusion

Hopefully this little mathematical exercise has convinced you to consider using the PLS concept when buying or selling seed, as well as when calculating rates of seeding. The PLS concept is a little more complicated than presented here, especially as it relates to seed purity, but this is how it works in general.

To be a smart buyer, request from your seed supplier actual seed number per pound along with percent purity and germination, which by law is required on each seed tag of each seed lot.

Step One: Calculate PLS content of the seed lot using the formula: % PLS = % purity X % germination.

Step Two: Calculate the number of bulk pounds to equal one pound of PLS: ? bulk pounds of % PLS (from Step 1) = 1 pound PLS

Step Three: Calculate the cost of one pound of PLS:

Answer in Step Two X price per bulk pound = Cost of one pound of PLS.

The PLS concept makes a lot of 'cents.'

These simple steps are something all superintendents should follow when shopping for seed at overseed time. Seed size or number per unit weight is important if one wishes to calculate actual seeding rates per unit area. Suppliers, however, should utilize seed number as well as seed quality in their sales methodology, as they should compare and adjust costs not on a bulk pound basis, but rather on a PLS basis. Everyone should use the PLS concept, because the PLS concept makes a lot of 'cents.'