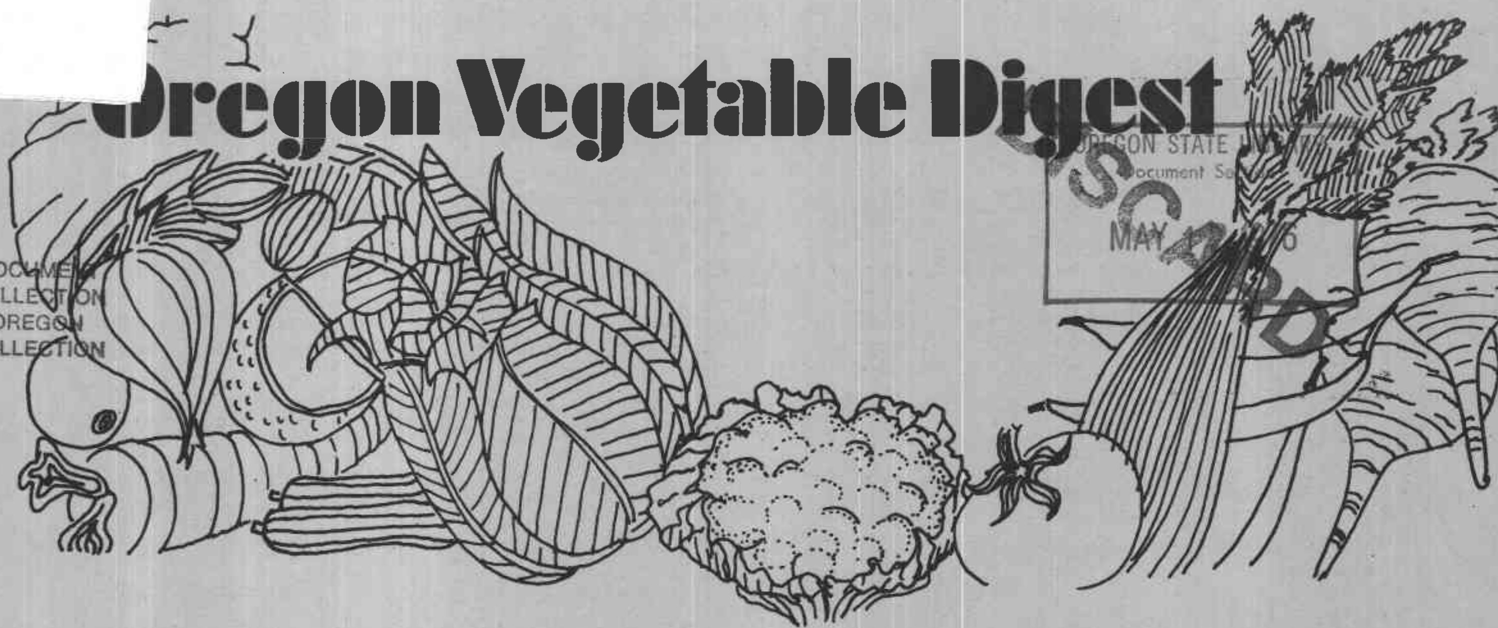
Oregon Vegetable Digest



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Seed-corn maggot control on sweet corn and snap beans

The seed-corn maggot, Hylemya platura (Meigen), attacks the germinating seeds and seedlings of many different plants and crops. In Oregon, it is of particular concern on sweet corn and green beans because of the relatively large number of acres of these crops. For many years, a standard commercial seed treatment for these crops has been the use of the insecticide, dieldrin, together with one or more fungicides such as thiram or captan. Severe restrictions on use registrations of dieldrin in the U.S. by the Environmental Protection Agency recently precipitated the need to develop and register a suitable substitute. The simultaneous development of resistance by the seed-corn maggot to dieldrin in many areas has emphasized this need.

Work at various institutions and by technical representatives of chemical companies has shown several materials to be effective against the maggots. Two pesticides, diazinon and chlorpyrifos (Lorsban), have had federal registration for several years as planter box applications with field corn (chlorpyrifos) and with beans, sweet corn, limas and peas (diazinon). Planter box applications are not readily accepted by growers, since they are bothersome and time consuming. The ideal would be a seed treatment, like the old dieldrin-fungicide one, with seeds in bulk treated in the fall, stored, and sacked in the spring ready for immediate planting, all without loss of effectiveness or reduction in germination. Chlorpyrifos comes very close to this ideal.

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Life History and Activities of the Seed-corn Maggot

The adult insect is similar to a house fly in appearance, but smaller, being about 1/5 inch long. Flies appear early in the spring from puparia which overwinter in the soil. After mating, the females hunt for decaying organic matter or germinating seeds near which they lay their eggs. Freshly worked soil is also attractive to gravid females. The larvae, or maggots, feed for 2 weeks or more and then convert into puparia in the soil where they metamorphose into adult flies to complete the cycle. In Oregon, the seed-corn maggot may pass through 3 or 4 generations each year. The spring generation is the most economically important one, for it is most active just as the majority of crops are planted.

The amount of damage done by seed-corn maggots depends on the crop (corn seed can harbor more maggots than bean or cucumber seed, for example, without affecting the growth of the seedling), soil temperature and moisture, time of year, and other factors. The principal damage is, of course, destruction of the growing tip of the developing seedling, or of the entire germinating seed. Bean and cucurbit seedlings are also vulnerable to stem tunneling for a short time, even after emergence of the seedling from the ground. For more information on biology and for suggestions for cultural control of the maggots, see the Oregon Insect Control Handbook.

Chemical Control

Although damaging infestations in beans and other large seeded crops are sporadic, it is generally felt that regular protection of the seed and seedlings is desirable, since once a planting is infested there is nothing that can be done short of replanting. The seeds and seedlings can be damaged by maggot attack for only a short time - 2 weeks or so - and thus many of the less persistent treatments tested here, in New York state and elsewhere, have given effective control. This led to the registrations of the planter box treatment of large seeded vegetables with diazinon insecticide.

New York Studies. A great deal of work has been done at the Geneva Experiment Station in recent years on biology and control of the seed-corn maggot. New York's Food & Life Sciences Bulletin No. 55 (May, 1975) and No. 56 (August, 1975) contain much information. For example, in Bulletin No. 55 the results of laboratory tests on levels of maggot damage on 8 susceptible crops are reported. Snap beans showed significant stand reduction when maggot infestation levels reached 5 larvae per seed; sweet corn could withstand up to 40 maggots/seed; only 2 to 4 maggots/seed on winter squash and cucumbers were enough to reduce stands; peas withstood levels up to 20 maggots/seed without significant loss.

Because of the possibility of attaining early registration for chlorpyrifos (Lorsban) as a seed treatment (in addition to its planter box registration on field corn), studies were made at Geneva in 1974. As reported in Bulletin No. 56, a cool, wet spring resulted in the heaviest maggot infestation in 4 years. In one test with Lorsban 25-SL, very good control was obtained on pumpkin and red kidney beans at both 1 and 2 ounces of active ingredient per hundred weight of seed; control on pea seed was inferior at the 1 ounce rate, but satisfactory at the 2 ounce rate. Another test, with company-treated Golden Cross Bantam corn, gave poor control with the 1 ounce/100 pounds seed treatment, while a planter box treatment protected the seeds effectively. In spite of seemingly unsatisfactory performance under some conditions, a registration for Lorsban as a 1 ounce AI/cwt of seed was achieved in the fall of 1975.

Oregon Studies. Also encouraged by the possibility of obtaining a federal registration for a seed treatment to replace dieldrin, the Oregon Agricultural Experiment Station and research personnel of a food processing company conducted tests and observations in 1975. Tests were conducted at various locations in the Willamette Valley including the OSU Vegetable Crops Farm at Corvallis. Materials other than Lorsban were tested and "bow wave" (band) applications of granular formulations were compared to seed treatments, in which the wettable powders were stuck to the corn and bean seeds with skimmed milk. Dieldrin-thiram seed treatment was included in some tests. In an effort to attract egg-laying female flies, dried blood or fishmeal was scattered along the rows after planting, or, in some tests, the attractants were placed in the furrow a week before the seeds were planted. Possible phytotoxicity from the chemicals was evaluated by comparing seedling stand counts with examination of the seeds and seedlings for maggot damage.

Insect control results from most of the tests were negative; no maggot infestations developed. The use of an attractant for the ovipositing female was overdone in one test in the Salem area--the maggot population in dried blood placed in the furrow a week before planting was so large that it destroyed all the seeds regardless of treatment. But 2 small bean tests at the Vegetable Crops Farm, where seed treatments of Lorsban and Delsan A-D (dieldrin-thiram) were compared to captan checks, were infested with light to moderate maggot populations. The Lorsban treatment gave perfect protection in these tests, while the failure of dieldrin showed that the seed-corn maggot has become highly resistant to that type of insecticide in the Corvallis area (Table 1).

Table 1. Effects of seed-corn maggot infestations on beans treated with various substances, Corvallis, 1975

Treatments*	Mean percent of seedlings damaged by maggot feeding** Test #1 (28 May)	Test #2 (18 June)
1. Captan CHECK Tendercrop bean	11.25	42.65
2. LORSBAN (1 oz) Tendercrop bean	0	0
3. Captan CHECK Baby lima bean (Kingston var.)	34.10	18.25
4. LORSBAN (1 oz) Baby lima bean (Kingston var.)	0	0
5. Captan CHECK OSU 2657 bush bean	15.10	26.45
6. DELSAN A-D OSU 2657 bush bean	10.62	33.52

* Captan used at the rate of 0.785 g AI/kg of seed. Lorsban 25% SL formulation used at the rate of 4 oz/cwt seed.
DELSAN A-D used at the rate of 4½ oz of formulation/cwt seed.

** Expressed in terms of percent of the seedling stand.

Recommendations and Remarks

The Oregon Agricultural Experiment Station is recommending the Lorsban slurry treatment on sweet corn, lima and snap bean seed for maggot control in 1976. The diazinon planter box treatment is also available and is registered for use with peas as well as with the corn and beans mentioned above. Both these treatments require the use of a fungicide on the seed in addition to the insecticides.

The Dow Chemical Company has issued a technical data sheet on their Lorsban 25-SL product. Some quotes may be appropriate here: "LORSBAN 25-SL insecticide is a wettable powder formulation containing 25% by weight of chlorpyrifos, an organophosphorothioate chemical, as the active ingredient. Used for the slurry treatment of sweet corn, lima bean and snap bean seeds prior to planting, LORSBAN 25-SL protects the germinating seeds and seedlings against injury by seed-corn maggots." "Tests on seed treated with LORSBAN 25-SL and stored up to 14 months before planting indicate that there is no loss of insecticidal activity." "LORSBAN 25-SL is compatible with commonly used fungicides, and may be applied in combination with captan, chloroneb or thiram fungicides for added protection of seed against fungus diseases or rot." "LORSBAN 25-SL is not phytotoxic at the dosages and in the uses for which it is registered. It is not a systemic insecticide." "For the control of seed-corn maggots attacking sweet corn, lima beans and snap beans, the recommended rate for the slurry seed treatment is 4 ounces of LORSBAN 25-SL per 100 pounds of seed."

--H. H. Crowell
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Wax bean varieties tested

The best of bush wax bean varieties available for processing have been generally inadequate in yield and quality when grown in Western Oregon. This has also been true in other areas. Wax beans are less productive and dependable in varying environments than green beans, and have the additional problem of retaining too much green color as the pods develop to usable sizes. Lack of environmental tolerance also results in poorly developed pods or "pollywogs," and crookedness. Although a minor crop compared to green beans, wax bean production involves many growers and processors. Production costs and finished product quality could be improved greatly by use of a better variety.

Bush varieties of wax snap beans were tested for yield and quality at the Vegetable Research Farm, Oregon State University. Two OSU breeding lines, which were developed and tested several years earlier, were also included. Sources of varieties are included with Table 3.

Two plantings, May 14 and June 9, were made on Chehalis silt-loam soil, in rows 36" apart. Plots were 15' long, planted with 100 seeds, and replicated 4 times in randomized blocks. Banded 8-24-8 fertilizer at 600 lbs./acre was applied, and water was provided by sprinkler about once each week when needed. Growth was continuously good with no water stresses apparent.

Yields were obtained by hand harvest. The best time of picking was very difficult to ascertain because of large differences in potential sieve size among varieties, and because there was a strong tendency for poor pod set, or split set, which also differed among varieties. It was not possible to adjust the yields according to distribution of % sieve size. Variety #3, for example, had 75% in 1-4 sieve in both plantings, but because 4½ sieve pods contained large seeds, it cannot be assumed that harvest could be delayed until the crop reached 50% 1-4 sieve (a common standard for green bean harvest).

Seven of the most promising varieties were processed in the pilot plant of the Food Science Department and later evaluated as coded samples by a panel of 10 judges.

Results

The principal problem in the field performance of the varieties was failure to set pods continuously to provide a concentrated crop which could be harvested efficiently. This "split-set" tendency was strongly varietal, and was noticeably worse in the early planting, suggesting that cool weather conditions were primarily involved. One variety, #11, was totally unadapted because of the pod-set problem, and yields of many others were seriously affected. The effect of planting date on yield was pronounced. Mean yield of all varieties in planting 1 was 3.6 T/A compared to 5.2 for planting 2.

Pods harvested from the early planting were generally less desirable in all respects than those from the late planting. In the early planting, there were more short, curved, and constricted pods, and a greater occurrence of pollywog and long necks.

Many of the varieties have small diameter pods which are fully mature at sieve size 5. While these pods are usually smooth, slender, and attractive, the quality at 4-5 sieve may be poor with large seeds and possibly fiber. Caution must be used in determining time of harvest because overmature pods are not eliminated by the sieve grading equipment as they are in varieties which develop 6 or 7 sieve pods. An additional general problem with wax beans is the persistence of green color in the 3, 4, and even 5 sieve sizes. Most of the varieties tested were poor in this respect. A combination of persistent green color and small maximum sieve size results in a limited range of usable pod sizes with many wax bean varieties. Large sieve varieties may also have problems because of persistence of green into the medium sieve size.

The most promising varieties in the trial, considering yield, general appearance, and quality, were Tenderwax, H89-4-1, Sunrise, and Goldette. Gabriella yielded well and received good notes in the field, but processed pod scores were somewhat low. The currently predominant commercial variety, Earliwax, was not high in yield or field notes, but received good panel scores for processed pods, especially for color.

Table 1. Wax Bean Variety Trial, Corvallis, Oregon, 1975 (Yields and Sieve Sizes)

No.	Variety	Source	Yield - Tons/Acre[1]			% Sieve Size - Early							% Sieve Size - Late							Max. Sieve[2] Size
			Early	Late	Aver.	1-2	3	4	5	6	7	1-4	1-2	3	4	5	6	7	1-4	
1	Goldcrop	1	4.9	3.8	4.4	19	16	18	32	15		53	13	16	37	31	3		66	6
2	Sungold	2	2.5	4.9	3.7	11	18	39	26	6		68	6	9	30	41	14		45	6
3	Goldette	3	3.5	5.6	4.5	14	20	41	24	1		75	10	18	47	24	1		75	5
4	Tenderwax	3	4.3	5.9	5.1	15	18	39	26	2		72	13	13	37	35	2		63	5
5	Gabriella	4	6.0	6.6	6.3	7	17	50	22	4		72	6	8	32	50	4		46	5½
6	Century Gold	5	4.2	6.3	5.3	14	6	12	33	35		32	14	12	19	29	21	5	45	6
7	72225	5	3.1	4.1	3.6	38	3	5	17	37		46	12	7	10	22	30	19	29	6½
8	Splendorgold	5	4.5	7.5	6.0	19	10	14	32	25		43	4	8	27	42	19		39	6
9	Bonanza	4	2.8	5.1	4.0	10	20	36	11	1		52	10	11	31	37	10	1	52	6
10	Midas	4	3.4	5.0	4.2	22	9	22	39	8		53	10	13	35	35	6	1	58	5½
11	25-58-84	6	1.3	3.6	2.5	40	4	4	6	27	23	48	10	10	14	28	35	3	34	6½
12	E-4205	7	2.5	5.8	4.2	22	17	31	22	8		70	7	7	20	49	17		34	6
13	E-4221	7	2.4	4.8	3.6	24	12	22	21	20	1	58	8	16	45	29	2		69	6
14	E-4204	7	3.3	5.1	4.2	11	21	35	27	6		67	10	29	42	17	2		81	5
15	H89-2-1	8	2.4	4.7	3.5	24	5	4	7	23	37	33	10	10	18	28	28	6	38	7
16	H89-4-1	8	5.1	5.3	5.2	12	9	29	47	3		50	10	12	39	37	2		61	5½
17	Valgold	8	3.9	2.8	3.3	6	8	15	35	33	3	29	11	14	31	36	8		56	6
18	W10	9	4.9	5.9	5.4	14	5	7	11	30	33	26	11	16	27	30	15	1	54	7
19	Earliwax	5	3.5	6.0	4.8	17	21	37	23	2		75	5	6	28	54	6	1	39	5
20	B6157	9	2.9	5.4	4.1	18	19	16	20	24	3	53	8	12	19	32	25	4	39	6
21	Sunrise	10	4.0	5.8	4.9	9	16	46	29			71	9	15	48	27	1		72	5
22	Gem	11	3.0	4.0	3.5	13	5	12	31	36	3	30	9	19	37	30	5		65	6
23	G4	2	3.5	4.5	4.0	18	8	13	37	24		39	9	14	33	38	6		56	6

[1] LSD @ 5% = .89 tons, @ 1% = 1.17 tons.

[2] Sieve size generally observed to be the upper extreme for usable pods. In some cases this size was very seedy and unusable.

Table 2. Wax Bean Observations, Corvallis, Oregon, 1975[1]

No.	Variety	Plant Vigor	Plant Color	Pod Set	Split Set	Days - Harvest[2] 1	Days - Harvest[2] 2	Overall Score[3]	Mature Pod Len.	Mature Yellow Color	Green[4] Persistence	General Notes[5]
1	Goldcrop	med.	dark	fair		77	67	2.0	5	med., sl. var.	3 1/2	Sl. consistent curve; older pods SG; round to oval.
2	Sungold	med.	m. dark			74	73	2.0	4	bright	3 1/2	Bad PW, curves early; LN & CS late.
3	Goldette	good	dark	poor		79	74	3.8	6	bright	4 1/2	Sm., slender, mostly st.; seeds lrg. at 4½ sv; v. good gen. app.
4	Tenderwax	good	dark	good	v. little	78	72	3.5	5-6	good	4	Round-oval; st., sm., sl. CS; lrg. seed at 5 sv; v. good app.
5	Gabriella	good	dark	fair	little	77	72	3.2	5 1/2	fair	3 1/2	Few PW early; very st., some CS & SG.
6	Century Gold	good	yellow	fair		76	73	2.0	7	good	4 1/2	Long; round-oval; many CR, SG; mod. puffy.
7	72225	good	yellow	poor	bad	76	70	2.0	6 1/2	medium	4	Sl. puffy; bad CV; many CS; older pods SG.
8	Splendorgold	med.	dark		some	76	72	2.5	5 1/2	variable	3 1/2	Some reverse curve & CB; fairly sm.; some CS & LN.
9	Bonanza	good	m. yellow	poor	bad	77	72	1.5	4		2 1/2	Med. seed at 5 sv.; many 2" PW early; LN late; most st.
10	Midas	good	dark	poor	bad	77	74	2.0	5	light	4 1/2	Becomes SG; mod. PW and CS early; f. st.
11	25-58-84	good	m. yellow	poor	v. bad	77	70	1.0	4	light	4	CB; LN; bad CR early; bad green tips.
12	E-4205	med.	m. yellow	poor	bad	72	70	2.0	4		3 1/2	Many LN & PW; sl. oval; st., sl. bumpy.
13	E-4221	med.	med.	poor	bad	74	67	2.0	5 1/2	uniform	3 1/2	Sm.; LN & PW early; sl. oval; lrg. seed at 5 sv.
14	E-4204	med.	dark			71	67	2.5	5 3/4	light, uniform	2 1/2	Oval; st. & sm.; mod. PW early; mod. strings in old pods.
15	H89-2-1	good	yellow		bad	76	70	1.8	6	medium	4 1/2	Cv, bumpy; sl. CR.
16	H89-4-1	good	m. yellow		med.	77	70	3.0	5	medium	3 1/2	Mod. oval sm.; f. st.; some LN.
17	Valgold		yellow	poor		77	67	1.8	5 1/2	uneven	3 1/2	Bad CR and PW; green tips; many fishhooks.
18	W10	med	v. yellow	fair		77	67	1.8	5	light	3 1/2	Flat, oval, PW; med. LN; gen. sm. and st.
19	Earliwax	m. low	med.		little	74	70	2.5	5	medium	3	Bad curve;sm.; some PW; green tips.
20	B6157	low	m. yellow			71	67	2.0	5	med.; var.	4	CB;sl fiber in 6 sv;PW & CS early.
21	Sunrise	good	m. dark			79	74	3.5	5 1/2	light	3 1/2	Sl. CR, mostly st; sm.
22	Gem	good	m. yellow		some	76	67	2.5	5 1/2	light	3 1/2	Sm.; some CS; sl. oval; st.
23	G4		m. yellow	poor	bad	78	70	2.2	6	light	3 1/2	Bad curves; some PW early.

[1]Plant and pod set notes from field, early planting; remainder from harvested pods in lab, composite of both plantings.
[2]Days from planting: date (1) 5-14, (2) 6-9; reps averaged when harvested on different days.
[3]Average of early and late plantings - subjective overall pod score, on a scale of 1-5 with 5 best.
[4]Score corresponds to sieve size with noticeable green; i.e., 3 1/2 score means strong green at sieve 3, some at sieve 4.
[5]Abbreviations used: sv - sieve, lrg - large, sm - smooth, st - straight, LN - long necks, PW - pollywogs, SG - segmented, CS - constrictions, CV - cavitation, CB - creaseback, CR - crooked.

Table 3. Panel Evaluation of Selected Wax Bean Varieties[1]

No.	Variety	Harvest Date	Canned Cut Pods								Canned Whole[2]		Frozen Cut Pods[2]						
			Sieve[2]	Over-all	Color	Appear.	Text.	Flav.	Flesh	Notes	Color	Appear.	Over-all	Color	Appear.	Text.	Flav.	Flesh	Notes
4	Tenderwax	7/29	5	5.7	5.8	5.9	5.9	6.2	5.3	Lt., orange suture	6.4	6.3	4.2	4.4	3.9	4.9	5.3	5.0	Pale, variable, long necks
		8/20	6	6.5	6.7	6.5	6.8	6.7	6.0	Lt., firm, attract.	6.2	6.6							
5	Gabriella	7/29	6	4.1	4.2	4.3	4.1	4.5	4.4	Pale, dull; fiber, seedy	7.0	6.7	4.7	4.5	4.7	5.3	5.1	5.3	Pale, dull, cavities, sl. tough
		8/20	6	5.6	5.6	6.0	6.1	5.6	6.5	Grayish, seedy fl.	5.5	5.7	5.2	4.8	5.1	5.7	5.7	5.7	Pale, dull, greenish
8	Splendorgold	8/20	6	5.9	6.7	5.9	6.8	5.9	5.4	Firm, cavities, creaseback	4.9	5.1	5.4	5.7	5.2	5.2	5.4	6.2	Sl. tough, bland
16	H89-4-1	7/30	5	5.8	6.3	5.8	5.8	6.3	5.4	Cavities	4.4	4.0	4.6	4.8	5.1	4.8	5.3	4.9	Pale, pollywogs, soft
		8/18	6	6.4	6.9	6.4	6.4	6.1	6.3	Gold with orange suture	4.2	5.6	5.8	6.1	6.0	5.9	5.8	5.7	
19	Earliwax	8/18	6	6.2	7.0	6.4	6.1	6.1	6.6		4.6	4.7	6.0	6.2	5.9	5.9	5.8	6.4	
21	Sunrise	8/22	5	6.4	6.7	6.8	6.5	6.5	6.4		6.1	6.8	6.1	5.9	6.3	6.1	6.3	6.3	
23	G4	8/19	6	6.5	6.7	6.6	7.0	6.3	7.1	Good color, small seed	5.6	5.6	4.6	4.3	4.5	5.2	5.3	5.8	Lt., watery; nutty fl.

[1]Evaluation by 10 judges of cut frozen or canned samples processed in Food Science pilot plant. Scores on 1.0-9.0 scale with 9.0 outstanding and 1.0 poor.

[2]For cut canned pods the largest available size was used. In some cases this did not represent the predominant large sieve size; i.e., Gabriella had few 6 sieve pods, but 6 sieve was evaluated. Frozen samples were all 4 and 5 sieve mixed. Whole canned pods were 3 sieve.

Sources of Varieties

1. Matt Silbernagel, Irrigation Experiment Station, Prosser, Washington 99350
2. M. H. Dickson, Ag. Experiment Station, Geneva, N.Y. 14456
3. Charter Research Inc., P.O. Box YY, Twin Falls, Idaho 83301
4. Asgrow Seed Co., Kalamazoo, Michigan 49001
5. Rogers Seed Co., P.O. Box 2188, Idaho Falls, Idaho 83401
6. Northrup King & Co., 1500 Jackson Street NE, Minneapolis, Minnesota 55413
7. Ferry Morse Seed Co., Box 100, Mountain View, California 94040
8. Gallatin Valley Seed Co., Box 167, Twin Falls, Idaho 83301
9. Department of Horticulture, Oregon State University, Corvallis, Oregon 97331
10. Keystone Seeds, 101 Chateau Avenue, St. Louis, Missouri 63123
11. FMC Seeds, P.O. Box 2508, El Macero, California 95618

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