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PURE LIVE SEED . . .



Seeding Rates for Grasses and Legumes

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PURE LIVE SEED (PLS) - the percentage of the content of a given seed lot that is pure and capable of producing a healthy growing plant.

The PURE LIVE SEED concept is the most accurate method for determining seeding rates of small seeded grasses and legumes. Forage crop seed lots vary in per cent germination and per cent purity following harvest, cleaning and storage. Seeding rates of grasses and legumes with either low germination or purity usually must be increased to obtain ade-

quate numbers of live seeds per acre to produce a full stand.

Forage crop plantings often fail due to poor seedbed preparation, planting methods and environmental conditions such as poor soil and weather conditions (Table 1). In addition, the quality of seed sown can have a major influence on establishment success.

Table 1. Reasons Why Forage Crops Fail To Become Established

Cause	Growth Period		
	Germination	Emergence	Establishment
Unfavorable -			
Temperature	X	X	X
Moisture	X	X	X
Lack of soil aeration	X	X	X
Surface crusting		X	
Seeding depth		X	
Seedling diseases			X
Competition from -			
Companion crop			X
Weeds			X
Lack of soil nutrients			X
Legumes not inoculated			X
Soil erosion			X
Winter killing			X

S
544.3
N9
48
783

The quality of a particular seed lot varies depending upon its per cent germination or live seeds and its per cent purity. Impurities in a seed lot may include such items of foreign material as dirt, sticks, stones, straw, chaff, weed seeds and other crop seeds which reduce the actual amount of pure seed available for planting. The PLS seeding rate concept allows for an upward adjustment in seeding rate for seed lots with germination and/or purity percentage less than 100. This adjustment permits the seeding of an equal number of live seeds per acre or unit area for seed lots of lower quality, increasing the potential for establishing a full stand.

ESTIMATING PLS

The seed tag or your laboratory seed test report lists the per cent germination and per cent purity of your particular seed lot. In addition, the kinds of impurities such as inert (straw, chaff, dirt, etc), weed seeds and other crop seeds will be listed. Seed germination and the kind and amount of the various impurities present should have a major influence on whether the seed should be planted.

A simple method for estimating PLS is to multiply the per cent germination x per cent purity. The result is a decimal number and is referred to as the PLS index. A seed lot with 100 per cent germination and 100 per cent purity would have a PLS index of 1.0. In other words, every pound of material or every seed in the bag is alive and capable of producing healthy plants if given the proper set of conditions for germination, emergence and seedling establishment. The actual seeding rates for seed lots with a PLS index less than 1.0 must usually be adjusted upwards to obtain the same number of live seeds planted per acre.

PLS index formula -

•% germination x % purity = PLS index

Example: 80% germination x 75% purity = .6 PLS index

Adjusted seeding rate formula -

•PLS seeding rate ÷ PLS index = lbs bagged seed/acre

Example: 6 lb PLS seeding rate ÷ .6 index = 10 lbs seed/acre

COMPUTE SEEDING RATE ADJUSTMENT

A seeding rate adjustment must be calculated for each grass and legume variety being seeded. The PLS seeding rate is adjusted for each variety based on the current per cent germination and per cent purity. Two methods are provided for computing the adjusted seeding rate:

METHOD 1: List each variety to be seeded in column 1 and the PLS seeding rate in column 2 of Table 2. The per cent germination (column 3) and the per cent purity (column 4) can be obtained from the seed tag or the laboratory seed test report. Information for columns 5 and 6 must be calculated. The adjusted seeding rate for each species (column 6) is the amount of seed required to obtain the pounds of PLS listed in column 2 based on the germination and purity of your seedlot. Total column 6 to obtain the total pounds of seed required per acre.

METHOD 2: List each variety to be seeded in Table 3, column 1. Complete columns 2, 3 and 4 as in the previous method. Column 5 is the PLS seeding rate adjustment factor which has already been calculated (Table 4) for various germination and purity percentages. Note that seed lots with either 100 or 95 per cent germination and purity need not be adjusted. Find the germination for your seed lot to the nearest 5 per cent (left column, Table 4) and move to the right until you reach the column headed by the per cent purity of your seed lot. This is your PLS seeding rate adjustment factor. Enter this number on the appropriate line in column 5, Table 3. For example, a seed lot with 80 per cent germination and purity has a PLS seeding rate adjustment factor of 1.6. Complete column 6 in Table 3 by multiplying column 2 x column 5. This is the adjusted seeding rate/acre required for each variety to obtain the pounds of seed required per acre.

Table 2. Adjusted Seeding Rate Calculations

Grass or Legume Variety (Col. 1)	PLS Seeding Rate (Col. 2)	% Germination (Col. 3)	% Purity (Col. 4)	PLS Index (Col. 5)	Adjusted Seeding Rate (Col. 6)
				(Col. 3 x 4)	(Col. 2 ÷ 5)
Total lbs/Acre		XXX	XXX	XXX	

Table 3. Adjusted Seeding Rate Calculations Using Seeding Rate Adjustment Factors in Table 4.

Grass or Legume Variety (Col. 1)	PLS Seeding Rate (Col. 2)	% Germination (Col. 3)	% Purity (Col. 4)	PLS Adjustment Factor (Col. 5)	Adjusted Seeding Rate (Col. 6)
				See Table 4	(Col. 2 x 5)
Total lbs/Acre		XXX	XXX	XXX	

Table 4. Seeding Rate Adjustment Factors for Various Germination And Purity Percentages

	% PURITY										
	100	95	90	85	80	75	70	65	60	55	50
100	0	0	1.1	1.2	1.3	1.3	1.4	1.5	1.7	1.8	2.0
95	0	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.8	1.9	2.1
90	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	2.2
85	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.1	2.4
80	1.3	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.1	2.3	2.5
75	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.1	2.2	2.4	2.7
70	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.2	2.4	2.6	2.9
65	1.5	1.6	1.7	1.8	1.9	2.1	2.2	2.4	2.6	2.8	3.1
60	1.7	1.8	1.9	2.0	2.1	2.2	2.4	2.6	2.8	3.0	3.3
55	1.8	1.9	2.0	2.1	2.3	2.4	2.6	2.8	3.0	3.3	3.6
50	2.0	2.1	2.2	2.4	2.5	2.7	2.9	3.1	3.3	3.6	4.0

SELECT QUALITY SEED

Seed quality should be a consideration when purchasing seed. The lowest cost seed per pound of PLS may not be the best buy. Quality factors such as per cent germination, per cent purity, per cent weed seeds and kind of weeds present should be considered when purchasing seed of small seeded grasses and legumes. A guide to the average germination and purity percentages of selected grasses and legumes is shown in Table 5.

LEGUME GERMINATION AND HARD SEEDEDNESS

Alfalfa and sweetclover seed lots usually contain "hard seed." These seeds will not germinate during the standard 7-day laboratory germination test because the seed coat will not permit water to enter the seed. Seed labeling laws require that the per cent germination and per cent hard seed be listed separately on the seed tag or seed test report. The total of the percentages also appears on the seed tag as "total germination and hard seed."

Table 5. Guide to Average Germination and Purity Percentages for Selected Grasses and Legumes

Kind	% Germination	% Purity
Legumes:		
Alfalfa	90*	98
Sweetclover	90*	98
Grasses:		
Creeping foxtail	80	85
Kentucky bluegrass	80	85
Orchardgrass	85	85
Reed canarygrass	80	95
Russian wildrye	85	90
Smooth bromegrass	85	90
Wheatgrass		
Crested	85	95
Intermediate	90	90
Pubescent	90	90
Slender	85	95
Tall	90	95
Western	80	80

* Germination plus hard seed.

The agricultural value of hard seededness differs between alfalfa and sweetclover. Hard seeds of alfalfa germinate better in the field than in the laboratory. Sweetclover hard seeds germinate about the same in the field as in the laboratory. Seed processors reduce hard seededness in legumes through a process known as scarification or by mixing seedlots with high and low hard seed content.

Recommendations:

Alfalfa - seeding rate adjustments are not usually made on seed lots with as much as 40 to 50 per cent hard seed. A high percentage of hard seeds will germinate in 2 to 4 weeks in the field.

Sweetclover - seeding rates for seed lots containing more than 25 per cent hard seed should be adjusted upwards to increase potential for a full stand. To compute the PLS index for sweetclover, use actual germination plus hard seed content not to exceed 25 per cent x the per cent purity.

COST/LB PLS

The cost per pound of PLS can be determined by using the following formula.

$$\text{Seed cost/lb} \div \text{PLS index} = \text{cost/lb PLS}$$

Example: Seed cost (1.00/lb) ÷ PLS index (.75) = \$1.33 cost/lb PLS