Orchardgrass Seed Production in Oregon

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COVER: Combining is a high-volume, low-cost-per-pound technique followed by successful growers of orchardgrass seed.

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Seed production investigations of the Oregon Agricultural Experiment Station, Corvallis, are conducted cooperatively with the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture.

Orchardgrass Seed Production in Oregon

Areas of Oregon that are especially favorable for the production of orchardgrass seed are the Willamette Valley, the Rogue, Umpqua, and Snake River valleys, and Union, Jefferson, and Umatilla counties. Here, comparatively mild winters and warm, dry summers promote vigorous plant growth and full seed development, and provide conditions for harvesting plump, bright, high-quality seed.

Well-drained soils ranging from sandy loams to loams are suitable for orchardgrass. Moisture and nutrients in the soil should be adequate to produce crops of high-quality seed. At least 18 inches of rainfall annually is needed for good orchardgrass growth on unirrigated soils with a minimum depth of 4 feet.

Small quantities of orchardgrass have been grown for seed in Oregon since about 1934. General interest in the crop is more recent among seed growers. In 1957 approximately 120 acres were harvested for seed. In 1962, seed was harvested from 2,500 acres. The prospect is for further expansion of production as the high-quality seed produced in the area attracts broader markets.

Growers of orchardgrass seed should plant only adapted varieties that are in demand. Certification is necessary for most varieties.

Establishing the Stand

Location of the field

New plantings intended for production of certified seed should be located to meet certification requirements for isolation and field history. Certification standards on isolation to minimize cross-pollination are: 80 rods to produce foundation seed; 40 rods to produce registered seed; and 20 rods for certified seed. The Oregon orchardgrass seed certification standards for 1963 state: "Land to produce Foundation seed must have been free of this grass for at least five years; two years for Registered or Certified seed unless the previous crop was of the same variety and certified."

This requirement minimizes contamination from old surviving plants and seedlings arising from dormant seeds in the soil. There are certain minimum requirements for seed purity and germination. There are also requirements regarding the presence of other crops and weeds. The land chosen should be free from other crops or weeds that cannot be easily controlled in the field with herbicides or cultivation, or that have seeds which are difficult or impossible to separate by cleaning. Such plants include ryegrass, fescues (tall, red, and chewings), quackgrass, dock, sheep sorrel, buckhorn, wild onion, and wild garlic.

Time to plant

Planting in April, May, or June is preferred, except in the Rogue River Valley where March and April are most favorable. At this time there is usually adequate moisture for satisfactory plant establishment and survival. Well-established, spring-sown stands usually produce good seed crops the

following year. Fall-sown stands seldom produce seed the following year and are often thin, uneven, and weedy.

The seedbed

Poor seedbeds contribute more to thin, uneven stands and stand failures than anything else. Good seedbeds are fine, firm, weed-free, and well supplied with moisture and plant nutrients. They provide:

- Adequate but not excessive soil covering for the seed.
- Moisture within the seed zone for germination and seedling establishment.
- Nutrients within the seedling root zone to promote rapid establishment and vigorous growth of plants.
- Relative freedom from competing plants.

Planting in cultivated rows

Experimental results have shown that orchardgrass usually yields more seed when grown in cultivated rows than in close-drilled stands. Tables 1 and 2 show comparative seed yields in 3-foot rows and 12-inch close drills at Corvallis. Row culture is necessary for economical production when soil moisture is limited. When soil moisture is adequate, there is less difference in yields from rows and close-drilled stands. Row plantings make more efficient use of nitrogen fertilizers. Row spacing of 28 to 30 inches is preferred when the crop is cut with a windrower. Rows spaced 28 to 30 inches apart are close enough to support the windrowed crop when the windrower places it properly across adjacent rows. Windrowed grass falls between wide-spaced rows, resulting in excessive loss of seed.

Table 1. Influence of cultural method and nitrogen at different rates and dates on seed yields of Danish commercial orchardgrass, Corvallis, 1958-1961

Treatment	Seed—pounds per acre					Percent of check[1]
	1958	1959	1960	1961	Avg.	
36-inch rows						
Nitrogen, 0	423	287	262	250	305	51
Nitrogen, 40 lbs. in spring	518	481	504	488	498	83
Nitrogen, 80 lbs. in spring (check)	616	571	646	573	601	100
Nitrogen, 120 lbs. in spring	693	576	590	531	597	99
Nitrogen, 160 lbs. in spring	664	534	591	492	572	95
Nitrogen, 80 lbs. ½ fall—½ spring	552	527	548	516	536	89
Nitrogen, 80 lbs. in fall	528	462	491	399	470	78
Close drills						
Nitrogen, 0	239	130	128	195	173	29
Nitrogen, 40 lbs. in spring	390	277	369	378	353	59
Nitrogen, 80 lbs. in spring	605	497	546	558	551	92
Nitrogen, 120 lbs. in spring	680	503	454	676	578	96
Nitrogen, 160 lbs. in spring	670	556	399	589	553	92
Nitrogen, 80 lbs. ½ fall—½ spring	536	446	505	498	496	83
Nitrogen, 80 lbs. in fall	489	436	415	375	429	71

[1] Nitrogen, 80 lbs. in spring; experiment conducted on Willamette silt loam soil.

Use of high-quality seed

There is no substitute for high-quality seed. The characteristics of high-quality seed are:

- It should have high germination.
- It should be clean.
- It should be free from seeds of other crops and weeds.
- It should be genetically true to type and variety.

Rates of planting

Orchardgrass sown in 28 to 30 inch rows requires about 3 pounds of seed per acre; close-drilled spacing 12 inches apart requires 7 to 8 pounds per acre. Planting rates may be reduced to 2 pounds for row seedings and 4½ to 5 pounds for close drills when the seedbed is good and the seed has high germination. In many seed fields, especially those sown in close drills, stands are too dense, resulting in low yields of seed. Thin, even stands generally give higher seed yields. When close-drilled plantings are made, sowing in 12 to 14 inch drill spacings rather than 6 to 7 inch spacings helps to avoid excessively thick stands. However, planting for seed production in wider rows at the recommended planting rate is usually a better way to avoid excessive plant population.

Depth of planting

Depth of seed placement is important when seeding any small-seeded crop. Covering the seed too deeply often results in poor stands. Sowing too shallowly prevents germination when the surface of the soil is dry. Seed should be planted one inch deep in loose friable soils; one-half inch in heavier soils; less than one-half inch if surface moisture is plentiful. Drills should be equipped with depth-control bands or wheels to regulate planting depth.

Table 2. Seed yields of orchardgrass varieties grown in 3-foot cultivated rows and close drills, Corvallis, 1958-1960

Variety	Average maturity date	Seed—pounds per acre				Percent of commercial
		1958	1959	1960	Average	
In 3-foot rows						
Domestic commercial..	6/22	784	360	310	485	100
Latar	7/6	549	418	441	469	97
Sterling	6/25	740	309	454	501	103
Potomac	6/25	679	475	570	575	119
Pennlate	7/6	532	507	692	577	119
S. 143	7/2	491	534	711	579	119
Akaroa—S.C.S. source	6/28	817	506	629	651	134
Danish commercial	6/28	878	606	756	747	154
In close drills						
Domestic commercial..	6/22	556	503	429	496	100
Potomac	6/25	461	407	541	470	95
Akaroa—S.C.S. source	6/28	609	452	528	530	107
Pennlate	7/6	583	555	650	596	120

Production of orchardgrass seed in rows is a means of avoiding the low yields usually resulting when stands are too dense.

Apply fertilizer at planting time

Orchardgrass seedlings respond to fertilizer, but fertilizer applied broadcast tends to stimulate weeds more than the seeded grass. Fertilizer is most effective in stimulating the vigor of seedlings when it is banded in the seedling root zone below or beside and below the seed. When fertilizer is banded at seeding time, it should be placed at least one inch away from the seed. Nitrogen is generally needed by young grass plants on most soils in Oregon. Deficiencies of phosphorus and sulfur frequently occur; potash deficiency occurs occasionally. A soil test can be used to identify soils that are low in phorphorus and potash and to indicate where response to these nutrients may be expected. The need for sulfur can be evaluated only by previous cropping history.

Ten to 15 pounds of actual nitrogen per acre is recommended for seedings made in 28 to 30 inch rows and approximately double that amount for 12 to 14 inch drills. When phosphorus deficiency is indicated, apply at least 40 pounds of P_2O_5 per acre. In areas where response to sulfur has been obtained and a sulfur-carrying fertilizer was not used the previous year, about 15 pounds of sulfur per acre should be applied.

Potash will seldom be needed for stand establishment.

Management

Fertilizing established stands

Nitrogen is usually the plant nutrient that limits production of grass seeds. Research at Corvallis and Medford* indicated that nitrogen at 80 pounds per acre was generally the most economical rate for orchardgrass seed production. Higher yields were sometimes obtained from heavier rates; however, the increased production usually did not pay for the additional nitrogen used. Effects of different rates of nitrogen on orchardgrass seed yields at Corvallis are shown in Table 1.

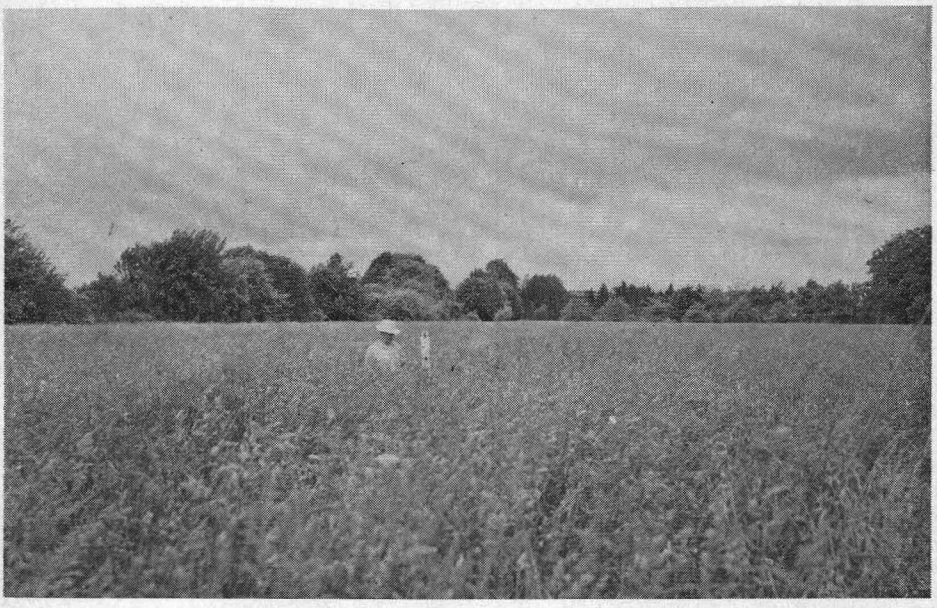
Phosphorus deficiency is not as general as nitrogen deficiency. However, definite responses to phosphorus occur on grass seed crops in different parts of Oregon. Soils that are low in phosphorus can be identified with a soil test.* Experiments at Corvallis indicated that when the soil test value was 2 to 3 pounds of phosphorus per acre, applying 80 pounds of P_2O_5 per acre would have been profitable. On a soil having a soil test value of 10 to 20 pounds of phosphorus per acre, 40 pounds of P_2O_5 should be adequate.

Sulfur deficiency frequently exists in the areas of Oregon where orchardgrass seed is grown. Yearly applications of 15 to 20 pounds per acre may be required for high yields of grass seeds. Sulfur requirements are usually filled by using sulfur-bearing nitrogen and phosphorus fertilizers.

* Data obtained by John Yungen, agronomist at the Southern Oregon Experiment Station.

* Determined by the Soil Testing Laboratory, Oregon State University, using the sodium bicarbonate method.

Close-drilled orchardgrass stands may produce high yields of seed when planted at low rates in drill rows 12 to 14 inches apart.



Response of orchardgrass seed crops to potash has not been measured experimentally in Oregon. Trial applications of potash should be made on soils with low potash soil-test values.

Growers' fields and Experiment Station trials in eastern and central Oregon have shown the best results when nitrogen fertilizers were applied in October and November. Fertilizing with nitrogen in March or early April gave the highest yields of seed in western Oregon according to experimental results at Corvallis. When soil fertility is too low for the production of numerous vigorous tillers in the fall in western Oregon, 25 to 30 pounds of nitrogen per acre should be applied in October to stimulate tiller production. These fall-formed tillers will produce seed heads the next spring.

Fall application is recommended for phosphorus and potash when the need for these fertilizers is indicated.

Sulfur can be applied in the fall or spring, whenever other fertilizers are being applied.

Orchardgrass growing on Willamette silt loam soil of pH 5.3 to 5.8 has not shown response to lime in experiments at Corvallis. However, applications of lime may be advisable on some acid soils.

Irrigation

Research data is lacking on the need for irrigating orchardgrass seed crops in western Oregon. Average seed yields of 500 pounds per acre are possible without irrigation on deep loam soils in areas of 18 to 20 inches of rainfall per year. Irrigation is necessary for sustained seed production where the rainfall is less than 18 inches annually.

Irrigation should be frequent enough to keep the grass growing vigorously from the time it starts in the early spring until the seed is in the milk stage. Moisture should penetrate two feet into the soil at each irrigation. Distributing the water uniformly will promote even maturity of seed.

Fall irrigation of orchardgrass seed fields is seldom practiced in the Willamette Valley, and probably is not needed except in years of prolonged fall drought. Irrigating in the fall will probably result in higher seed yields in other seed-producing areas.

Control of weeds and other plants

Control of weeds and other crops in orchardgrass is essential to the production of high-quality seed. Chemicals for controlling unwanted plants are available, and new ones are being introduced. However, cultivation and hand roguing will continue as methods for controlling weeds in fields producing top-quality seed.

Cultivating and hand roguing

One of the reasons for growing grass seed in cultivated rows is to control weeds. Cultivation may be omitted after the year of establishment if the grower does a thorough job of controlling volunteer seedlings and weeds with herbicides .Fall cultivation should not be practiced when diuron (Karmex D-W) is to be applied. Cultivation buries shattered orchardgrass seeds below the herbicide, and unsatisfactory control of volunteer seedlings generally results. Spring cultivation, if practiced, should be shallow to reduce injury to the grass roots. Research at Corvallis indicated that where weeds were controlled with chemicals, seed yields were not reduced when cultivation was omitted.

Hand-roguing to remove problem plants is practiced by growers of high-quality seeds. Large well-established

plants of grasses such as tall fescue, ryegrass, Kentucky bluegrass, bentgrass, and quackgrass are more easily killed by spot spraying than with hand digging tools. (See the section on weed control with chemicals.)

Weed control with chemicals

Chemicals used for the control of weeds in orchardgrass seed fields are 2,4-D, diuron, simazine, IPC, and CIPC. Effective use of diuron, simazine, IPC, and CIPC is confined to western Oregon.

Most broadleafed weeds are susceptible to 2,4-D sprays, although some are susceptible only when young. This herbicide is usually used in the spring. Spraying of new plantings with 2,4-D should be delayed for at least 60 days after emergence of the orchardgrass seedlings; then about ½ pound of the amine form in 10 to 20 gallons of water per acre should be applied. Further treatment with 2,4-D the first year may be given as required. Established stands should be sprayed with ¾ to 1 pound of 2,4-D amine to 10 to 20 gallons of water per acre before head emergence.

Shattered seeds of orchardgrass and many weedy annuals germinate after the first fall rains. IPC or CIPC should be applied at 3 pounds per acre in water before or soon after the seedlings emerge and before October 31. Spraying young orchardgrass seed fields with IPC or CIPC should be delayed until after the first seed harvest to avoid injury to the plants. Diuron is commonly applied in October and November for control of seedling plants. The recommended rate is 3 pounds of diuron as 80% wettable powder per acre in water the first fall on well-established spring plantings; for older fields, 4 pounds of diuron per acre. Ash on burned fields reduces the effectiveness of diuron. Fields should be burned as soon as possible after harvest and spraying delayed until October or early November to minimize the effect of ash on diuron. However, diuron should be applied without further delay when the seedlings begin to emerge. Simazine should be applied early at 2½ pounds of 80-W formulation in 15 or more gallons of water per acre when the weed seedlings are emerging. Simazine should not be used on fields that have not produced one seed crop, and fields that have been sprayed with simazine should not be grazed.

Spot-spraying. Hard-to-kill plants of unwanted grasses can be removed by careful spot-spraying with atrazine at 20 pounds per acre of area actually sprayed. The atrazine should be mixed in 50 gallons of water and sprayed to wet the unwanted plants. When a hand sprayer is used, 1 pound of atrazine to 2 gallons of water sprayed to wet the foliage is advised. Spot-spraying should be done in early spring.

Growers should consult with county Extension agents each year on changes in herbicide recommendations.

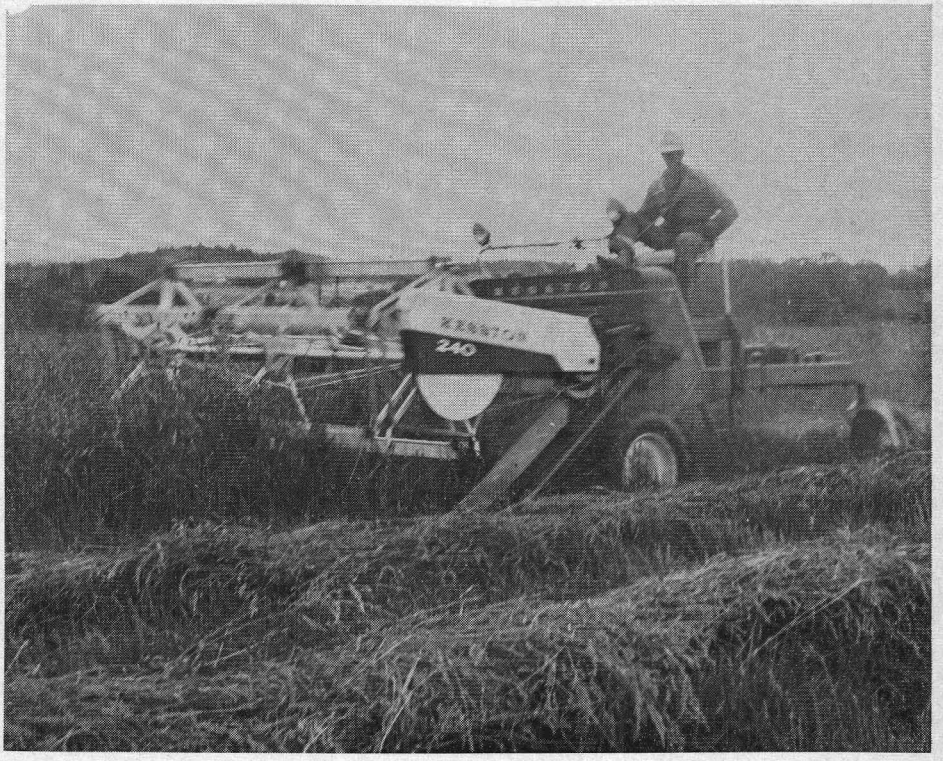
Harvesting the Seed Crop

Some growers of grass seeds delay harvest too long, believing that seed is not fully matured until it has passed through the hard dough stage. Research has shown that orchardgrass seed harvested at medium to hard dough stage (when the moisture was 42 to 48%), and cured on the stems was not reduced in germination, seed size, or total yield.

When to harvest

Orchardgrass seeds shatter readily when ripe. The best harvest stage is when most of the seed is in medium to hard dough. At this stage, most of the seed will be pale green to yellow green with a few straw colored. The stem just below the seed head will be changing from green to straw colored. The moisture content of the seed will be approximately 45%. Few shattered seeds will be seen on the ground. When the crop reaches the harvest stage, it should be handled quickly to avoid excessive losses of seed by shattering. Delay of two or three days results in heavy shattering loss. Standing orchardgrass in the dough stage should not be combine harvested unless artificial drying equipment is immediately available.

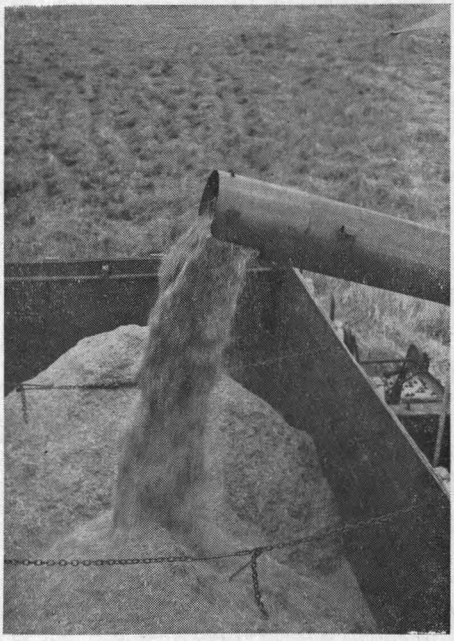
The reel-type windrower quickly cuts the crop and places it in windrows to cure before threshing with a combine. This method has largely replaced the high-labor-cost method of binding, shocking, and hauling to a stationary thresher.



Harvesting methods

The orchardgrass seed crop should be cut at the medium to hard dough stage and cured in windows. The best and quickest way to cut is with a reel-type windrower. Stubble should be left 12 to 18 inches tall. This permits air circulation under the windrow, holds the cut material off the ground, and reduces the amount of straw passing through the combine. After the crop is dry, it can be threshed with a combine. The cylinder speed required may vary considerably, according to type of threshing cylinder, climatic conditions, and the variety of orchardgrass. Cylinder speed and concave clearance should be adjusted so the seed will be threshed from the heads with little dehulling or groating and damage of the seed. A peripheral cylinder speed of at least 3,000 feet per minute is generally required (575 r.p.m. for a 20-inch cylinder). Under some conditions a speed of 5,200 feet per minute may be needed (990 r.p.m. for a 20-inch cylinder). Cylinder and concave adjustments may be desirable daily with marked changes in relative humidity of the atmosphere. The combine should be run with the straw spreader operating in order to get uniform distribution of straw.

When the grain binder is used, binding should be done at the same stage as recommended for windrowing and cured in shocked bundles. The cured bundles can be either hauled to a stationary thresher or forked into a combine. This latter method of threshing makes it necessary to remove the straw from the field.



Bulk handling of orchardgrass seed saves field labor and sack costs. Seed must be dry for safe bulk handling

Post-Harvest Management

Burning

After-harvest burning of orchardgrass seed fields is practiced for field sanitation and to remove crop residue. Orchardgrass has shallow crowns and is less tolerant of burning than tall fescue and Kentucky bluegrass. More than 3 tons of straw per acre may remain after seed harvest. This amount of straw produces extremely hot fires. To burn with minimum loss of plants, these precautions should be observed:

1. Use a straw spreader on the combine.

2. Do not chop the straw. Chopped straw burns slowly and often incompletely.

3. Spread piles of straw which have accumulated in the field.

4. Burn on a dry day when the straw will burn rapidly. Quick burns are generally less damaging than slow burns.

5. Burn before rains have started new growth. Patchy, incomplete burns often occur after straw has been rained on. Scatter unburned patches of straw or chaff and deep ash with the harrow or rotary chopper to improve weed control.

Fields have remained in good condition at Corvallis after five consecutive years of burning when the above precautions were taken.

Pasturing seed fields

Information is not available on the effects of pasturing orchardgrass seed fields in Oregon. Indications are that additional nitrogen should be applied when seed fields are grazed in the fall. Fall grazing should be light and not extended past December 31.

Age of stand

Well-managed orchardgrass seed fields have produced good seed crops for five years in the Willamette Valley. Factors shortening the life of orchardgrass seed fields are: unadapted soils,

Table 3. Seed yields of orchardgrass varieties grown with irrigation in 28-inch rows, Eastern Oregon Experiment Station, Union, 1959-1961

Variety	Maturity	Seed—pounds per acre				Percent of commercial
		1959	1960	1961	Average	
Potomac	v. early	909	224	388	514	81
Sterling	v. early	978	351	566	632	100
Domestic commercial	early	994	326	584	635	100
S. 143	early	916	100	232	416	66
Akaroa—S.C.S. source	early	940	328	446	571	90
S. 37	early	1,021	301	478	600	94
Pennlate	med-late	941	656	691	763	120
Latar	late	860	647	704	737	116

Data obtained by F. V. Pumphrey, agronomist.

Table 4. Seed yields of orchardgrass varieties grown in 3-foot rows, Red Soils Experiment Station, Oregon City, 1960 and 1961

Variety	Seed—pounds per acre		
	1960	1961	Average
S. 37	583	613	598
Akaroa—S.C.S. source	536	433	484
S. 143 (New Type)	473	566	519
Danish commercial	473	480	476
S. 26	383	500	441
S. 143 (Old Type)	376	492	434
Potomac	376	353	364

Data obtained by Jack T. McDermid, station superintendent.

prolonged drought, winter injury, burning injury, leaf diseases, insect damage, and improper use of herbicides. Seed yields for three and four year periods at Corvallis are shown in Tables 1 and 2. Seed yields for a three-year period at Union are shown in Table 3; for a two-year period at Oregon City in Table 4, and for a four-year period at Medford in Table 5.

Table 5. Seed yields of orchardgrass varieties grown in 3-foot rows with irrigation, Southern Oregon Experiment Station, Medford, 1955-1958

Variety	Seed—pounds per acre					Percent of commercial
	1955	1956	1957	1958	Avg.	
Commercial	321	1,029	796	704	712	100
Potomac	379	1,334	914	606	808	113
Akaroa	457	1,084	703	445	672	94
Danish	522	1,308	922	469	805	113
Latar	253	356	364	236	302	42
Avon	317	1,067	849	413	661	93
Welsh S. 37	511	1,142	704	541	724	102
Welsh S. 143	335	388	391	417	383	54
Wisconsin 52	458	1,270	831	427	746	105

Data obtained by John Yungen, agronomist.

Diseases and Pests of Orchardgrass

New developments in agricultural chemicals result in many changes in recommendations for pest control. Growers should check annually with county Extension agents on recommended control methods for orchardgrass diseases and insects.

Ergot

Ergot is one of the most serious disease threats to the orchardgrass seed crop. Ergot is an elongated, dark, hard fungus body that replaces the seed. While developing, ergot produces a moist substance that makes the heads sticky. Thorough burning of straw and stubble after seed harvest destroys the ergot bodies on the soil surface. Ergot-free seed should be used for new plantings. Orchardgrass screenings containing ergot should not be fed to livestock.

Silvertop

Silvertop is a serious disorder of orchardgrass. It is characterized by whitened heads which do not form seeds. Stems of affected heads can be easily pulled from the leaf sheath. Silvertop can be controlled by burning after harvest, before fall rains, and applying DDT at 1 pound or heptachlor *or* aldrin at 8 ounces per acre when the early heads are in the boot. Treated fields should not be grazed, and forage from them should not be fed to livestock.

Leaf diseases

Several leaf diseases are common on orchardgrass in Oregon. These diseases cause round to elongated, dark brown spots and streaks on the leaves. They are most common in the spring

and fall. Severe epidemics in the spring may almost completely destroy green leaf tissue. Heavy infestations may reduce seed yield 50% or more. After-harvest burning is believed to help in the control of leaf diseases.

Other diseases

Other diseases known to affect orchardgrass include grass-seed nematode, bacterial blight, snow mold, mosaic, and dwarf bunt. Nematode-free seed should be used for new plantings. Fall burning aids in the control of nematode.

Insects and other pests

Damage to orchardgrass is frequently caused by the gray garden slug, sod webworms, grasshoppers, aphids, cutworms, and the timothy mite. Slugs often damage seedling stands in western Oregon by consuming young plants. Slugs can be controlled by baiting with pellets containing 3% metaldehyde and 5% calcium arsenate at 5 to 10 pounds per acre. For most effective slug control, bait should be applied following the first fall rains. Baiting can be repeated as needed during the fall and early spring. These chemicals are poisonous and can be dangerous to children and farm animals. They should be used carefully to avoid accidents.

Sod webworms are sometimes destructive in orchardgrass fields in the summer. They destroy or weaken the plants by consuming the crowns and roots. There is no recommended control for western Oregon. For control in eastern Oregon, crop residue should be removed or burned. Follow by spraying with lindane or benzene hexachloride at 1½ pounds per acre just before fall rains. Livestock should not be permitted to graze or consume forage from fields treated with lindane or benzene hexachloride. Injury by sod webworm is usually temporary; fields generally recover the following season.

Grasshoppers feed on grass seed heads and destroy the developing seeds. Losses by grasshopper damage are more common in eastern Oregon than in western Oregon. Toxaphene should be applied at 1½ pounds, heptachlor at 4 ounces, or aldrin at 4 ounces per acre. Fields treated with these insecticides should not be grazed or forage from them fed to livestock. If treated forage is to be fed, 1 pound of Sevin or 1 pound of malathion per acre should be used. Five days should elapse between the application of malathion and grazing or harvesting for forage. There is no restriction on the use of Sevin as recommended. Insecticides should be applied whenever damage is apparent.

The amount of damage by aphids to grass seed crops has not been established. These insects feed on plant juices. Heavy infestations probably cause some reduction in seed yields. Treatment for control should be undertaken only when aphids are numerous. Parathion at 6 ounces per acre or carbophenothion at 1 pound per acre is recommended. (Carbophenothion was formerly known and is still commonly marketed under the name trithion.) A less hazardous, and possibly less effective treatment, is malathion at 1 pound per acre. Fields should not be grazed or forage harvested for livestock within 5 days after application of malathion or within 15 days after application of parathion. Fields treated with carbophenothion should not be grazed and forage from them should not be fed to livestock.

Timothy mites suck plant juices from grass leaves causing small white spots on the leaves. Heavy infestations result in reduced yields of seed. The

best control for the timothy mite is after-harvest burning. When damage to the developing seed crop appears likely, dusting sulphur should be applied at 30 pounds per acre for control, and the field should be burned after the crop has been harvested.

Cutworms cause damage occasionally. They can be controlled with toxaphene or DDT at 2 pounds per acre. Fields treated with these insecticides should not be grazed or forage from them fed to livestock.

New developments in agricultural chemicals result in many changes in recommendations for pest control, and a grower should always check on the best approved methods.

Precautions

Pesticides are poisonous. Use them only when needed and handle them with care. Follow the directions and heed all precautions on container labels. Pesticides should be kept in closed, well-labeled containers, in a dry place where they will not contaminate food or feed, and where children and pets cannot reach them. Avoid repeated or prolonged contact with skin and inhalation of dusts and mists. Wear clean, dry clothing, and wash hands and face before eating or smoking. When handling concentrates, avoid spilling them on skin and keep them out of the eyes, nose, and mouth. If any is spilled, wash it off the skin and change clothing immediately. If it gets in the eyes, flush with plenty of water for 15 minutes and get medical attention.

To minimize losses of honey bees and other pollinating insects, make insecticide application, when possible, during hours when the insects are not visiting the plants; avoid drift into bee yards and adjacent crops in bloom. Growers should notify beekeepers at least 48 hours before dusting and spraying large acreages, so that measures can be taken to protect the bees.

To protect fish and wildlife, be careful not to contaminate streams, lakes, or ponds with insecticides. Do not clean spraying equipment or dump excess spray material near such water.

Avoid drift of pesticide sprays or dusts to nearby crops or livestock, especially from applications by airplane and other power equipment.

Parathion is extremely poisonous and may be fatal if swallowed, inhaled, or absorbed through the skin. This highly toxic insecticide should be applied only by a person thoroughly familiar with its hazards and one who will assume full responsibility for safe use and comply with all the precautions on the label. Reduce the danger of skin exposure by wearing protective clothing and equipment as specified on the container label. Wear a respirator or mask of a type that has been tested by the U. S. Department of Agriculture and found to be satisfactory for protection against parathion.

Orchardgrass Varieties

Several improved varieties of orchardgrass with good seed-yielding ability are available to seed growers. Others will doubtless appear in greater numbers in the future as a result of breeding programs. Orchardgrass varieties have been tested for seed yields on experiment stations at Corvallis, Union, Oregon City, and Medford. Results are shown in Tables 2, 3, 4,

and 5. These tests indicate that satisfactory seed yields can be obtained from several improved varieties that are in demand and for which seed stock eligible for certification is available. They include Pennlate, Latar, Sterling, and Potomac. Seed yields of early varieties may be reduced by leaf diseases and spring frosts. Late varieties such as Pennlate and Latar are most likely to escape damage by leaf diseases, severe spring frosts (see seed yields for 1960 in Table 3), and unfavorable weather during pollination, but they require favorable soil moisture for an extended period.