

PART IV

Seed Facts

David L. Whitt, Extension Seed Programs Leader

Seed inoculation

Legumes have the ability to gather available nitrogen from the air and utilize it for their growth. Grasses growing in association with legumes, or following legumes in rotation, also benefit. Legumes are able to accomplish this through the presence of nitrogen-fixing bacteria that form colonies on the legume roots.

Most soils contain native strains of nitrogen fixing bacteria (rhizobia), but these are often not efficient in fixing nitrogen. Whenever a legume is seeded, especially in soil where that legume has not been grown in the previous 2 or 3 years, commercial strains of bacteria should be included with the seed to “inoculate” the soil and the plant roots. This insures that bacteria of a productive strain are present in sufficient quantities to fix nitrogen for the plant.

The rhizobia are usually mixed with black peat that serves as the carrier for the bacteria. This black “inoculum” is mixed with the seed just prior to seeding. It may be mixed thoroughly with dry seed, but better seed contact is obtained by slightly moistening the seed with sugar water or a commercial sticker before adding the inoculum. Pre-inoculated seed, which is coated with the appropriate rhizobia by the seed company, is also available.

When the seed germinates in the soil, the rhizobia bacteria invade the root hairs of the seedlings and begin to multiply to form nodules. A symbiotic relationship exists between the bacteria in these nodules and the plant. The plant provides food and a supply system for the bacteria and, in return, the bacteria convert atmospheric nitrogen into ammonia nitrogen which the plant utilizes.

Well nodulated plants have large nodules that are pink or red inside. Ineffective bacteria produce small nodules that are white, gray, or green inside. Nodules should be present by about four weeks after seed germination. If the plants are not properly nodulated, emergency inoculum can be applied to the soil surface by broadcasting or spraying in rainy weather. Under hot and dry conditions, it is necessary to drill the inoculum into the soil.

There are several different strains of rhizobia. It is important to use the correct strain to inoculate the legume being seeded. The table below indicates those groups of legumes or individual legumes requiring specific strains.

Precautions in utilizing inoculum:

1. Use the correct strain for each legume.
2. Use fresh inoculum - check the expiration date on the bag.
3. Remember that the bacteria in the inoculum are living organisms and must be kept alive. Store at temperatures between 40° and 70°F.
4. Inoculate seed immediately before planting, especially if the seed is treated with a pesticide.
5. Prevent exposure of inoculum to direct sunlight.
6. Do not mix fertilizer with inoculated seed.

Certified seed

The use of viable seed of adapted varieties is an essential part of successful crop production. Like livestock, seed are living bodies subject to the influences of weather, disease, and breeding. It is not enough that the seed produce a plant, it must also contain the genes which will enable the plant to resist disease, produce high yields, and utilize high levels of soil fertility.

CROSS-INOCULATION OF LEGUMES

	Bur clover	Alfalfa	Sweet clover	Black medic	Red clover	White clover	Ladino clover	Alsike clover	Crimson clover	Hairy vetch	Garden pea	Canada field pea	Austrian winter pea	Birdsfoot trefoil	Crown vetch	Graden bean	Soybean	Cowpea	Partridge pea	Peanut	Lespedeza	Kudzu
Bur clover	+	+	+	+																		
Alfalfa	+	+	+	+																		
Sweet clover	+	+	+	+																		
Black medic	+	+	+	+																		
Red clover					+	+	+	+	+													
White clover					+	+	+	+	+													
Ladino clover					+	+	+	+	+													
Alsike clover					+	+	+	+	+													
Crimson clover					+	+	+	+	+													
Hairy vetch										+	+	+	+									
Garden pea										+	+	+	+									
Canada field pea										+	+	+	+									
Austrian winter pea										+	+	+	+									
Birdsfoot trefoil														+								
Crown vetch															+							
Garden bean																+						
Soybean																	+					
Cowpea																		+	+	+	+	+
Partridge pea																			+	+	+	+
Peanut																				+	+	+
Lespedeza																					+	+
Kudzu																						+

(Note: Cross marks indicate which legumes are inoculated by bacteria from other legumes. For example, alfalfa is inoculated by bacteria from bur clover, sweet clover, and black medic.)

Certifying agency

The Virginia Crop Improvement Association has been designated as the official seed certifying agency in Virginia by the State Certified Seed Council. The Association is an incorporated non-profit organization of seed growers.

The Virginia Crop Improvement Association works in cooperation with seed growers, seedsmen, research, extension, and teaching divisions of Virginia Polytechnic Institute and State University, the Virginia Department of Agriculture and Consumer Services, and the United States Department of Agriculture.

Purpose of certification

The purpose of certification is to reproduce and make available to the public, through certification, high-quality seed and propagating material of superior plant varieties grown and distributed as to insure genetic purity and a minimum of seed-borne diseases. The word seed, or seeds, includes all propagating material that may be certified.

Classes and sources of certified seed

Four classes of seed shall be recognized in seed certification; namely, (a) Breeder, (b) Foundation, (c) Registered, (d) Certified.

Breeder seed is seed or vegetive propagating material directly controlled by the originating or sponsoring plant breeder or institution, and which provides the source for the initial increase of foundation seed. Breeder seed is not available for commercial distribution.

Foundation seed is seed stock that is so handled as to most nearly maintain specific genetic identity and purity. Production must be carefully supervised and approved by the certifying agency and/or the agricultural research station.

Registered seed is the progeny of foundation or registered seed that is so handled as to maintain satisfactory genetic identity and purity and a minimum of seed-borne diseases, and that has been approved and certified by an official certifying agency.

Certified seed is normally the progeny of foundation or registered seed. However, when foundation or registered classes of a variety are not available, certified seed may be produced from certified seed that was grown under the supervision of the certifying agency and so handled as to maintain genetic identity, purity, and a minimum of seed-borne diseases.

Application for certification

Application for inspection of a crop for certification may be made on an official Association application blank that may be obtained from Extension agents, vocational teachers, or by writing to the Association office. The application must be properly filled out and mailed to the Virginia Crop Improvement Association, 9142 Atlee Station Road, Mechanicsville, VA 23116 (804) 746-4884.

Field inspection

At least one field inspection is made at a time most appropriate to determine compliance with certification requirements. All inspections are performed by individuals who have been trained for the job.

Sampling of seed

Before sampling, seed lots should be cleaned and ready for sale, except for labeling. A representative sample should be taken from the entire lot.

A 1.5 lb sample is required for small grains, soybeans, and peanuts needing germination and purity tests. A 0.5 lb sample is needed for grasses and small seeded legumes.

Samples may be sent to:

State Seed Testing Laboratory 1 North 14th Street Richmond, VA 23219

Sources of Seed

The VCIA distributes spring and fall certified seed directories which list sources of registered and certified seed grown in Virginia. The Foundation Seed Farm is located at P.O. Box 78, Mt. Holly, VA 22524 and is responsible for increasing seed of new varieties and maintaining commercially important varieties that have been developed by public institutions.

A quick method for estimating the pounds of seeds broadcast per acre:

After planting, place a sheet of 8 1/2" x 11" paper over the planted area and make an outline in the soil. Remove the paper and count the seeds in the marked area. In Column A, find the number counted. The other columns show pounds of seed per acre. Measure several different areas and take an average. This method could be modified by placing a large cover on the ground before planting to make the small seed more visible.

No. seed Counted Under 8 1/2x11" paper	Alfalfa Fescue (tall)	Red Clover	Bluegrass	Orchard- grass	Wheat Barley
Pounds of Seed Broadcast per Acre					
1	0.3	0.25	0.05	0.1	5
2	0.6	0.5	0.1	0.2	10
4	1.2	1.0	0.1	0.5	20
6	1.8	1.5	0.2	0.7	30
8	2.4	2.1	0.2	0.9	41
10	3.0	2.6	0.3	1.1	51
12	3.7	3.1	0.4	1.4	61
14	3.7	3.1	0.4	1.6	72
16	4.9	4.1	0.5	1.8	82
18	5.5	4.6	0.5	2.0	92
20	6.1	5.2	0.6	2.3	103
25	7.6	6.5	0.8	2.8	129
30	1.9	7.7	0.9	3.4	154
40	12.2	10.3	1.2	4.5	206
50	15.2	12.9	1.5	5.7	258
60	18.3	15.5	1.8	6.8	309
70	21.3	18.1	2.1	7.9	361
80	24.4	20.6	2.4	9.1	412
90	27.4	23.2	2.7	10.2	464
100	30.5	25.8	3.0	11.4	516

Seed Population at Planting

Seeds Per Acre	Row Spacing																
	4"	6"	8"	10"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"
4,000	392	261	195	156	111	98	87	78	71	65	60	56	52	49	46	43	41
6,000	262	174	131	104	75	66	58	52	48	44	40	37	35	33	31	29	26
8,000	196	131	98	78	56	49	44	39	36	33	30	28	26	25	23	22	21
10,000	157	104	78	63	45	39	35	31	29	26	24	22	21	20	19	17	16
12,000	131	87	65	52	37	33	29	26	24	22	20	19	17	16	15	14	13
14,000	112	75	56	45	32	28	25	22	20	19	17	16	15	14	13	12	11
16,000	98	65	49	39	28	25	22	20	18	16	15	14	13	12	11	10	10
18,000	87	58	43	35	25	22	19	17	16	15	13	12	12	11	10	9.7	9.2
20,000	78	52	39	31	22	20	17	16	14	13	12	11	11	9.8	9.2	8.7	8.2
22,000	71	47	36	28	20	18	16	15	13	12	11	10	9.5	8.9	8.4	7.9	7.5
24,000	65	43	33	26	19	16	15	13	12	11	10	9.3	8.7	8.2	7.7	7.3	6.9
26,000	60	40	30	24	17	15	13	12	11	10	9.3	8.6	8.1	7.5	7.1	6.7	6.3
28,000	56	37	28	22	16	14	12	11	10	9.3	8.6	8.0	7.5	7.0	6.6	6.2	5.9
30,000	52	34	26	21	15	13	12	10	9.5	8.7	8.0	7.4	7.0	6.5	6.2	5.8	5.5
35,000	45	29	22	18	13	11	10	8.9	8.2	7.5	6.9	6.4	6.0	5.6	5.3	5.0	4.7
40,000	39	26	20	16	11	9.8	8.7	7.8	7.1	6.5	6.0	5.6	5.2	4.9	4.6	4.4	4.1
50,000	31	21	16	13	8.9	7.8	7.0	6.3	5.7	5.2	4.8	4.5	4.2	3.9	3.7	3.5	3.3
60,000	26	17	13	10	7.4	6.6	5.8	5.2	4.8	4.4	4.0	3.7	3.5	3.3	3.1	2.9	2.7
70,000	22	15	11	8.9	6.4	5.6	5.0	4.5	4.1	3.7	3.4	3.2	3.0	2.8	2.6	2.5	2.4
80,000	20	13	10	7.8	5.6	4.9	4.4	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.3	2.2	2.1
90,000	17	12	8.7	6.9	5.0	4.4	3.9	3.5	3.2	2.9	2.7	2.5	2.3	2.2	2.1	1.9	1.8
100,000	16	10	7.8	6.2	4.5	3.9	3.5	3.1	2.9	2.6	2.4	2.2	2.1	2.0	1.8	1.7	1.6
125,000	13	8.4	6.2	5.0	3.6	3.1	2.8	2.5	2.3	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3
150,000	12	7.0	5.2	4.2	3.0	2.6	2.3	2.1	1.9	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1
200,000	7.8	5.2	3.9	3.1	2.2	2.0	1.7	1.6	1.4	1.3	1.2	1.1	1.0	1.0	0.9	0.9	0.8
250,000	6.2	4.2	3.1	2.5	1.8	1.6	1.4	1.3	1.1	1.0	1.0	0.9	0.8	0.8	0.7	0.7	0.7
300,000	5.2	3.5	2.6	2.1	1.5	1.3	1.2	1.0	1.0	0.9	0.8	0.7	0.7	0.7	0.6	0.6	0.5
500,000	3.1	2.1	1.5	1.2	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3
1,000,000	1.5	1.0	0.8	0.6	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1,500,000	1.0	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1

Inches Between Seeds

