1985

SEED PRODUCTION RESEARCH
AT OREGON STATE UNIVERSITY
USDA-ARS COOPERATING

Edited by Harold W. Youngberg
Associate Editor Janet Burcham

Contents

	Page
Introduction	1
Effect of Lontrel on Meadowfoam Seed Yields	1
Effect of Ramrod and Fusilade On Meadowfoam Seed Yield	2
Seed Dormancy and Stand Establishment of Meadowfoam	2
Maturation and Dormancy of Cuphea Seed	3
Herbicide Tolerance Tests with Flowers, 1985 Season	3
Flower Seed Production Adaptation Trials	5
Meadowfoam Fertilizer Trials	5
Seed Conditioning Research	8
Comparison of Herbicide Banding and Charcoal Banding Techniques for Establishment of Grass Seed Crops	8
Response to Applications of Fungicides to Control Diseases	9
Current Research on the Endophytic Fungi in Tall Fescue and Perennial Ryegrass	11
Nitrogen, Phosphorus, and Potassium Fertilization of Kentucky Bluegrass and Fine Fescue in Northeastern Oregon	12
Response of Kentucky Bluegrass to Nematicide Treatment	12
Development of Moisture Testing Methods for Seed Crops	12
Study to Determine Effect of Time and Method of Phosphorous Application on Grass Seed Crops	13
Establishment of Grass Seed Crops with Cereal Companion Crops	13
Effect of Post Harvest Residue and Regrowth Removal on the Fifth Year Seed Yield of Selected Kentucky Bluegrass Varieties at Madras, Oregon in 1985	15
Residual Effects of 1983-84 Nitrogen Rate/ Schedule on 1985 Seed Yield of Kentucky Bluegrass in Central Oregon	17
Grass Variety Seed Yield Evaluation	17
Red Clover Variety Seed Yield Evaluation	17
Effects of Parlay Retreatment in Grass Seed Production	18
Minimum Tillage Systems for Changing Varieties in Seed Production	18
Interaction of Increased Rate of Early Spring Nitrogen and Parlay Plant Growth Retardant in Pennfine Perennial Ryegrass Seed Production	19
Effects of XE-1019 Growth Retardant on Caravelle Perennial Ryegrass Seed Production	21
Nitrogen Rate and Date Effects on Parlay Response in Tall Fescue, Fine Fescue, and Orchardgrass	21
Response of Bentgrass Varieties to Parlay Applications for Lodging Control	22
Lodging Control and Yield Enhancement in Morex Spring Barley with Parlay Treatment	32

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INTRODUCTION

Harold Youngberg

The "1985 Seed Production Research at Oregon State University" is the fourth edition research-in-progress report prepared for Oregon seed growers. It is published in cooperation with the Oregon State University Extension Service and the U.S. Department of Agriculture, Agricultural Research Service, with financial support from the Oregon Seed Council.

Seed producers have faced serious financial and regulatory problems in recent years. Only by the use of the best technology can growers maintain the seed quality and yield necessary to remain competitive in the market. In addition to seeking solutions to current production problems, attention is focused on developing new and alternative crops adapted to lands currently producing seed. The availability of other profitable crops will reduce the pressure on less profitable seed crops and reduce the need to burn large quantities of grass seed crop residue. Several reports in this issue deal with these topics.

Seed research is carried on by several departments in the College of Agriculture bringing the strengths of various academic specialities to bear on research problems. The Branch Research Stations also perform a valuable function in conducting research in the regions of the state. This report includes work from the Central Oregon Experiment Station, the Columbia Basin Agricultural Research Center, and the Southern Oregon Experiment Station.

Construction began on the National Forage Seed Production Research Laboratory facility during 1985. The importance of seed production in this region to national forage production is recognized by the establishment of this lab at Oregon State University. When complete and occupied in 1987, the facility will include a major building with office-laboratories and a greenhouse complex for the USDA-ARS seed research staff.

During this year Dr. G. Mueller-Warrant joined the USDA-ARS research staff as Weed Scientist. Dr. J.M. Hart joined the Department of Soil Science specializing in the area of soil fertility.

Appreciation is expressed to the Oregon Seed Council for financial support of printing and distribution of this report.

Effect of Lontrel on Meadowfoam Seed Yields

B.D. Brewster, R.L. Spinney, and A.P. Appleby

Lontrel (clopyralid) is a herbicide which is effective primarily on legumes (vetch, lupine, etc.), composites (dandelion, groundsel, thistle, mayweed, etc.), and knotweeds. Since many common weeds are composites, Lontrel would be a useful herbicide in meadowfoam culture. A trial was conducted at the Hyslop Crop Science Field Laboratory to compare rates of Lontrel for crop safety.

Lontrel was applied at rates of 0.0625, 0.125, 0.25, and 0.5 lbs acid equivalent per acre on January 3, 1985. The meadowfoam plant was 3 to 4 inches in diameter when treated. No visible effects on the meadowfoam were detected in plots treated with 0.0625 to 0.25 lbs a.e./a. At the 0.5 lb/a rate, slight stunting and twisting of the foliage was observed. Seed yields were reduced about 14% by the 0.5 lb/a rate, but yields from plots treated with the lower rates were not significantly different from those in the untreated check. Since the 0.125 lb/a rate is adequate to control most sensitive annual broadleaf weeds, there appears to be sufficient safety with this herbicide on meadowfoam.

Further research is being conducted to evaluate meadowfoam tolerance to Lontrel. Applications are being made throughout the cropping season to determine whether meadowfoam is tolerant to Lontrel at all stages of growth.

Effect of Ramrod and Fusilade on Meadowfoam Seed Yield

B.D. Brewster, R.L. Spinney, and A.P. Appleby

Ramrod (propachlor) and Fusilade 2000 (fluazifop-P-butyl) have been shown to be reasonably selective in meadowfoam in recent research at Oregon State University. Ramrod is effective on many annual grasses and certain annual broadleaf weeds when applied prior to weed emergence from the soil. Fusilade 2000 is effective only on grasses. This herbicide is most effective when applied while the grasses are actively growing but are still in a vegetative state. However, annual bluegrass and rattail fescue are highly resistant to Fusilade 2000. Fortunately, these two species are controlled by Ramrod.

This past year, experiments were conducted in growers' fields and the Hyslop Research Farm to evaluate the effect of Ramrod and Fusilade 2000 on meadowfoam seed yield and to collect seeds for chemical residue analysis. Ramrod was applied after seeding but prior to crop emergence, while Fusilade 2000 was applied in early January when the meadowfoam plants were 2 to 4 inches in diameter.

Meadowfoam growth was reduced by all applications of Ramrod, but seed yield was less affected. Although an October application on Ramrod at 3 lbs active ingredient per acre had reduced growth by over 40% in March, no significant reductions in seed yield were found in any trial at application rates of less than 8 lbs a.i./a.

Fusilade 2000 seemed to have little direct effect on the meadowfoam. Even a sixteen-fold increase in the rate of Fusilade did not affect seed yield, although plant growth was reduced. Seed samples were collected from the Fusilade 2000 and the Ramrod-treated plots and are being analyzed for herbicide residues by the OSU Agricultural Chemistry Department.

Additional research is underway to confirm the safety of Ramrod on meadowfoam. The most likely use rate will be 2 to 3 lbs a.i./a. Fusilade 2000 will probably be used at rates of 0.125 to 0.5 lbs a.i./a.

Seed Dormancy and Stand Establishment of Meadowfoam

D.F. Grabe, O.B. Mmolowa, S. Nyunt, and C.J. Garbacik

Meadowfoam seed is known for poor germination under warm soil temperature conditions. For this reason, fall seeding of meadowfoam is usually delayed to obtain the cool soil temperatures required for successful stand establishment. If seed dormancy problems related to warm temperatures can be overcome, seeding could be earlier, resulting in more vigorous stands with larger plants at the onset of winter. Earlier seeding would also reduce the risk delayed planting due to fall rains and cold weather which would delay planting and necessary fall growth.

The overall objective of this project is to reduce the temperature-related dormancy problems of meadowfoam to facilitate early fall planting, establishment of optimum stands, and maximum crop yields. The first steps in accomplishing this are to thoroughly characterize meadowfoam seed dormancy and to determine the effect of planting date on stand establishment. The following statements summarize the results of 1985 research.

1. Species and seed lots within species vary in degree of dormancy, with *Limnanthes floccosa* being much more dormant than *L. alba* variety Mermaid and the cross of *L. alba* x *L. floccosa*. This indicates that progress in overcoming dormancy can be achieved through breeding and selection.

2. The degree of dormancy is reduced as seeds age, with older seed resulting in better field emergence at warmer temperatures.

3. Meadowfoam germination is very sensitive to warm temperatures, with 10-13°C (50-55°F) required for maximum germination.

4. Germination is inhibited by light, more so at warm temperatures than cool.

5. Of the several plant growth regulators tried, potassium nitrate at a concentration of 0.1 or 0.2% is most effective in promoting germination.

6. Chipping the seedcoat was effective in obtaining nearly complete germination at 5-15°C (41-59°F).

7. Osmotic priming in PEG 8000 promoted some germination at the warm temperature of 25°C (77°F), the only treatment to do so.

8. Secondary dormancy is induced by short exposure to warm temperatures so germination does not occur when temperatures are later reduced.

9. Planting depths of 1/4, 1/2, and 3/4 inch gave equal emergence percentages.

10. Field emergence of five seed lots and three planting depths was determined at six planting dates. Average emergence percentages were 42% on August 29, 51% on September 12, 60% on September 19, 68% on September 26, 65% on October 3, and 70% on October 10.

These findings provide several important leads to overcome warm-temperature dormancy on a practical scale.

Osmotic priming, scarification, growth regulators and aging have potential for overcoming dormancy and permit earlier planting in warm soils. All should be studied further to determine their applicability to commercial planting.

Acknowledgement: This research was partically funded by a grant from the Oregon Department of Environmental Quality.

Maturation and Dormancy of Cuphea Seed

D.F. Grabe, C.J. Garbacik, and I. Kaliangile

There is interest in developing Cuphea as a new oilseed crop for production of medium-chain fatty acids for use in manufacture of soaps and detergents. Cuphea plants are indeterminant in their flowering with seeds ripening over a period of several weeks. The ripe seeds are not enclosed by a protective covering and shatter as soon as they are ripe, making it difficult to determine the proper stage to harvest for maximum yield of dry matter and oil. Furthermore, the seeds are dormant when harvested and it is not possible to establish a stand of plants, in field or greenhouse, from recently harvested seed.

Domestication of Cuphea will require a thorough understanding of all aspects of seed technology. Studies this year concentrated on seed development and seed dormancy since the results can have immediate application to timing of seed harvesting operations and to problems with stand establishment. Some of the more significant findings are:

1. Species vary in vegetative development patterns and time and position of first flowering. It is hoped these characteristics may be related to concentration of flowering and seed production periods.

2. Seed production was continuous until cold weather, but reached a peak output in *Cuphea lutea* about October 10 in 1985.

3. In studies of seed development in *C. lutea*, maximum oil and dry matter content were reached 18 days after anthesis in the greenhouse. Maximum dry weight was reached in 20 days in the field. The calyxes opened, exposing the seed, 14 days after anthesis in the greenhouse and 20 days in the field. Thus, seeds in the field had developed their maximum dry matter content by the time the calyxes opened and exposed the seeds to shattering.

4. Seed of *C. wrightii* was dormant at harvest and did not germinate without special treatment. Considerable dormancy was still present in 1- year-old seed, but dormancy was nearly absent in 3-year-old seed.

5. Minimum and maximum temperatures for germination of *C. wrightii* were 15 and 35°C (59 and 95°F), respectively. Light was required for germination. For maximum germination, *C. wrightii* seeds require planting on top of blotters, at 20-30°C (68-86°F), in light, for a period of 3 weeks.

6. Of the many dormancy-breaking techniques applied, scarification in concentrated sulfuric acid was most successful. Small positive effects were obtained from dry heat, gibberellin, potassium nitrate, and mechanical scarification. No effects were obtained from kinetin, thiourea and ethephon. Negative effects were obtained from pre-chilling, activated charcoal, and many combination treatments. For small greenhouse or growth chamber trials, adequate numbers of plants may be obtained by mechanical or acid scarification.

7. Osmoconditioning, or priming, of partially dormant 1984 seed of *C. wrightii* increased the speed of germination and raised total germination from 19 to 93%. Priming was not effective on dormant 1985 seed.

Much of the work was concentrated on *C. wrightii* because of good seed supplies. The work should now be extended to other species that have commercial potential.

Acknowledgement: This research was partially funded by a grant from the Soap and Detergent Association and the USDA, ARS.

Herbicide Tolerance Tests With Flowers, 1985 Season

J.A. Yungen

The herbicide tolerances of a group of flowers were evaluated in two trials in southern Oregon during 1985. The first involved eight different flowers that were seeded March 27 in the greenhouse. The other seeding was made in the field April 10-11 and included 13 flowers. Herbicides used in each test were of known efficacy, registered on a wide range of vegetable, field, and ornamental crops.

Greenhouse Trial:

The growth media was Central Point sandy loam soil that was screened through an 8-mm screen to remove rocks and to obtain uniform particle size. Metal flats were used as containers, and the soil depth was three inches.

Two treatments were pre-plant incorporated. They were trifluralin (Treflan) at 0.75 pound per acre and EPTC (Eptam) at 2.5 pounds per acre. Candytuft, celosia, echinacea, linaria, nasturtium, phacelia, shirley poppy, and silene were seeded in the flats after the herbicides were incorporated. Watering was by sub-irrigation through the bottom of each flat.

Pre-emergence treatments of DCPA (Dacthal) at 6.0, diphenamid (Enide) at 4.0, and CIPC (Furloe) at 4.0 pounds per acre were applied two days after the flowers were seeded.

Stand and plant ratings were made April 1, April 4, and April 9. Emergence and crop response to herbicides were noted. Silene had the most emergence by April 1, followed by linaria, phacelia, and shirley poppy.

Candytuft showed good tolerance to Treflan and only slightly less tolerance to Dacthal and Furloe. Enide and Eptam resulted in some stand loss and smaller plants.

Celosia was not highly tolerant of any of the herbicides. It showed marginal tolerance to Dacthal. Cultivation and handweeding appear to be most practical for the crop.

Echinacea is a perennial that emerges slowly. It tolerated the pre-emergence Furloe treatment to a greater degree than the others, although Treflan showed some promise for the crop.

Linaria emerged quickly but was not highly tolerant of any treatment. Treflan resulted in stand reduction, but plant size nearly equalled that of the check treatment.

Nasturtium was quite tolerant of Treflan and Furloe treatments and slightly less so to Dacthal. Enide resulted in severe stand damage and size reduction.

Phacelia showed moderate tolerance to Dacthal, Treflan and Enide, although all three caused either stand reduction or growth retardation. Tolerances to Eptam and Furloe were poor.

Shirley poppy showed poor tolerance to each of the treatments. Cultivation and handweeding would be the preferred method of weed control.

Silene emerged quickly and had unusual growth vigor for such a small-seeded plant. It did not show much tolerance to any of the herbicides in the trial. Only very marginal tolerances to Enide and Eptam were indicated.

Field Trial:

Preplant incorporated treatments of Treflan (0.75 lb/a), Eptam (2.5 lb/a), and Prefar (4.0 lbs/a) were applied to a Central Point sandy loam soil on April 10. Thirteen different flowers were planted April 11 using a Planet Jr. seeder. Pre-emergence treatments Dacthal (6.0 lbs/a), Enide (4.0 lbs/a) and Furloe (4.0 lbs/a) were applied April 19. Irrigation was done with overhead sprinklers.

The herbicide treatment effects were rated April 30 and June 28. Strong weed growth pressure was observed at the June 28 reading because of frequent irrigation and favorable growth conditions. Table 1 presents observations on crop tolerances to the herbicides under field conditions.

Table 1. Observed Tolerances of Flowers to Herbicides, Field Planting
Southern Oregon Experiment Station, Medford, 1985 Season

	Herbicide treatment, (lbs/a, a.i.)					
Flower	Treflam (0.75)	Eptam (2.5)	Dacthal (6.0)	Furloe (4.0)	Enide (4.0)	Prefar (4.0)
Bells of Ireland	fair	f. good	poor	good	good	f. good
Clarkia	good	fair				
Echinacea	poor	poor		good		poor
Helianthus	good	good	good	good	good	good
Linaria	f. good	fair	poor	poor	poor	fair
Lupin	good	f. good				fair
Mirabilis	fair	poor				fair
Nasturtium	good	good	f. good	fair	poor	fair
Oenothera	good	poor	f. good	poor	poor	
Phacelia	f. good	poor	f. good	poor	f. good	f. good
Rudbeckia	good	fair				poor
Shirley Poppy	poor	fair				poor
Silene	poor	fair	poor	poor	fair	poor

Notes:
1. Treatment timing: Treflan, Eptam, and Prefar, pre-plant incorporated. Dacthal, Furloe, and Enide were pre-emergence.
2. The soil was a sprinkler-irrigated Central Point sandy loam.
3. The flowers were seeded April 11.
4. A rating of fair can be considered as marginal for crop safety.
5. Ratings were based on observations of April 30 and June 28.

Bells of Ireland showed good tolerance to Furloe and Enide and less tolerance to Eptam and Prefar and even less to Treflan and Dacthal.

Clarkia showed tolerance to Treflan but only marginal tolerance to Eptam. Echinacea showed good tolerance to Furloe but not to the other herbicides. Helianthus had the broadest tolerances of any of the flowers. Stands and growth were satisfactory with all the treatments.

Linaria showed some tolerance to Treflan, but the Eptam and Prefar treatments were only marginally safe. Dacthal and Enide caused considerable stand thinning. Treflan was the safest treatment for Lupin, while Eptam and Prefar resulted in more crop injury. Treflan and Prefar were marginally safe to use with Mirabilis while Eptam caused plant injury.

Nasturtium showed tolerances to Treflan and Eptam, lesser tolerance to Dacthal and Prefar, and it was injured by Furloe.

Treflan was the safest treatment for use with Oenothera. Phacelia showed moderate tolerance to Treflan, Dacthal, Enide, and Prefar but not to Furloe and Eptam. Rudbeckia showed tolerance to Treflan.

Shirley poppy showed marginal tolerance to Eptam, but cultivation and handweeding are still indicated for the crop.

Silene had very little tolerance to the treatments except for marginal safety in the Eptam and Enide treated areas. Cultivation and handweeding are viable alternatives for weed control in the crop. Its vigorous seedling growth and early upright growth should make cultivation easier than for many flowers.

Flower Seed Production Adaptation Trials

J.A. Yungen

Flower seed production trials were conducted in southern Oregon with 39 different flowers over a three-year period beginning in 1970. Several growers have been producing commercial flower seed for four years. Renewed interest in seed production led to new trials in 1984 and 1985.

Nine different flowers were grown in 1985 as part of a seed production adaptability experiment. All the flowers were seeded in an April 10-11 planting except for celosia which was seeded May 22 because it lacked frost tolerance. Rows were spaced 20-inches apart, and irrigation was done with overhead sprinklers on the Central Point sandy loam soil.

Emergence, growth habit, flowering date, attractiveness to bees and other pollinating insects, seed maturity date, seed retention and shattering, and seed yield varied widely among the flowers. Nasturtium responded unfavorably to high summer temperatures, and even though rapid growth resumed as temperatures moderated, it failed to mature seed before frost. Echinacea or purple coneflower, a perennial, did not reach its full potential from the spring seeding and produced only a small amount of seed.

Seed yields of the other flowers were considered satisfactory (Table 1). Layia was the earliest in maturity and its seeds were vacuumed from the plant. Silene, phacelia, shirley poppy, and linaria all matured in July when harvest conditions were favorable. While a few seeds of marigold were vacuumed from the plants July 19, most of its seeds were harvested by direct-combining October 14. Because the shatter hazard of many of the flowers is quite high, laying the swathed material on paper or on a tarp helps reduce seed losses. Direct harvest with a combine is possible with a number of the flowers.

Table 1. Flower information and seed yield, 1985

Flower	Harvest date	Harvest method[1]	Shatter hazard	Seed yield lb/acre
Layia	July 5, 12, 19	v	high	343
Silene	July 15	c + v	moderate	365
Phacelia	July 19	c + v	high	258
Shirley poppy	July 25	c	moderate	268
Linaria	July 25	c + v	high	170
Celosia	October 14	c	moderate	297
Marigold	October 14	c	moderate	329
Echinacea	November 11	h	low	21
Nasturtium	no seeds matured before frost			

[1] Layia seeds and a small amount of marigold seeds were vacuumed from the plants; 80% of the linaria and 27% of the silene seeds were vacuumed from the ground. v=vacuum; c=combine; h=hand harvest

Meadowfoam Fertilizer Trials

J.M. Hart and W.C. Young III

Yield reponse of meadowfoam to fall-spring applications of nitrogen (25 lb N/a, 50 lb N/a, respectively) have been previously reported. No responses in seed or oil yield was noted from applications of phosphorus, potassium, sulfur, and lime even though initial soil tests indicated that nutrient levels at the selected sites were within a responsive range for other Willamette Valley crops (Table 1).

OSU-Schmidt Farm

Seed and oil yield responded to applications of N. Spring application of 50 lb N/a preceded by 0 or 25 lb of N/a in the fall produced the highest seed and oil yields (Table 2). Higher

Table 2. Meadowfoam response to fertilizer treatment, Schmidt Farm, 1985.

Treatments					
Fall N	Spring N	S	Percent Oil	Seed Yield	Oil Yield
(lb/a)			(%)	(lb/a)	
0	0	36	25.1	734	184
25	25	36	24.3	1020	248
25	50	36	23.9	1279	306
25	100	36	21.6	1119	242
0	50	36	24.3	1186	289
50	50	36	23.7	1118	266
25	50	0	23.2	1207	281
0	0	0	25.0	748	187
LSD .05			1.7	109	38

rates of N in the fall or spring decreased yields. Treatments receiving no N produced only 57% of the seed yield in plots receiving 25 lb N/a in the fall and 50 lb N/a in the spring. Treatments receiving 100 lbs N/a in the spring produced significantly lower seed yields, oil yields, and percent oil than treatments receiving only 50 lb N/a in the spring. Both seed and oil yield decreased with an increase in seed yield. This is not surprising, as the dilution effect is observed in many crops.

IOKA Farm

Seed and oil yields at IOKA farms were not as responsive to N as they were at the Schmidt farm. The check treatment produced 82% of the highest seed yield (995 lb/a vs 1172 lb/a) (Table 3). A split N application of 25 lb/a in both spring and fall produced the only oil yield significantly higher than the check. Seed yields higher than the check were produced by the application of a single 50 lb/a treatment and split N applications of 25/25 and 25/50 lb/a treatments. The 100 N lb/a spring application rate caused a significant decrease in seed yield, oil yield, and percent oil. Treatments of 50 lb N/a and 100 lbs P_2O_5/a produced the highest yields. A yield response to P fertilizer was expected as the P soil test value of 4 ppm is extremely low. Thus, at a site with low P values, application of P fertilizers may increase oil yield by increasing the percent oil. No response to S was found at this site.

Ringsdorf Farm

Seed and oil yields were increased over the check with any combination of N rate or timing at this location (Table 4). Seed yield of the check at 708 lb/a was 53% of the highest

Table 3. Meadowfoam response to fertilizer treatment, IOKA Farm, 1985.

Treatments						
Fall N	Spring N	P_2O_5	S	Percent Oil	Seed Yield	Oil Yield
(lb/a)				(%)	(lb/a)	
0	0	100	36	25.8	995	256
25	25	100	36	25.4	1172	299
25	50	100	36	23.3	1083	256
25	100	100	36	21.5	863	186
0	50	100	36	23.7	1133	268
50	50	100	36	22.9	1079	247
25	50	100	0	23.6	1062	251
25	50	0	36	23.9	1136	272
0	0	0	0	25.5	962	245
LSD .05				1.5	105	33

Table 4. Meadowfoam response to fertilizer treatment, Ringsdorf Farm, 1985.

Treatments						Percent Oil	Seed Yield	Oil Yield
Fall N	Spring N	P_2O_5	K_2O	S	L[1]			
-(lb/a)-						(%)	(lb/a)	
0	0	100	100	36	0	26.4	708	187
25	25	100	100	36	0	25.6	1085	277
25	50	100	100	36	0	25.1	1252	313
25	100	100	100	36	0	23.7	1292	306
0	50	100	100	36	0	25.4	1329	337
50	50	100	100	36	0	24.3	1166	284
25	50	0	100	36	0	24.8	1155	290
25	50	100	0	36	0	25.2	1209	305
25	50	100	100	0	0	24.6	1258	309
25	50	100	100	36	3000	24.0	1195	288
25	0	0	0	0	0	26.5	714	190
LSD .05						1.25	221	57

[1] Lime

yield (1,329 lb/a). Percent oil was decreased with an increasing amount of N. Soil test levels for potassium, phosphorus, and lime were low but percent oil, oil yield, and seed yield were not affected by addition of lime, phosphorus, potassium, or sulfur.

Wirth Farm

Applications of nitrogen decreased percent oil and seed yield at this site (Table 5). Nitrogen treatment rates were lower here in anticipation of nitrogen release from the previous white clover crop. In spite of that, any addition of N decreased seed yield and oil yield. Thus, crop rotation and the amount of carryover or mineralizable N will dictate meadowfoam's seed yield, oil yield, and percent oil response to N applications. The 50 lb/a spring N rate at the Wirth farm decreased yields similar to the 100 lb/a rate at other sites. Furthermore, applying lime increased the pH of 5.3 and provided conditions favorable to increased conversion of available plant nitrogen, resulting in low seed yield and the lowest percent oil. Response to fertilizer N should not be expected where meadowfoam follows a legume crop.

Summary

The previous crops at the IOKA and Ringsdorf farms were grass for seed; the Schmidt farm was fallow. Meadowfoam responded to low amounts, up to 25 lb/a, of fertilizer nitrogen in the fall and to slightly higher amounts, 25 to 50 lb/a, in the spring as soil nitrogen level was depleted at those

Table 5. Meadowfoam response to fertilizer treatment, Wirth Farm, 1985.

Treatments				Percent Oil	Seed Yield	Oil Yield
Fall N	Spring N	S	L[1]			
-(lb/a)-				(%)	-(lb/a)-	
0	0	36	0	22.1	1114	246
25	25	36	0	20.6	948	196
25	50	36	0	21.3	794	170
0	25	36	0	22.3	990	222
25	25	0	0	21.8	901	197
25	25	36	3000	19.7	868	171
LSD .05				0.7	126	27

[1] Lime

locations. However, when meadowfoam followed a legume, such as white clover, application of fertilizer N depressed yields. Regardless of soil test levels, application of lime, potassium, phosphorus, or sulfur did not increase meadowfoam seed or oil production. At very low phosphorus levels (4 ppm), addition of phosphorus tended to increase percent oil. This trend should be explored in future programs.

Seed Conditioning Research

A.G. Berlage, D.M. Bilsland, and T.M. Cooper

Seed conditioning includes postharvest operations such as contaminant removal and germination improvement. Physical property differences between the crop seed and its contaminants must be determined and taken advantage of in order to obtain the best possible purity and quality. A physical property difference may be created so as to achieve a separation by other than conventional techniques.

Electrostatic Separation

Onion seed as harvested may be mixed with weed seeds and inert materials including receptacle and pedicel parts of the onion flower. Research was conducted to study the application of electrostatic principles in removing flower parts from onion seed. The onion seed/flower part mixture was fed onto a conducting type conveyor belt and passed under an electrode (17 kV) through an electric field. With a discharging or "pinning" field, the poor conductors in the mixture adhered to the belt until their charge was neutralized along the belt's return path. The better conductors lost their charge rapidly and followed a normal discharge pattern from the belt. Adjustable dividers were set to optimize the separation with most good seed falling at collecting points 1 and 2, and most flower parts falling at point 5. Some seeds and a few flower parts were collected at points 3 and 4. A controlled environment of 58°F and 20% humidity provided the best results. Both germination and density were highest for the seeds collected at points 1 and 2. These seeds were combined and rerun once to insure complete removal of flower parts. The electrostatic separator offers an alternate cleaning and grading method for onion seed.

Magnetic Separation

Magnetic fluid and conventional iron powder with moisture were also compared for effectiveness in removing flower parts from onion seed lots. Test lots were pretreated with iron powder and moisture and with a ferromagnetic fluid at three different dilutions. After the pretreatment, the mixtures were passed over a permanent-magnet drum separator. The magnetic particles are readily picked up by the more porous flower parts and shriveled or cracked onion seed. With proper setting of the discharge divider, a separation of magnetic (flower parts and poor seed) and nonmagnetic (good seed) fractions was obtained with the magnetic drum separator. All flower parts were removed from the mixtures pretreated with iron powder and moisture, but seed lot germination was not improved. Pretreatment with the magnetic fluid was not as effective in removing all flower parts, but was more effective in improving seed lot germination.

Seed Identification

The machine vision system (MVS) was used to study identification of tetraploid and diploid annual ryegrass cultivars by visual means. Twelve variables were measured or calculated from images of 480 seeds (4 subsamples of 8 varieties) using a high resolution MOS camera. The images were electronically processed with improved algorithms. The methods employed yielded an 85% correct classification of 6 tetraploid varieties and 2 diploid varieties. There is potential for the use of MVS to recognize small morphological differences. Further refinement of the methods and development of a more complex algorithm are necessary for improved accuracy of identification.

Threshing

Approximately 35 crop/contaminant mixtures were evaluated for optimum conditioning sequences. Lentils and meadowfoam are among the seeds threshed to remove the seed coat. Lentils without hulls reduce flatulence, and dehulled meadowfoam seed provides improved oil quality. A unique, vertical belt thresher was designed for improved control of the threshing action. Convenient adjustments provide the required versatility to thresh large seed heads, the seed crop as harvested (stem, leaves, and seeds), small seed heads or pods, and individual seeds.

Capacity is a function of belt width and belt speed. Once the belt width requirement has been determined, the other design features can be easily adjusted. The belt textures, belt clearance and convergence, feed rate, and speed ratio are easily changed to provide threshing action ranging from gentle to aggressive. For a given pair of belts, decreasing the clearance and/or increasing the speed ratio will increase the threshing aggressiveness.

Research done in cooperation with the Oregon Agricultural Experiment Station.

Comparison of Herbicide Banding and Charcoal Banding Techniques for Establishment of Grass Seed Crops

G.Mueller-Warrant

A series of experiments were planted at Hyslop Crop Science Field Laboratory in the fall of 1985 to compare banding of herbicides between the rows with the standard charcoal banding-broadcast diuron method currently recommended for establishment of new stands of grass. Herbicides applied as bands directed between the crop rows included simazine, diuron, propazine, prometryn, and prodiamine. Crops tested were tall fescue, orchardgrass, and annual ryegrass.

One method used to create the bands involved broadcast spraying ahead of planting, relying on the planter's openers to move enough soil to create narrow, herbicide-free zones directly over the rows. The second method was to position spray nozzles between the press wheels at the back of the planter, angling them to leave untreated zones 1.0, 1.5, or 2.0 inches wide directly over the rows. Herbicide rates ranged from 0.9 to 3.0 lbs/a, varying with each herbicide to equal that rate required to achieve broad spectrum, non-selective weed control between the crop rows. The standard establishment method used for comparison was broadcast application of 2.4 lbs/a of diuron after planting in conjunction with 25 lbs/a of activated charcoal applied in a one-inch wide band over the row at planting time.

Preliminary injury ratings were made one month after planting. Severe crop injury was noted for all treatments that involved use of herbicides broadcast before planting. The amount of soil movement achieved by the row-openers was apparently inadequate to protect the crop seedlings from herbicide injury. Band spraying of herbicides was somewhat safer, with the 2.0- inch wide untreated band causing less injury than the 1.5-inch wide band, which in turn was safer than the 1.0-inch wide band. However, none of the banded herbicide treatments were as safe as the standard charcoal planting method. Diuron caused the least damage to all three species of any of the herbicides tested. It also appeared that prometryn on orchardgrass was somewhat safer than most of the other banded triazine treatments on the three grasses used.

Severe frost and heaving injury occurred in late November and all of December. This weather stress combined with the herbicide injury to cause high levels of seedling mortality over the winter. For herbicide banding to be safe in years such as this, it will probably be necessary to combine use of relatively wide untreated bands over the rows along with selection of herbicide-crop combinations that show moderate levels of inherent crop tolerance.

Response to Applications of Fungicides to Control Diseases

R.E. Welty and P.A. Koepsell

Orchardgrass

Five separate studies were done in 1985 to study the effects of 1-4 fungicide applications for control of head blight and stripe rust. The studies were done at the Hyslop Field Laboratory, Corvallis. Three fungicides were evaluated for blight control: Bravo (3pt/a), Difolatan (1.5 lb/a), and Tilt (8 oz/a). This was the second year of a three-year study. Three fungicides were evaluated for rust control: Tilt (8 oz/a), Bayleton (0.5 lb/a), and Ni Maneb (3 lb/a). This was the first year of a three-year study. In the remaining three studies, four applications of Bravo and Tilt were applied alone or as a tank mix to 7 to 9 cultivars of orchardgrass. No fungicide applications resulted in significant yield increases (Tables 1-4). In 1985 (Table 5), April and May were drier than

Table 1. Seed yield of Pennlate orchardgrass as influenced by 1 to 3 applications of fungicides to control stripe rust; harvested June 29, 1985, Hyslop Field Laboratory.

		Seed yield, (grams/plot)		
		Fungicides		
Number of applications	Dates applied	Ni-maneb (3 lb/a)	Tilt (8 oz/a)	Bayleton (0.5 lb/a)
0	Control	128 [1]	147	152
1	4/30	142	131	126
1	5/10	139	140	136
1	6/3	142	119	137
2	4/30 & 5/10	159	125	130
2	5/10 & 6/3	156	140	145
3	4/30, 5/10, & 6/3	152	150	121
	LSD 0.05	NS	NS	NS

[1] Average based on 6 replications per application.

Table 2. Seed yield of seven cultivars of orchardgrass receiving four applications[1] of a tank mix of fungicide for disease control; harvested June 29, 1985, Hyslop Field Laboratory.

	Seed yield (grams/plot)	
Cultivar	Control	Fungicide Mixture [2]
Able	183 [3]	147
Aonami	135	126
Frontier	108	106
Hallmark	144	162
Juno	158	178
Latar	112	121
Potomac	127	164

[1] Spray dates 1985: 4/25, 5/7, 5/20, 6/3.

[2] Bravo (3 pt) and Tilt (8 oz)

[3] Averages (3 replications) within a cultivar for sprayed and nonsprayed were not significantly different from one another (P= 0.05).

Table 3. Seed yield of orchardgrass receiving four applications of Tilt (8 oz/a) to control stripe rust; or Bravo (3 pt/a) to control blight and leafspot; harvested June 29, 1985, Hyslop Field Laboratory.

Cultivar	Seed yield (grams per plot) Blight: Control	Blight: Bravo	Rust: Control	Rust: Tilt
Able	163 [2]	164	166 [1]	204
Pennlate	136	150	199	204
Frontier	127	118	-	-
Latar	127	118	152	151
Sterling	113	112	143	151
Hallmark	96	104	128	157
Aonami	95	103	114	120
Potomac	95	92	126	140
Cambria	-	-	223	258

[1] Spray dates in 1985: 4/25, 5/7, 5/20, 6/3.

[2] Averages (4 replications) within a cultivar for sprayed and nonsprayed with either fungicide are not significantly different from one another (P= 0.05).

Table 4. Seed yield of Potomac orchardgrass as influenced by 1 to 3 applications of fungicides to control leaf and head blight; harvested June 29, 1985, Hyslop Field Laboratory.

Number of applications	Dates applied	Seed yield, (grams/plot) Fungicides: Bravo (3 pt/a)	Tilt (8 oz/a)	Difolatan (1.5 lb/a)
0	Control	190 [1]	173	180
1	4/30	178	177	185
1	5/10	171	172	187
1	6/3	178	182	182
2	4/30 & 5/10	184	177	181
2	5/10 & 6/3	184	173	204
3	4/30, 5/10, & 6/3	200	202	205
	LSD 0.05	NS	NS	NS

[1] Average based on 6 replications per application.

normal and precipitation in June was measureable on 5 days. April was warmer than normal and May and June were cooler than normal. These meterological conditions contributed to less disease development and are reflected in no statistically significant difference between the nonsprayed and fungicide-sprayed plots. In 1984, one or more applications of Bravo at late-boot or 100% head-emergence growth stages resulted in significantly (P=.05) higher seed yields and lower disease scores than nonsprayed controls.

Table 5. Meterological data, Hyslop Field Laboratory: temperatures and days with measureable or trace amounts of precipitation; deviation from normal temperatures and precipitation.

	Temperature (F) Daily Avg. Max	Daily Avg. Min	Deviation Norm Max	Deviation Norm Min	Precipitation (inch) Days with 0	Days with Trace	Days with Measureable	Total	Deviation
1984									
March	57.9	40.3	+4.1	+4.2	9	1	21	3.82	-0.86
April	57.2	38.9	-2.1	+0.1	2	9	20	3.41	+0.95
May	63.6	42.7	-2.6	-0.5	9	3	19	3.67	+1.75
June	69.7	46.6	-2.9	-1.7	15	3	12	4.34	+3.14
1985									
March	53.1	33.9	-0.7	-2.2	11	4	16	6.14	+0.38
April	62.2	41.9	+2.9	+3.1	14	4	12	1.05	-1.41
May	67.3	42.8	+1.1	-0.4	15	6	10	0.94	-0.98
June	75.3	47.4	+2.7	-0.9	23	2	5	2.22	+1.02

On the Byron Cook farm (Benton County), a 28-treatment study was done on 'Sterling' orchardgrass. Plots received 1 to 4 applications of 9 fungicide treatments (fungicides alone or in tank mixes) at jointing, early boot, late boot, or heading (Table 6). The treatments (amount per acre) included Bravo (3 pt), Difolatan (1.5 lb), Mertect (20 fl. oz), Bayleton (0.25 lb), Rovral (1 lb), Tilt (6 oz), Dithant M-45 (2 lb), Benlate (0.25 lb) + Dithant M-45 (2 lb), and Bravo (3 pt) + Difolatan (1.5 lb). Treatment means were not significantly different from each other. Yields ranged from 408 to 531 grams/plot.

Table 6. Seed yields of Sterling orchardgrass receiving fungicide treatments to control blight; Byron Cook farm, Benton County; harvested June 24, 1985.

	Growth Stage (date)					
Treatment	Jointing (4/30)	Early boot (5/6)	Late boot (5/14)	Heading (5/20)	Rep.	Seed Yield [1] (g/plot)
Control	No fungicide applied				2	531
Bravo	X				4	472
Bravo		X			4	496
Bravo			X		4	506
Bravo				X	3	489
Bravo	X	X			3	480
Bravo		X	X		4	483
Bravo			X	X	4	517
Bravo	X		X		4	422
Bravo		X		X	4	471
Difolatan	X				2	482
Difolatan		X			3	513
Difolatan			X		3	519
Difolatan				X	3	531
Difolatan	X		X		3	408
Difolatan		X	X		3	527
Difolatan			X	X	4	476
Difolatan		X		X	4	531
Benlate + Dithane M-45			X	X	3	473
Merteck	X				4	514
Merteck	X	X			4	469
Bayleton	X				4	490
Bayleton	X	X			4	508
Rovral	X				4	409
Rovral	X	X			3	443
Bravo + Difolatan		X	X		4	519
Tilt			X	X	3	528
Dithane M-45	X	X			4	488

[1] Treatments with similar number of replications were statistically analyzed as a group. Averages were not statistically different from each other (P= 0.05).

Tall Fescue

Fawn tall fescue was sprayed with Tilt, Bravo, Bayleton, Benlate, Rovral, Difolatan, Bravo + Tilt, Rovral + Tilt, Difolatan + Bayleton, and Benlate + Bayleton to control leaf and stem diseases. Spray dates were April 25, May 10, and May 30. No differences in disease severity were observed among fungicide treatments and the nonsprayed controls; plots were not harvested.

Current Research on the Endophytic Fungi in Tall Fescue and Perennial Ryegrass

R.E. Welty and P.A. Koepsell

A test was developed to detect viable endophyte hyphae in meristems and leaf sheaths of tall fescue and perennial ryegrass seedlings. Seedlings are germinated according to the germination test procedures used at the Oregon State University Seed Laboratory, stained, and examined with a microscope. The suitability of the technique is being evaluated by the OSU Seed Laboratory and the Oregon Department of Agriculture for routine use to evaluate the level of viable endophyte in seed lots.

Seed lots continue to be evaluated by the Oregon Department of Agriculture using seed-stain for the presence of the endophyte in seeds. In 1983, 1984, and 1985 (to 8/1/85), the percentage of seed lots at or below 5% endophyte infection were 92, 90, and 92% respectively. The percentages represent 2.4, 4, 8, and 1.1 million pounds of tall fescue seed for each of these three years.

A study in which seeds of tall fescue and perennial ryegrass were stored for 18 months at 50, 68, and 85 F at moisture contents (MC) from about 5 to 25% was completed. Germination and endophyte survival was evaluated at 1- to 3-month intervals. Generally, seeds of both species stored below 10% MC maintained seed germination with a gradual decline in viable endophyte. However, when seeds are stored above 10% MC endophyte survival decreases, but loss of germination can be rapid. Under these conditions seed lots should be evaluated every few months for germination and viable endophyte to determine seed quality.

Twenty endophyte-free and 10 endophyte-infected tall fescue plants were transplanted to six research stations in Oregon. Mature seeds were harvested in 1984 and 1985 and examined for endophyte. For all locations, endophyte-infected plants pro- duced endophyte-infected seeds. At all locations except Pendleton, endophyte-free plants produced endophyte-free seeds. In 1984 and 1985 at Pendleton, the level of infection in the seed endophyte-free plants was 8 and 3%, respectively. A plant-by-plant analysis of seeds harvested in 1985 was completed; one infected plant was found in the twenty examined. Further research is needed to determine if transmission occurred in the field or if an endophyte-infected plant escaped the screening procedure and was infected when transplanted. The two cultivars do not flower at the same time, thus eliminating the possibility of floral infection.

Nitrogen, Phosphorus, and Potassium Fertilization of Kentucky Bluegrass and Fine Fescue in Northeastern Oregon

F.V. Pumphrey

Experiments were established in the fall of 1983 near Imbler, Oregon to evaluate the seed production response of Kentucky bluegrass and fine fescue to nitrogen (N), phosphorus (P), and potassium (K) fertilization. The primary objective was to examine the need for annual applications of P and K. To fulfill this objective, fertilizer treatments were to be repeated on the same plots for four consecutive years. All P and K plus 15 pounds N per acre were applied post burn and prior to the first fall irrigation. Most of the N was applied when cooler weather reduced the rate of fall growth (late October); the remainder of the N was applied when growth started in the spring (early April).

Results from the first two years of these trials indicate an annual increase of nearly 100 pounds of seed per acre from applying 40 pounds P_2O_5 per acre compared to no P. Potassium application reduced seed yield nearly 100 pounds per acre. Neither P and/or K application had any visual effects on reducing early lodging caused by inefficient N management. Proper N management has been more critical to seed yield than P and/or K application. Bluegrass receiving 160 lb N/a, fall applied, produced over 200 lb/a more seed than bluegrass receiving 120 pounds N/a, fall applied. Splitting the N into a fall plus spring application had a positive effect when excessive and early lodging did not occur.

Fine fescue required at least 40 pounds less N per acre than bluegrass for optimum seed yield. An early spring application of N was less critical to fine fescue than to bluegrass seed production.

Response of Kentucky Bluegrass to Nematicide Treatment

R.E. Welty and G. Newcomb

A study was conducted on the G. Royes Jr. farm (Union County) to evaluate seed yield response to Nemacur 3G treatment in an area where the root-lesion nematode had previously been recovered from plant roots and soil. Single (1.5 lb/a), double, and treble application rates of the nematicide were applied and irrigated into the soil. (Note: Nemacur is not currently labeled for use on Kentucky bluegrass). Higher seed yields were observed in the nematicide treated plots (Table 1); but within replication variation was great and the plot averages were not significantly different. Additional studies are needed before any request for registration can be made for the use of nematicides on bluegrass.

Use of a company or product name does not imply approval or recommendation of the product.

Table 1. Seed yield (grams/plot) of Kentucky bluegrass treated with 1.5 lb/a Nemacur 3G for lesion nematode control; harvested July 4, 1985, G. Royes, Jr., Union County, OR.

Total number of applications	Dates of application	Seed yield, grams/plot 1984	Seed yield, grams/plot 1985
0	Control	243 [1]	104
1	4/15/84	257	130
1	5/7/84	257	161
1	5/28/84	245	143
2	4/15 & 5/7/84	269	178
3	4/15, 5/7, 5/28/84	263	167
	LSD 0.05	NS	NS

[1] Average based on 6 replications per treatment.

Development of Moisture Testing Methods for Seed Crops

D.F. Grabe, E. Benjamin, C.J. Garbacik, and T.G. Chastain

The objectives of this project are to (1) develop rapid practical methods of measuring seed moisture to aid seed growers in harvesting, storing and marketing seed crops, and (2) develop more precise basic oven methods of measuring seed moisture for use in official seed testing laboratories.

Rapid moisture testers

Several types of moisture testers are available for use on seed crops. The choice of which to purchase will depend on many factors, including accuracy, reproducability of results, ease of operation, portability, durability, time required to perform a test, suitability for particular crops, and cost. Several moisture testers are being evaluated for these qualities.

Electric meters are best adapted for use with cereals, legumes and other free- flowing seeds. Most cannot be used with chaffy grasses and seedheads stripped from plants while they are still at high moisture levels. Some electric meters read directly in moisture percent, while others require conversion of the meter reading to moisture percentage by use of a chart. Unfortunately, most electric meters do not have charts for all the grass seed crops produced in Oregon. We have prepared several charts for grass seed crops for use with the Farmi and Delmhorst meters. These are available on request.

Moisture testers that employ a heat source to remove the seed moisture do not require charts. They can be used over the entire seed moisture range (0 to 100%) and work well with all kinds of crop seed. However, the 30-minute time requirement is considered by some people to be excessive.

We evaluated a microwave oven as to its suitability as a seed moisture tester. Grass seed can be dried to constant weight in about 15 minutes. Its accuracy was generally within 2 to 3% of that of a moisture test performed in a drying oven.

Basic oven methods

There are no standard moisture testing methods followed by seed testing laboratories in the United States. We conducted a survey of all seed laboratories in the U.S. and Canada and found 35 combinations of time and temperature presently in use in oven moisture testing procedures. Since the apparent seed moisture content varies with time and temperature of drying, these laboratories would obviously obtain different moisture percentages. Such discrepancies go undetected because it is not common for different laboratories to conduct moisture tests on the same seed lot.

We are now attempting to develop standard oven testing procedures to be followed by all seed testing laboratories worldwide. This is a two-step program. The first step is to adopt the Karl Fischer moisture titration method as the basic reference method and develop procedures for the most important seed crops. The second step is to establish the proper test conditions for the oven method by calibrating the oven method against the Karl Fischer method. We have recently developed a procedure for perennial ryegrass and will continue with other grass seed crops.

Acknowledgement: Research on oven-drying methods was partially funded by a grant from the American Seed Research Foundation.

Study to Determine Effect of Time and Method of Phosphorous Application on Grass Seed Crops

J.M. Hart

Phosphorus is applied to perennial grass seed crops as a topdressing with expectation of uptake by the dense fibrous root system developed on or near the surface of the soil. Since the soils on which grass is grown for seed generally have high abilities to fix phosphorus, questions about banding P have arisen. Plots were established in the fall of 1985 to evaluate banding and broadcasting P for November, January and March application dates. A liquid, 10-34-0, is being used. Band or broadcast treatments are regulated by nozzle direction on the spray boom. Tissue samples will be analyzed to determine if plant P concentration or amount is increased by banding or time of application when compared to broadcast treatments. If band applications indicate increased P uptake, yield trials will be established in 1986 to determine the effect of these treatments on seed yield.

Establishment of Grass Seed Crops With Cereal Companion Crops

T.G. Chastain and D.F. Grabe

Many perennial grass seed crops do not produce a seed crop during the establishment year. As a consequence, the grower loses a year of production every time a new seed field is planted. In several European countries, however, grass seed crops are normally established with a cereal companion crop so a cash crop can be harvested the year the seed crop is established. This report is a summary of our investigations to determine the feasibility of this establishment method for red fescue in the Willamette Valley.

Pennlawn red fescue was charcoal seeded in the fall of 1982 and 1983 at Hyslop Crop Science Field Laboratory, with Yamhill and Hill 81 winter wheat and Hesk and Scio winter barley as companion crops. The cereals were drilled in 6-, 12-, 18-, and 24- inch rows perpendicular to the red fescue rows.

Cereal companion crops inhibited red fescue tiller production, increased tiller height and reduced dry matter production during establishment. These negative effects on red fescue growth were attributable to shading rather than depletion of soil moisture by the cereal crops. Although companion crops adversely affected red fescue growth during establishment, the first-year seed yield in 1984 was not significantly reduced (Table 1). In the following year, there were also no differences in seed yield, thus over a two-year period seed yield was not decreased by establishment with companion crops. The seed yield of red fescue planted in 1983 was somewhat depressed in 1985 by wheat and Hesk barley but not by Scio barley. This reduction in seed yield was primarily due to improved grain crop growth and yield in 1984.

Table 1. Seed yields of red fescue established with cereal companion crops in 1982 and 1983.

	Establishment Year: 1982			1983
Cereal	Seed Yield			
Cultivar	1984	1985	84-85 Total	1985
	(lbs/a)			
Hesk barley	451	1869	2320	824
Scio barley	583	1801	2384	900
Yamhill wheat	458	1893	2351	819
Hill 81 wheat	437	1897	2334	811
Control [1]	525	1714	2239	1051
LSD 0.05	141	NS	--	158

[1] Control indicates red fescue without a companion crop.

A partial budgeting technique was employed to determine the net income change due to establishment with cereal companion crops in 1982 (Table 2). These figures were based on production costs and market conditions at the time of the experiment. Although the cost of establishing red fescue with companion crops was greater, the increased revenue from sale of cereal grain would have more than compensated for these added costs. Averaged over row spacings, increases in net income over the three-year period were greater for wheat than for barley. For example, the grower would have earned $205.54 more per acre by planting red fescue with Yamhill wheat than by planting the fescue alone. The increases in net income for two different establishment years are illustrated in Table 3. These results demonstrate the profitability of this establishment method.

Table 2 Partial budget for establishment of red fescue with cereal companion crops in 1982. Production costs, revenues and net charges in income are averaged over row spacings for a three-year period. Results are based on one cereal harvest and two seed harvests.

	Companion crop cultivar			
Budget item	Hesk	Scio	Yamhill	Hill 81
	(dollars/acre)			
Production costs				
Increased costs	76.65	79.25	84.68	84.81
Decreased costs	0.	0.	0.	0.
Revenue				
Increased revenue	183.15	180.21	309.38	311.91
Decreased revenue	21.17	0.	19.16	25.17
Net increase in income	85.33	100.96	205.54	201.93

Table 3. Net change in income over a two-year period for red fescue established with cereal companion crops in 6-inch rows. Results are based on one cereal harvest and one seed harvest for each experiment.

	Net change in income	
Cereal cultivar	1984[1]	1985[2]
	(dollars/acre)	
Hesk barley	49.40	37.58
Scio barley	75.63	89.72
Yamhill wheat	171.42	112.65
Hill 81 wheat	121.44	175.83

[1] Red fescue and cereals planted in fall of 1982.
[2] Red fescue and cereals planted in fall of 1983.

Red fescue growth during establishment was not affected differentially by wheat or barley. Wider cereal row spacings provided a more favorable environment for red fescue growth during establishment but had no effect on first-year seed yields. On the basis of these two studies, therefore, red fescue seed production was most profitable when established with wheat companion crops in 6- or 12- inch rows.

Companion cropping studies will be extended to other grass seed crops and include comparisons of fall and spring establishment systems.

Acknowledgement: This research was partially funded by a grant from the CENEX Foundation.

Effect of Post Harvest Residue and Regrowth Removal on the Fifth Year Seed Yield of Selected Kentucky Bluegrasses at Madras, Oregon in 1985

J.L. Nelson

The objectives, materials and methods and the 1984 seed yields from this study are available in OSU, Agricultural Experiment Station Special Report 747, "Irrigated Crops Research in Central Oregon 1985". Only the 1985 seed yield will be reported.

After 1984 seed harvest eight treatments on residue/ regrowth were imposed on each variety (Table 1).

It was necessary to propane burn all plots to achieve good uniform residue/regrowth removal. Treatments 2-8 were propane burned on September 11, 1984 compared to August 8 for the control (treatment 1). The experimental area was irrigated with 4.5 inches of water from August 9-15, 1984 to promote regrowth.

The average seed yield for all varieties subjected to treatment one was significantly higher than the yield following treatments 2-8; 645 compared to 183-380 lb/a, respectively (Table 2). However treatment 7 was less injurious to the subsequent year's seed production averaged over all varie ties than treatments 2-6 and 8. Besides the control, treatment 7 was the only other series of plots with a full straw load. Regrowth of these Kentucky bluegrass plants was from 12-14 inches tall and showed signs of etiolation except the top 3-4 inches exposed to the light. Regrowth on the other plots varied from 3-6 inches depending on variety. The regrowth was completely green and the tiller base diameters appeared to be larger than for those tillers under the straw for treatment 7.

The analysis of variance indicated that the management treatment x variety interaction was highly significant. The response of each variety was not the same for the different management treatments. Merit, Baron, Parade, and Rugby were similar but several differences can be observed in Table 2 for the other varieties. Mystic, the lowest seed producer after OFB-PB, was not significantly affected by treatment 7 but its seed yield over all management treatments was significantly less than all other varieties. In comparison with the control, America's seed yield was only adversely affected by treatments 4, 5, and 8. However it was a poor performer after OFB-PE. An examination of variety yield averaged over all management treatments shows that America was superior followed by Parade and Rugby.

A grower may reasonably expect reduced seed yield from normally high yielding varieties if regrowth occurs before post-harvest residue can be removed by open field and/or propane burning. If the straw has been baled and removed from the field, which would preclude using treatment 7, then any one of treatments 2-6, and 8 would be suitable to maintain as high a seed production as possible under adverse conditions. However, the cost may vary among residue/regrowth removal methods so this factor needs to be one of the grower's selection criterion.

Paraquat and Contact (dinitro-) gave similar results except for American variety on which yield was reduced by Paraquat. It was noted that although Paraquat caused better drying of the regrowth with subsequently better burns either by open field or propane burning. If one elects to clip the regrowth, a disc type mower is superior to a rotary type because clippings are left in longer pieces which aid drying and subsequently contribute to improved combustion at burning time. For fields with regrowth impregnated straw it is suggested that a rapidly rotating drum tedder be used. Side delivery rakes or tedders with contra-rotating rake wheels are not well suited to achieve uniform straw distribution. There appears to be considerable resistance to lifting compacted or settled straw up out of regrowth so the power source for turning the tedder drum needs to be considered. A British Lely Pheasant 80 drum tedder which is powered by the tractor's PTO shaft did a superb job for our treatment 7.

(continued)

Table 1. Treatments and descriptions of post harvest residue methods

Trt No.	Treatment	Description	
1	OFB-PB	Open-Field Burn + Propane Burn, Aug. 8--CONTROL	
2	HT-MB-PB	Regrowth machine burned at high temperature, 800-900°F + PB	
3	MT-MB-PB	Like Trt. 2 but at med. temp., 500-600°F + PB	
4	LT-MB-PB	Like Trt. 2 but at low temp., 300-400'F + PB	
5	Par-OFB-PB	Regrowth dried with 1 qt/a Paraquat + OFB + PB	
6	Con-OFB-PB	Regrowth dried with 2 qt/a Contact (dinitro) + OFB + PB	7
	St-OFB+PB	Straw fluffed-up from regrowth + OFB + PB	
8	Clip-OFB-PB	Regrowth clipped + OFB + PB	

Table 2. Fifth year seed yield of Merit, Baron, Parade, America, Mystic, and Rugby Kentucky bluegrass after eight different residue management treatments, Madras, Oregon, 1985

Mgt. Trt.	Merit	Baron	Parade	America	Mystic	Rugby	Mgt. Trt. Avg.
1. OFB-PB	765 a[1] a[2]	781 a a	768 a a	498 a b	354 a c	706 a a	645 a
2. HT-MB-PB	132 c bcd	109 c cd	184 c bc	412 ab a	37 b d	224 c b	183 c
3. MT-MB-PB	96 c c	110 c c	244 c b	432 ab a	109 b c	264 c b	209 c
4. LT-MB-PB	98 c c	128 c c	222 c b	373 b a	73 b c	240 c b	189 c
5. Par-OFB-PB	153 c bc	142 c c	262 c a	211 c abc	146 b c	252 c ab	194 c
6. Con-OFB-PB	135 c de	152 c cd	238 c bc	466 ab a	43 b e	282 c b	219 c
7. St-OFB-PB	308 b b	325 b b	499 b a	433 ab a	289 a b	426 b a	380 b
8. Clip-OFB-PB	141 c c	138 c c	299 c ab	364 b a	47 b c	259 c b	208 c
Variety Average	228 c	236 c	340 b	399 a	137 d	332 b	

[1] Values among management treatments within a variety (column) with different letters beside the value are significantly different at the .05 level of probability using Duncan's multiple range test.

[2] Values among varieties within a management treatment (row) with different letters below the value are significantly different at the .05 level of probability using Duncan's multiple range test.

Residual Effects of 1983-84 Nitrogen Rate/Schedules on 1985 Seed Yield of Rugby Kentucky Bluegrass in Central Oregon

J.L. Nelson

The 1983-84 nitrogen rate/time study plots were maintained for the 1984-85 season in a similar manner as the previous production year except for nitrogen fertilization. One hundred thirteen and 98 pounds of nitrogen from a 25-10-0-15(S) fertilizer were applied on October 15, 1984, and February 26, 1985, respectively. The objective was to determine residual effects from the previous year's N rate/time treatments on seed yield and its components. Only the seed yield information will be reported.

Some of the highest seed yields were obtained from plots that received the lowest amount and/or no nitrogen fertilizer the previous year (Table 1). These were striking contrasts to the 1984 seed yields for the same treatments although some of the difference is probably due to seasonal affects. The seed yield component data which is in the process of analyses may help explain some of the differences. These are only one year results but they indicate the extent to which a Kentucky bluegrass stand can be restored and maintained for seed production.

Table 1. Residual effect of N rate/time on fifth year seed yield of Rugby Kentucky bluegrass compared to prior year yields, Madras, Oregon, 1985

Trt.	Nitrogen Applied (lb/a)				Seed Yield (lb/a)	
No.	Date	Rate	Date	Rate	1985	1984 [2]
14	10-19-83	30	3-02-84	0	736 a [1]	206 g [1]
15		60		0	730 a	365 f
13	------NO NITROGEN-----				685 ab	80 h
16	10-19-83	90	3-02-84	0	672 abc	470 e
18		150		50	616 a-d	760 ab
8	10-03-83	60		140	586 a-e	692 a-d
12	10-19-83	90		110	584 a-e	682 a-d
11		60		140	568 a-e	742 abc
2	9-15-83	60	10-19-83	140	504 b-e	641 cd
10	10-19-83	30	3-02-84	170	493 b-e	688 a-d
19		200		0	487 cde	686 a-d
17		100		100	485 cde	671 bcd
1	9-15-83	30	10-19-83	170	481 cde	675 a-d
7	10-03-83	30	3-02-84	170	459 de	682 a-d
9		90		110	448 de	742 abc
5	9-15-83	60	10-19-83	200	447 de	789 a
6		90		200	422 de	744 abc
4		30		200	420 de	767 ab
3		90		110	397 e	589 d
		Variety Average			538	614
		CV (%)			19	10

[1] Values within a column with the same letter are not significantly different at .05 level of probability using Duncan's multiple range test.

[2] Data from OSU Agricultural Experiment Station Special Report 747.

Grass Variety Seed Yield Evaluation

H.W. Youngberg, W.C. Young III, and D.O. Chilcote

Oregon State University conducts a series of grass variety seed yield trials. The latest was planted in 1983 and harvested for seed in 1984 and 1985. It included 12 perennial ryegrass, 12 orchardgrass, 9 bluegrass, 6 tall fescue, 12 tall fescue, and 12 Italian ryegrass varieties.

Results of the two harvests are reported in Crop Science Reports EXT/CRS 51 and EXT/CRS 59. A summary report is being prepared and will be available on request from the authors.

Red Clover Variety Seed Yield Evaluation

W.C. Young III and H.W. Youngberg

First year seed yield data were collected in 1985 on eight red clover varieties. A replicated study was established in late September, 1983, by planting 2-row plots of each variety, using a circular belt planter. Row spacing was 12 inches, with a blank row to separate entries within blocks, and plot length was 15 feet. Seeding rate was 7 lb/a of inoculated seed for each variety.

The trial, designed to follow commercial field practices of Willamette Valley growers, was conducted at Hyslop Crop Science Field Laboratory, Corvallis, on a Woodburn silt loam soil. No seed was harvested in 1984. All plots were flail chopped in mid-August and crop residue was removed. On September 17, 1984, 250 lb/a 10-20-20-7 fertilizer was broadcast applied, and on October 16, 1984, 2.0 lb/a Karmex (diuron) 80 W was used for weed control. All plots were flail chopped to remove forage on May 15, 1985, for the control of clover midge. On May 16, 1985, 2.0 inches of irrigation was applied to insure adequate soil moisture for regrowth. Wild bumblebee activity during early July appeared to provide adequate pollination.

The entire plot area was harvested on August 13, 1985, using a small plot harvester incorporating a sickle bar cutter and draper designed for efficient bagging of the above-ground plant biomass. The bagged material was air-dried, threshed, cleaned, and weighed. A 3- to 5-gram seed sample of each plot was taken with a seed divider to determine the 1000 seed weight. In addition, harvest index was calculated for each entry:

$$\text{Harvest Index} = \frac{\text{Clean seed weight}}{\text{Total harvested weight}} \times 100$$

Data were subjected to a randomized block analysis of variance and least significant difference test to determine differences among variety means. In addition, a standard variety, Medium red clover, was used to express seed yield as a percentage of a known entry. Results of this study are presented in Table 1.

Table 1. 1985 seed yield data of red clover varieties.

Variety name	Seed yield		1000 seed wt.	Harvest index
	(lb/a)	(% Std.)	(g)	(%)
Medium red clover (Std.)	309	100	1.83	9.2
Arlington	211	68	1.78	5.8
Kenland	169	55	1.77	5.8
Lakeland	132	43	1.70	6.3
Bartolia	113	37	2.04	3.8
Temara	68	22	2.49	2.5
Hamidori	61	20	2.40	2.4
Jubilatka	35	11	2.25	1.3
LSD .05	32.3	--	0.13	1.06

Effects of Parlay Retreatment in Grass Seed Production

W.C. Young III, D.O. Chilcote, and H.W. Youngberg

Research continued in 1985 in cooperation with ICI Americas to further evaluate the potential of Parlay growth retardant in seed production in Oregon. These replicated field studies were established in commercial seed fields throughout the Willamette Valley in 1984, and continued this year to evaluate Parlay use for two consecutive years. In addition, periodic soil sampling by ICI Technical Service personnel was included to determine the presence and/or significance of Parlay residue in the soil.

Agronomic data were collected to show the effects of Parlay on seed yield, total harvested dry weight, 1000 seed weight, fertile tiller number, seed per tiller, harvest index, area and severity of lodging, and plant height. Parlay application was delayed past the previously defined optimum growth stage in most varieties due to dry spring conditions. In spite of the adverse conditions for application and uptake, significant seed yield increases were observed at five of seven locations (Table 1). These positive responses were attained primarily through improved conditions for seed filling, a result of lodging control.

Acknowledgement: This research was supported by a grant from ICI Americas.

Table 1. Seed yield for Parlay treatments, 1985.

Parlay rate and time 1984	1985	Perennial Ryegrass Derby	Perennial Ryegrass Fiesta	Perennial Ryegrass Palmer	Fine Fescue Banner	Fine Fescue Pennlawn	Tall Fescue Houndog	Tall Fescue Alta
-(lb ai/a)-		(lb/a)						
Check		1000	1335	1076	1409	980	1886	814
0.5	0	907	1246	1153	1223	950	1721	847
0	0.5	1295	1291	1384	1791	1464	2095	1017
0.5	0.5	1343	1286	1254	1694	1342	1894	834
LSD .05		95	NS	124	192	191	NS	128

Minimum Tillage Systems for Changing Varieties in Seed Production

W.C. Young III and H.W. Youngberg

Seed growers have been innovative in adopting new technologies for seed production. Current economic pressure and restriction on agricultural burning increase the need for research in seed crop management systems. More grass varieties are introduced each year for production under the Oregon and international (OECD) certification programs. Seed quality standards are constantly being raised. These numerous variety options create a problem in finding enough fields with a crop history that meets the stringent requirements of the certification programs.

Research and new technology, from chemicals to planters, are extending the usefulness of minimum tillage. In a minimum tillage system, the seed is planted with just enough tillage (usually a narrow slit) to allow seed coverage while some residue from the previous crop remains on the soil surface with no further cultivation. Weeds are controlled with herbicides.

A satisfactory minimum tillage system in grass seed production could take advantage of the previous weed control and keep crop seed on the soil surface where it could be more easily destroyed. Other advantages of minimum tillage are lower energy requirement for tillage, lower production costs, greater flexibility in crop selection and cropping sequences, and erosion control not provided by "clean" cropping systems.

Several problems must be overcome. Crop residues provide a more favorable habitat for some insect pests and pathogens, increasing the requirement for pesticides. Herbicide selection and rate must be determined. In some cases, certification regulations may need to be changed.

Certified seed crop establishment under a minimum tillage system has had only limited research. Two experiments were established at the Hyslop Crop Science Field Laboratory, Corvallis, in the late summer of 1985. No-till seeding in burned and unburned crop residue were used in combinations with available herbicides to study the transition period between two grass varieties.

One study will evaluate the effectiveness of a one- and two-year red clover crop, established under a no-till system in perennial ryegrass sod, in preparation for production of a perennial ryegrass seed crop of another variety. The second study will compare the effectiveness of a one-year rotation to meadowfoam, in changing from one perennial ryegrass seed crop to another variety planted in burned and nonburned stubble.

Vigorous stands of both red clover and meadowfoam were established in 1985. Yields will be harvested in 1986. Results will be reviewed for economic return and acceptability in meeting the regulations of the seed certification program.

Interaction of Increased Rate of Early Spring Nitrogen and Parlay Plant Growth Retardant in Pennfine Perennial Ryegrass Seed Production

W.C. Young III, D.O. Chilcote, and H.W. Youngberg

Investigation continued in 1985 to examine the opportunity for capitilizing on the increased yield potential developed by application of high rates of nitrogen at the vegetative growth stage and spring application of Parlay growth retardant. In previous studies, Pennfine perennial ryegrass responded to high nitrogen rates applied during the spring vegetative stage with increased tiller density and more potential seed sites per unit area. However, this potential seed yield increase frequently does not materialize because the number of harvested seeds per tiller declines as tiller densities increase. In addition, severe lodging associated with high rates of nitrogen applied early in the growing season increased tiller mortality and resulted in no increase in seed harvested.

Treatments were a combination of nitrogen applied during the vegetative stage of development (VEGN) at 54, 107, and 160 lb N/a as 46-0- 0, and Parlay at 0.0 or 0.67 lb a.i./a applied at floret initiation stage. All plots received an additional 54 lb N/a at spikelet initiation; thus, total spring nitrogen rates were 107, 161, and 214 lb N/a applied as a split application.

The tiller population at peak anthesis and the number of fertile tillers at maturity were not significantly affected by either nitrogen or Parlay treatment (Table 1). However, there was a significant increase in the number of potential seed sites as nitrogen rate increased. There was a significant interaction between nitrogen rate and Parlay application for seed yield data (Table 2). Although Parlay treatment achieved significant increases regardless of nitrogen rate, the most positive results were attained when combined with 107 lb N/a applied during vegetative development. The increase in number of seed harvested is a result of a significant improvement in floret site utilization with this treatment combination.

These data were not entirely consistent with effects reported in 1984. Although total tiller number at anthesis was lower for all treatments in 1985 when compared to 1984, there were a greater number of spikes at maturity. Dry spring weather in 1985 probably reduced vegetative development, resulting in a lower tiller density. This effect subsequently delayed and lessened the severity of lodging, thereby reducing tiller mortality. Thus, the increased yield potential from higher nitrogen rates was harvestable, and resulted in greater seed yield in 1985.

Table 1. Yield component data of Pennfine perennial ryegrass as influenced by nitrogen rate and Parlay application, 1985.

Treatment	Peak anthesis: Total tillers	Peak anthesis: Fully emerged spikes	Peak anthesis: Late reprod. spikes	Peak anthesis: Vegetative tillers	Maturity, total spikes	Potential seed sites
VEGN (N lb/a)	(per ft ^{2})					
54	194	88	27	80	230	29,899
107	219	95	37	87	198	27,936
160	203	77	43	83	263	38,948
LSD .05	NS	NS	NS	NS	NS	8,699
Parlay rate (lb a.i./a)						
0.00	199	89	39	71	232	32,602
0.67	211	85	32	95	228	31,920
LSD .05	NS	NS	NS	NS	NS	NS

Table 2. Interaction of nitrogen rate and Parlay application on seed yield data from Pennfine perennial ryegrass, 1985.

Treatment: N	Treatment: Parlay	Seed yield	Actual seeds per ft ^{2}	Floret site utilization	Harvest index
(lb/a)	(lb a.i./a)	(lb/a)	(#)	(%)	(%)
54	0	1186	6723	27.2	15.7
54	0.67	1615	9705	33.8	22.5
107	0	1163	6756	21.3	15.7
107	0.67	1933	11521	53.5	22.9
160	0	1429	7986	22.5	17.6
160	0.67	1805	10762	31.3	21.5
LSD .05		210	1317	14.4	1.8

Effects of XE-1019 Growth Retardant on Caravelle Perennial Ryegrass Seed Production

W.C. Young III, D.O. Chilcote, and H.W. Youngberg

Chevron Chemical Company's experimental compound XE-1019 (10% WP) was evaluated in a study at Hyslop Crop Science Field Laboratory, Corvallis, to determine its effect on perennial ryegrass seed production. A four-year- old stand of the mid-season variety, Caravelle, was selected for study. Four rates of XE-1019 were applied approximately one week after floret initiation growth stage (Table 1). Treatments were arranged in a randomized block design and compared with an untreated check plot. A split-spring nitrogen application (120 lb N/a) was broadcast across all plots in addition to 30 lb N/a (185 lb/a 16-20-0) applied the previous fall making a total N application of 150 lb/a.

Treatment effects were not evident until late May. The dry spring conditions slowed movement of the chemical into the soil for uptake by plant roots. Irrigation was applied in early May to insure adequate soil moisture for physiological maturity of the crop. Rapid stem elongation preceded heading in early June. Reduction in stem length first appeared at the higher rates of XE-1019 (0.50 and 0.75 lb a.i./a). This effect was confirmed by *in situ* plant height measurements in late June (Table 1). Lodging was delayed in all treated plots; however, only those receiving the two highest rates of XE-1019 remained virtually unlodged at harvest (Table 1).

Seed yield and harvest index were significantly higher than the check at all rates (Table 1). Total harvested dry weight was not significantly changed, probably as a result of slightly more fertile tillers. No effect on the number of seed per tiller was observed. The mean seed weight was significantly increased by treatment with XE-1019 at rates above 0.25 lb a.i./a. The delay in onset and severity of lodging may have increased the duration of seed filling, resulting in greater seed yield. This result has been observed from other plant growth retardants by other workers.

Table 1. Plant height, lodging severity, seed yield and yield components of Caravelle perennial ryegrass as influenced by rate of XE-1019 application, 1985.

XE-1019 rate	Plant Height	Lodging Severity[1] 6-21-85	Lodging Severity[1] 7-10-85	Seed Yield	Total Dry Weight	Harv. Index	1000 Seed Weight	Fertile Tiller Number	Seed per Tiller
(lb a.i./a)	(cm)	---- (1-5) ----		(lb/a)	(ton/a)	(%)	(g)	(/ft^2)	(no.)
0	72	2.3	3.5	576	4.03	7.04	1.56	236	16.3
0.12	69	1.8	2.8	705	4.36	8.08	1.60	219	21.3
0.25	70	1.8	3.0	715	4.27	8.39	1.64	265	17.6
0.50	64	1.0	1.2	777	4.16	9.34	1.63	268	19.0
0.75	64	1.3	1.3	802	4.06	9.85	1.67	259	23.7
LSD .05	3	0.6	0.9	135	NS	1.09	0.06	NS	NS

[1] Lodging score 1-5, with 1= no lodging and 5= flat.

Nitrogen Rate and Date Effects on Parlay Response in Tall Fescue, Fine Fescue, and Orchardgrass

D.O. Chilcote, W.C. Young III, and H.W. Youngberg

Nitrogen is a key nutrient in grass seed crops, and its level or timing could interact with growth retardant treatment and thus impact subsequent seed yield response. The objectives of research currently underway are to identify nitrogen rate and timing effects on plant growth and seed yield response to growth retardant treatment in tall fescue, fine fescue, and orchardgrass. The purpose of this work is to develop an understanding of possible nitrogen-growth retardant interactions in various grass species.

Questions concerning possible nitrogen-growth retardant interaction need to be answered. For example, does nitrogen rate affect the degree of inhibition of stem internode expansion by growth retardant application? Is growth retardant control of tillering affected by nitrogen level or timing? Does nitrogen influence growth retardant control of dry matter partitioning to stem internodes? Is growth retardant control of dry matter distribution within tillers affected differently by nitrogen applied during the vegetative versus reproductive growth stage? What influence does nitrogen level or timing have on growth retardant effects on seed filling rate or duration?

A key objective of this research is to determine whether the increases that have been observed in potential seed yield with higher nitrogen rates can be translated into greater seed yield where growth retardant applications are made. An understanding of the basis for seed yield response to growth retardant and nitrogen application in these diverse grass seed species will be sought by examining potential versus actual seed yield, yield components, and differences in dry matter partitioning among and within various plant organs.

The plan in these studies is to evaluate spring nitrogen effects with adequate levels of other nutrients provided. Both the nitrogen rate and time of application will be varied to identify effects from Parlay applications with nitrogen supplied at tillering versus the seed-set and seed filling stages of growth. Optimal and super-optimum nitrogen rates will be used since nitrogen levels may interact with Parlay rates. It is also necessary to determine whether a higher rate of growth retardant is required where higher rates of nitrogen are applied.

Studies will be continued for two years. Future studies with other major nutrients will also be considered.

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Response of Bentgrass Varieties to Parlay Applications for Lodging Control

D.O. Chilcote, W.C. Young III, H.W. Youngberg, and G. Gingrich

The effects of early (floret initiation growth stage) and late (2 weeks after floret initiation) applications of Parlay on Seaside, Penneagle, and Penncross varieties were studied in 1985. Visual observations detected little or no effect on plant height or lodging control. Measurements of tiller stem base elongation also showed no response of the varieties to Parlay application. There was no effect on seed yield or dry matter production from the rates and dates of application used in these tests (Table 1). Bentgrass seems unresponsive to Parlay application under the conditions of 1985.

Acknowledgement: Appreciation is expressed to Andy Burlingham, undergraduate student in Crop Science for his assistance in this work.

Table 1. Parlay effects on Bentgrass, 1985.

Treatment	Harvest Index	Seed Yield	Total Dry Weight
(lb ai/a)	(%)	(lb/a)	(ton/a)
Seaside			
0	5.08	425	4.18
0.25 e	5.51	403	3.69
0.50 e	5.49	406	3.66
0.75 e	5.98	410	3.48
0.25 l	6.13	489	4.11
0.50 l	6.28	451	3.62
0.75 l	5.18	405	3.90
LSD .05	NS	NS	NS
Penneagle			
0	8.45	285	1.69
0.25 e	9.93	362	1.80
0.50 e	10.44	230	1.14
0.75 e	10.90	329	1.52
0.25 l	9.84	297	1.50
0.50 l	8.91	319	1.76
0.75 l	11.35	302	1.33
LSD .05	NS	NS	NS
Penncross			
0	9.45	424	2.48
0.25 e	8.29	408	2.49
0.50 e	9.08	468	2.61
0.75 e	9.13	462	2.54
0.25 l	7.73	424	2.76
0.50 l	9.47	410	2.23
0.75 l	7.80	409	2.65
LSD .05	NS	NS	NS

Note: Date of early application (e): Seaside, 5-11-85; Penneagle, 5-24-85; Penncross, 5-14-85. Late application (l) was 2 weeks after the early application.

Lodging Control and Yield Enhancement in Morex Spring Barley with Parlay Treatment

L.A. Morrison, D.O. Chilcote, and H.W. Youngberg

Parlay, an experimental plant growth regulator, is reported to control cereal crop lodging through height reduction and stem strengthening and thereby enhance yield. Field experiments in 1984 at Hermiston, Oregon, tested Parlay under two levels of nitrogen application on a known lodging-susceptible spring barley cultivar (Hordeum vulgare cv. Morex).

Parlay applied at Feekes scale 6 growth stage significantly shortened the basal internodes, reduced stem height, but did not increase strength of the mature stem. No change in spikelet number was noted. Due to delayed lodging, treated plots produced yields significantly greater than the control plots (Table 1). Number of seeds per tiller were also increased. The high treatment rates (.714 and .892 lbs a.i./a) also showed significant yield increases over the low treatment rates (.357 and .535 lbs a.i./a). There were no differences in grain yield between the normal and superoptimum nitrogen rates.

The reduced stem height and delay in lodging contributed to yield increases. Under irrigated conditions, Parlay can play a role in reducing yield losses associated with early lodging in spring barley.

Table 1. Effect of Parlay treatment rate on yield components and height of Morex barley grown under two nitrogen treatments, Hermiston, Oregon, 1984.

Parlay Rate	Fertile Tillers	TSW [1]	Yield	CST [2]	Spikelet Number	Plant Height
(lbs a.i./a)		(g)	(lbs/a)			(cm)
0	26	40	3920	25	20.8	124
.357	25	38	5187	34	20.9	106
.535	31	37	5331	30	20.6	101
.714	28	37	5980	36	20.9	95
.892	27	37	6044	38	20.8	91
LSD .01	NS	1	645	10	NS	5

[1] 1000 seed weight
[2] Calculated seeds per tiller

This report was prepared in cooperation with the Extension Service, Department of Crop Science, Oregon State University, Corvallis. Requests pertaining to the report should be addressed to Dr. Harold W. Youngberg, Department of Crop Science, Oregon State University, Corvallis, OR 97331.

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