# Progress Report on Seed Production Research

prepared by

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for

Presentation at the Grass Seed Institute
Roseau, Minnesota
March 27, 1974

Kentucky Bluegrass:

- Performance of 27 Kentucky Bluegrass Strains
- Residue Management for Park Kentucky Bluegrass Seed Production Varieties
- Interaction of Kentucky Bluegrass with Residue Management Regimes and Fertilizer Rates

Timothy:

- Seven Years of Climax Timothy Seed Production with Five Seeding Rates and Three Fertilizer Rates
- Seed Production of Timothy Varieties
- Interaction of Variety x Fertilizer Rate for Seed Yield in Timothy

Weed Control:

- Chemical Control of Weeds and Volunteer Seedlings in Established Stands of Grasses and Legumes

Acknowledgements:

Fertilizer studies are in cooperation with John Grava.
Herbicide studies are in cooperation with Richard Behrens.

Performance of 27 Kentucky bluegrass strains.

These data represent one year of production and should be accepted with some reservations. However, we believe they do represent a range in seed yields and certainly suggest that one should have some performance information on a variety before you accept it for production. We will harvest these again in 1974.

| Variety | Lot. No. | Plant height (inches) | Disease readings* rust | Disease readings* mildew | Harvest date | Seed yield** (lbs/Ac) |
|---|---|---|---|---|---|---|
| Experimental | K-1-187 | 21 | 3.5 | 1.5 | 7-7 | 9 a |
| " | K-1-154 | 26 | 4.0 | 1.0 | 7-7+ | 13 a |
| " | K-1-132 | 21 | 2.5 | 1.5 | 7-7 | 13 a |
| Pennstar | | 19 | 2.0 | 2.0 | 7-8 | 13 a |
| Birka | Mi 8006 | 19 | 2.5 | 1.5 | 7-7 | 30 b |
| Experimental | K-1-194 | 17 | 3.0 | 1.0 | 7-7 | 34 b |
| K-412 | Mi 8005 | 20 | 2.5 | 1.0 | 7-7 | 34 b |
| Experimental | K-1-158 | 24 | 4.0 | 1.5 | 7-7+ | 34 bc |
| " | K-1-106 | 24 | 3.5 | 3.0 | 7-9 | 38 bc |
| " | K-1-138 | 22 | 3.5 | 2.0 | 7-9 | 51 c |
| " | K-2-74 | 26 | 2.0 | 3.0 | 7-7 | 51 c |
| " | K-1-192 | 26 | 2.5 | 3.5 | 7-7 | 60 cd |
| " | K-1-46 | 20 | 3.5 | 5.0 | 7-7 | 60 cd |
| Sodco | Indiana Seed | 23 | 3.5 | 1.5 | 7-9 | 60 cd |
| Delft | 9-1599 | 25 | 1.5 | 3.5 | 6-29 | 64 cd |
| Experimental | K-8-144 | 22 | 4.0 | 2.0 | 7-7 | 68 de |
| Primo | 7-2787 | 26 | 2.0 | 2.0 | 7-7 | 68 de |
| Experimental | K-2-80 | 19 | 1.0 | 2.5 | 7-9 | 81 ef |
| " | K-8-145 | 25 | 3.5 | 1.0 | 7-7 | 85 ef |
| " | K-2-81 | 29 | 3.0 | 2.0 | 6-29 | 90 fg |
| " | K-1-193 | 27 | 4.0 | 2.0 | 7-3 | 98 g |
| Sydsport | 9-1020 | 25 | 3.0 | 1.5 | 7-7 | 102 gh |
| Experimental | K-1-196 | 23 | 4.0 | 3.5 | 7-3 | 124 i |
| " | K-1-139 | 28 | 4.0 | 3.5 | 7-3 | 124 i |
| Park | | 27 | 4.5 | 4.5 | 7-3 | 137 i |
| Experimental | K-8-219 | 21 | 4.0 | 2.0 | 7-3 | 175 j |
| " | K-1-47 | 21 | 4.0 | 2.5 | 7-3 | 235 k |

* Read June 27, 1973. 1 = least infection, 5 = most severe infection.
** Means followed by same letter do not differ significantly.
\+ These varieties had shattered 75% by visual estimate.

# Residue Management in Park Kentucky Bluegrass Seed Production

Each year we have given you information and data from our studies on residue management in 'Park' Kentucky bluegrass. This year we update this information and present a complete set of the data. These particular tests have been discontinued, although we will be continuing work with other varieties, but with less residue management treatments. We believe there is little doubt concerning the value of residue removal to bluegrass seed production. The method of removal may be influenced by needs and/or possibilities of the use of the residue. One should keep these factors in mind as he studies this report. We have not attempted to interpret and suggest possible uses of residue, although that is a factor for some growers to thoroughly consider.

In the first or second production year Kentucky bluegrass seed production does not seem to be inhibited by excess plant residue from previous crops. The plant residue buildup occurs from the aftermath, straw and stubble left in the field. One to two tons of dry matter per acre is normally deposited each year. Higher fertilizer rates increase the quantity of residue deposited and cause lower seed yields unless the residue is removed.

In 1967 residue removal studies were initiated on the Helmstetter Farm, Roosevelt, Minnesota; and the Kveen Farms, Roseau, Minnesota. We have studied methods and times of residue removal including:

1. Check - the loose straw was raked from the plot, leaving the stubble and aftermath.

2. July-burn - the stubble, aftermath and straw were burned as soon as convenient after harvest (July or early August).

3. September-burn - the stubble, aftermath and straw burned in early September or late August.

4. April-burn - the stubble, aftermath and straw burned following April.

5. September-clip - the plants mowed 1 1/2 inches high and all loose material removed from the plots in September.

6. July-clip - plants mowed 1 1/2 inches high and all loose material removed from the plots in July.

7. July-clip-torch - plants mowed 1 1/2 inches high, all loose material removed from plots and the areas burned with propane torch in July.

8. Check-burn - after several years as check plots, these were mowed 1 1/2 inches high, let dry and burned in July.

9. July-spray-burn - the plant material is sprayed with a desiccant, let dry for 48 to 72 hours and burned in place. Straw is not removed prior to spraying.

We had little information on which to select our treatments at the outset; therefore, it was not surprising that we should add other treatments during this study. After two years it was obvious that the April-burn did not improve seed production, and it was very difficult to get a complete burn in the spring. The September-burn was consistently lower than the July-burn. The September-clip was consistently low, and we changed to July-clip to determine whether the date would significantly affect seed yield.

It has been obvious throughout these studies that the complete removal of the residue by fire gives the best seed yield. By clipping the material, raking off the residue and flaming the plot area with a propane torch we initiated the clip-torch treatment. This treatment produces less smoke than the July burn. In practical operation, the grower would remove the straw, stubble and aftermath for feed or bedding then flame the field with a propane burner.

Varieties like Primo or Pennstar do not burn as readily as Park. It is possible to clip the material, let it dry and burn the field. However, it is time consuming and costly to mow a field with a standard mower. The desiccate-burn treatment serves the same purpose. A dessicant is sprayed on the field to dry the aftermath. After at least 48 hours, the material is burned. This has been effective, although more costly than the July-burn.

The check-burn treatment originated when a check plot was burned in 1969 by mistake and the 1970 seed yield was very good. This treatment has been studied to determine whether a field with excess residue can be brought into good production in a short time.

Yields from the treatments are given in the table. Although all treatments were not included each year, we believe we have enough comparisons for valid conclusions. We studied three levels of fertilizer on each treatment area each year. The first two years the fertilizer treatments were 30+15+15, 60+30+30, and 90+45+45. In 1970 we changed to 40+20+20, 80+40+40, and 120+60+60. Fertilizer treatments are shown as low, intermediate and high.

The seed yields of the check and April-burn treatments were low in each test. Nearly complete residue removal as accomplished by the July-burn, the July-dessicate-burn, July-clip-torch, and the check-burn treatments has consistently produced the highest seed yields. The July-burn treatment has been included in each test each year. This treatment with high fertility has produced over 550 lbs seed per acre each year. (Note: These yields may not be comparable to farmer fields as our clean-out is not as severe.) July-clip-torch was somewhat lower, but comparable, and July-dessicate-burn has been equal too.

Initially we used the September date for clipping and removing residue. The yields were not comparable to July-burn, and we changed to July date for clipping, which is more nearly comparable. However, these yields were not equal to those where the residue was removed by fire.

The check-burn treatment was introduced after a check plot was burned by mistake and the following year the seed yield was exceedingly good. We were interested in how quickly satisfactory yields could be recovered where the residue had built up. These yields are very good, which indicates that timely and complete residue removal gives quick recovery of satisfactory seed yield.

The difficulty of burning some varieties and the Park variety under adverse weather conditions has been a concern. Some growers have clipped fields, let the material dry, and then burned with good success. However, this is time consuming and costly. As an alternative a dessicant was sprayed on the plots with no straw removed and 48 hours or more later burned. This treatment produces less smoke, gives rapid and relatively complete residue removal and gives good seed yields.

The data in the table indicate that with good residue removal additional fertilizer produces higher seed yields. The check and April-burn treatments do not give sufficient seed increase to warrant application of additional fertilizer.

Weed control in burned areas is important. Dandelions seem to establish more readily in areas which have been burned, but we have noted little change in other weed populations.

The Capsus bug is effectively and practically controlled when the residue is removed by burning. The highest incidence of Capsus bug damage (silvertop) is observed in the check plots when not sprayed with an insecticide. Clipping, whether in July or September, seems to reduce the incidence of Capsus bug, but does not give practical control of the pest. All burn treatments give essentially perfect control of Capsus bug and silvertop damage. We believe there is no reason to apply an insecticide for Capsus control when the residue is removed by fire. The meadow plant bug is also controlled effectively by burning.

Growers may burn seed fields when they obtain proper permission. However, the grower is urged to cooperate to the fullest extent so that smoke from his fields does not drift across populated areas and/or locations where numbers of people are gathered. Also, he is urged to respect his neighbor and not burn when smoke will drift across the neighbor's farmstead. It is understood that growers will burn fields only when smoke does not cross a public road and/or highway, airport or other public installation. Adherrence to common sense rules is the best assurance of continued permission to burn residue from the seed fields in northern Minnesota.

Pounds of Kentucky bluegrass seed per acre from several residue treatments and fertilizer applications at three locations.

| Treatment | Fertilizer rate* | Helmstetter | | | | | | | Kveen (East) | | | | Kveen (West) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | avg. | 1968 | 1969 | 1970 | 3-yr avg. | 1970 | 1971 | 1972 | 1973 | avg. |
| Check | Lo | 0 | 203 | 116 | -** | 168 | - | 122 | 162 | 107 | 32 | 100 | 119 | 40 | - | 192 | 120 |
| | Int | 0 | 203 | 124 | - | 250 | - | 144 | 299 | 107 | 54 | 153 | 174 | 113 | | 239 | 175 |
| | High | 0 | 235 | 141 | - | 266 | - | 161 | 350 | 64 | 65 | 160 | 144 | 111 | | 305 | 187 |
| July-clip | Lo | | | | 296 | 226 | 273 | 265 | | | | | | 215 | 125 | 202 | 181 |
| | Int | | | | 316 | 266 | 330 | 304 | | | | | | 399 | 240 | 352 | 330 |
| | High | | | | 398 | 294 | 359 | 350 | | | | | | 569 | 345 | 362 | 425 |
| July-burn | Lo | 273 | 429 | 498 | 426 | 379 | 314 | 387 | 367 | 309 | 451 | 376 | 468 | 270 | 218 | 262 | 305 |
| | Int | 367 | 576 | 633 | 507 | 445 | 429 | 493 | 520 | 448 | 673 | 547 | 654 | 492 | 405 | 422 | 494 |
| | High | 478 | 683 | 666 | 574 | 525 | 473 | 567 | 650 | 501 | 799 | 650 | 795 | 573 | 470 | 576 | 604 |
| Sept-clip | Lo | 0 | 277 | 307 | 261 | - | - | 211 | 120 | 171 | 249 | 180 | 336 | 112 | - | - | 224 |
| | Int | 0 | 352 | 378 | 351 | - | - | 270 | 179 | 160 | 322 | 220 | 479 | 322 | - | - | 401 |
| | High | 0 | 352 | 453 | 470 | - | - | 319 | 196 | 128 | 579 | 301 | 535 | 296 | - | - | 416 |
| Sept-burn | Lo | 93 | 320 | 431 | - | - | - | 281 | 102 | 171 | 256 | 176 | - | - | - | - | - |
| | Int | 153 | 373 | 567 | - | - | - | 364 | 188 | 224 | 454 | 289 | - | - | - | - | - |
| | High | 188 | 469 | 704 | - | - | - | 454 | 418 | 341 | 726 | 495 | - | - | - | - | - |
| April-burn | Lo | 0 | 235 | 124 | - | - | - | 120 | 179 | 245 | 129 | 184 | | | | | |
| | Int | 0 | 331 | 122 | - | - | - | 151 | 230 | 245 | 153 | 209 | | | | | |
| | High | 0 | 341 | 171 | - | - | - | 171 | 265 | 139 | 150 | 185 | | | | | |
| Clip-torch | Lo | | | 512 | 461 | 304 | 347 | 406 | | | | | 453 | 200 | 181 | 215 | 262 |
| | Int | | | 677 | 549 | 409 | 419 | 514 | | | | | 606 | 469 | 341 | 396 | 453 |
| | High | | | 608 | 690 | 491 | 476 | 566 | | | | | 752 | 448 | 409 | 555 | 541 |
| Check-burn | Lo | | | | 412 | - | 439 | 426 | | | | | | | 258 | - | 258 |
| | Int | | | | 570 | - | 484 | 527 | | | | | | | 457 | - | 457 |
| | High | | | | 834 | - | 528 | 681 | | | | | | | 509 | - | 509 |
| July-spray-burn | Lo | | | | | 425 | 353 | 389 | | | | | | | 266 | 280 | 273 |
| | Int | | | | | 524 | 418 | 471 | | | | | | | 452 | 404 | 428 |
| | High | | | | | 554 | 492 | 523 | | | | | | | 643 | 555 | 599 |

* Fertilizer rates for 1968 and 1969 crops were: Lo = 30+15+15, Int = 60+30+30, High = 90+45+45
These changed in 1970 to: Lo = 40+20+20, Int = 80+40+40, High = 120+60+60

** Treatment not conducted in this trial.

# Interaction of Kentucky Bluegrass Varieties with Residue Management Regimes and Fertilizer Rates

As a continuation of the residue management studies initiated in 1967, we have seeded six bluegrass varieties on the Magnusson farm. On these varieties we have superimposed 3 residue management regimes and 3 fertilizer treatments. The residue treatments are:

C-1 July-burn - the residue is burned in place in July
C-2 Clip-torch - the stubble and aftermath are removed and then plot area is burned with a torch
C-3 July-clip - the stubble and aftermath are mowed and raked off

The three fertilizer treatments are:

50+25+25
100+50+50
150+75+75

1973 is the first year we have collected data from these plots. The wide range between varieties for seed yields appears to be the most significant finding in 1973. The residue management regimes did not differ significantly. Since we are using three rather refined residue removal schedules, we should not expect gross differences between treatments. There were differences between fertilizer rates, but there were no variety x fertilizer or residue management x fertilizer interactions.

One of our interests when we initiated this study was whether we could improve the seed production of some of the elite varieties. It is evident that Park is our best seed yielding variety. There does not seem to be good explanation of why Pennstar, Merion and some of the other varieties will not yield better. We do not suggest that 150+75+75 is an economical fertilizer rate. Some have suggested that some varieties require higher fertilizer rates, and we are interested from this viewpoint. The yields observed in 1973 suggest that the 100+50+50 rate often improves the yield, but that the 150+75+75 may have depressed the yield.

Seed yields (lbs/Ac) for six Kentucky bluegrass varieties under three residue management regimes and three fertilizer rates. Roseau, Minnesota 1973.

| Variety | Fertilizer | July-burn | July-clip-torch | July-clip | Average |
|---|---|---|---|---|---|
| Park | 50+25+25 | 327 | 368 | 292 | 329 |
| | 100+50+50 | 333 | 349 | 398 | 360 |
| | 150+75+75 | 348 | 311 | 336 | 332 |
| Average | | 336 | 343 | 342 | |
| Nugget | 50+25+25 | 324 | 167 | 190 | 227 |
| | 100+50+50 | 253 | 224 | 258 | 245 |
| | 150+75+75 | 297 | 270 | 269 | 279 |
| Average | | 291 | 220 | 239 | |
| Pennstar | 50+25+25 | 105 | 85 | 110 | 100 |
| | 100+50+50 | 148 | 151 | 189 | 163 |
| | 150+75+75 | 215 | 194 | 121 | 177 |
| Average | | 156 | 143 | 140 | |
| Merion | 50+25+25 | 125 | 117 | 80 | 107 |
| | 100+50+50 | 117 | 137 | 93 | 116 |
| | 150+75+75 | 197 | 146 | 68 | 137 |
| Average | | 146 | 133 | 80 | |
| Fylking | 50+25+25 | 61 | 85 | 71 | 72 |
| | 100+50+50 | 144 | 155 | 85 | 128 |
| | 150+75+75 | 123 | 178 | 93 | 131 |
| Average | | 109 | 139 | 83 | |
| Experimental strain | 50+25+25 | 85 | 66 | 107 | 86 |
| | 100+50+50 | 107 | 78 | 151 | 112 |
| | 150+75+75 | 84 | 119 | 116 | 106 |
| Average | | 92 | 88 | 125 | |

# Seven Years of Climax Timothy Seed Production
## With Five Seeding Rates and Three Fertilizer Levels

One of our initial concerns for timothy seed production was to learn why old stands appear to "give out" after three or four years of production. In 1966 we seeded two studies with Climax timothy. One was on the Floyd Baade farm near Pitt, Minnesota and the other on the Welin farm 1 mile west of Roseau.

The five seeding rates were 1/3, 2/3 and 1 2/3 lbs per acre in 18-inch rows, and 1 & 2 lbs per acre in 6-inch rows. The three fertilizer levels were: 30+15+15, 60+30+30 and 90+45+45 applied either in the very early spring or the fall before production year. We made one modification in the fertilizer treatment. It was evident that the 30+15+15 was not sufficient to maintain production, and the yields were lower each year. For the 1973 production year, we applied about 110+55+55 on both the 30+15+15 and the 90+45+45 areas in the Welin trial. We had intended to apply 90+45+45, but due to an error in calibrating our fertilizer spreader, we applied the heavier rate.

In almost all cases we burned the residue after harvest. On the Welin farm, we mowed and raked off the straw in 1967 and again in 1972. We believe that since the straw on our plots does not go through a combine, we have had more injury due to burning than we see in fields where the straw has been cut up by the combine and burned.

Results

We are presenting the complete data from these two trials. 1972 was very dry; therefore, the seed yields are low for all treatments at the Welin farm. We believe also that the plants were seriously injured by burning in August, 1971. The straw was laying close to the ground and may have injured the plants much more than is normal in the fields where the combine cuts up straw and spreads it on the stubble.

In general, it appears that it is practical to maintain a stand of timothy for 6 or 7 years if the residue management is sound and if the fertilizer treatments are adequate. We did not see a significant difference between seeding rates for resulting seed yields; therefore, a very low seeding rate appears to give good seed yields.

Applying a higher rate of fertilizer on the 30+15+15 area in 1972 indicates that adequate fertilizer will return the seed yield production to an economical yield.

Very dry weather in 1973 caused a failure on the Baade farm, and yields were not obtained in that trial in 1973.

These two trials have been discontinued.

Seed yields (lbs/ac) from Climax timothy seeded at five seeding rates and fertilized with three rates, Welin and Baade farms, 1967-1973.

| Fertilizer | Row width (inches) | Seeding rate (lbs/ac) | Welin farm | | | | | | | | Baade farm | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973* | 7-yr avg.** | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 6-yr avg. |
| 30+15+15 | 6 | 1 | 597 | 407 | 562 | 355 | 262 | 82 | 400 | 379 | 345 | 352 | 311 | 294 | 128 | 70 | 250 |
| | 6 | 2 | 658 | 445 | 608 | 391 | 227 | 81 | 464 | 402 | 243 | 342 | 305 | 275 | 86 | 93 | 224 |
| | 18 | 1/3 | 546 | 488 | 683 | 319 | 267 | 99 | 411 | 401 | 248 | 399 | 372 | 228 | 118 | 101 | 244 |
| | 18 | 2/3 | 586 | 459 | 660 | 306 | 257 | 102 | 405 | 395 | 285 | 374 | 385 | 239 | 92 | 86 | 244 |
| | 18 | 1 1/3 | 587 | 423 | 651 | 309 | 258 | 89 | 432 | 387 | 242 | 348 | 346 | 222 | 124 | 100 | 230 |
| Averages | | | 594 | 444 | 633 | 336 | 254 | 91 | 422 | 392 | 271 | 363 | 344 | 252 | 110 | 90 | 238 |
| 60+30+30 | 6 | 1 | 559 | 490 | 760 | 553 | 391 | 141 | 261 | 451 | 369 | 343 | 510 | 369 | 197 | 287 | 346 |
| | 6 | 2 | 509 | 544 | 722 | 607 | 421 | 134 | 256 | 456 | 294 | 353 | 519 | 376 | 195 | 305 | 340 |
| | 18 | 1/3 | 582 | 595 | 822 | 471 | 376 | 142 | 272 | 466 | 287 | 415 | 453 | 275 | 157 | 184 | 295 |
| | 18 | 2/3 | 509 | 467 | 755 | 499 | 391 | 170 | 293 | 441 | 284 | 411 | 572 | 315 | 194 | 267 | 341 |
| | 18 | 1 1/3 | 608 | 484 | 751 | 498 | 386 | 158 | 251 | 448 | 301 | 397 | 511 | 339 | 216 | 329 | 349 |
| Averages | | | 553 | 516 | 762 | 526 | 393 | 149 | 267 | 452 | 307 | 384 | 513 | 335 | 192 | 274 | 334 |
| 90+45+45 | 6 | 1 | 606 | 482 | 712 | 647 | 539 | 218 | 304 | 501 | 411 | 329 | 584 | 433 | 209 | 478 | 407 |
| | 6 | 2 | 607 | 481 | 596 | 689 | 533 | 209 | 304 | 488 | 363 | 395 | 481 | 380 | 201 | 467 | 381 |
| | 18 | 1/3 | 479 | 598 | 815 | 650 | 610 | 214 | 267 | 519 | 332 | 458 | 561 | 367 | 189 | 406 | 386 |
| | 18 | 2/3 | 653 | 567 | 735 | 607 | 581 | 185 | 299 | 518 | 325 | 431 | 559 | 386 | 229 | 465 | 399 |
| | 18 | 1 1/3 | 543 | 440 | 749 | 597 | 609 | 191 | 325 | 493 | 307 | 404 | 595 | 347 | 208 | 446 | 384 |
| Averages | | | 578 | 514 | 721 | 638 | 574 | 203 | 300 | 504 | 348 | 403 | 556 | 383 | 207 | 452 | 391 |

* 110+55+55 on 30+15+15 and 90+45+45 areas, 60+30+30 on 60+30+30 area.
** 30+15+15 average does not include 1973 yields from these plots.

# Seed Production of Timothy Varieties

Several characteristics should be considered in selecting timothy varieties for seed production in northern Minnesota. The four we believe most important are: (1) seed yield per acre, (2) plant height, (3) maturity date, and (4) standability.

We are presenting here two sets of data which suggest seed yield potential of a number of varieties. The first table will include data for four years (1970-1973) for 19 varieties seeded in 4-row plots, three replications. These varieties include most of the varieties being grown in northern Minnesota. It seems appropriate to point out that the seed yields are rather consistent, with some major discrepancies. The height measurements are also quite consistent Harvest date is remarkably consistent with some discrepancies which are probably due to an error in time of harvest. This reading is the date we harvested that variety. Therefore, if a variety was harvested early or late, it will show here. Probably the best estimate of maturity reading is an average of the four dates. It is apparent that most items were later in 1971 than the other three years, but in the main all are very similar.

The loding score indicates some varieties like Motim will normally lodge; hence, they will be harder to pick up for swathing.

The second table include 75 or more varieties which were seeded in 1972. These were seeded in duplicate 2-row plots, and two square yards were harvested from each plot. A reading of the percent of the heads in a plot which were shedding pollen on the specified day are reported as % Bloom. This suggests that there is a rather long period when varieties are shedding pollen. The seed yields, plant height, date of harvest are much the same as in the 4-row plot test described above. It seems pertinent to point out the rather wide range observed for seed yield and the consistent evaluation when two or more entries of a given variety in this trial are compared, or when entries in this trial are compared with the same varieties in other trials.

Seed yields, plant height, harvest dates and lodging scores for 19 timothy varieties seeded on Welin farm in 1969.

| Variety | Seed yield (lbs/A) | | | | | Plant height (inches) | | | | | Harvest date | | | | Lodging at harvest** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 1971 | 1972 | 1973 | 4-yr avg. | 1970 | 1971 | 1972 | 1973 | 4-yr avg. | 1970 | 1971 | 1972 | 1973 | 1970 | 1971 | 1972 | 3-yr avg. |
| Bariton | 551 | 388 | 261 | 203 | 351 | 37 | 38 | 37 | 34 | 37 | 8/18 | 8/17 | 8/15 | 8/8 | 2.5 | 3.4 | 3.6 | 3.2 |
| Barmoti | 624 | 594 | 541 | 443 | 551 | 47 | 39 | 43 | 39 | 42 | 8/4 | 8/2 | 7/27 | 7/28 | 3.0 | 3.9 | 2.6 | 3.2 |
| S-48 | 646 | 227 | 289 | 235 | 350 | 35 | 33 | 38 | 33 | 35 | 8/18 | 8/17 | 8/22 | 8/17 | 2.5 | 3.3 | 1.6 | 2.5 |
| S-51 | 383 | 407 | 358 | 176 | 331 | 45 | 36 | 42 | 41 | 41 | 8/4 | 8/17 | 8/9 | 8/1 | 3.0 | 3.3 | 4.0 | 3.4 |
| S-352 | 442 | 408 | 358 | 219 | 357 | 44 | 39 | 43 | 38 | 41 | 7/31 | 8/2 | 7/27 | 7/28 | 1.2 | 3.3 | 1.6 | 2.0 |
| Clair | 488 | 403 | 396 | 197 | 371 | 47 | 40 | 45 | 39 | 43 | 7/31 | 8/2 | 7/27 | 7/28 | 1.3 | 3.1 | 2.0 | 2.1 |
| Climax | 478 | 358 | 373 | 309 | 380 | 49 | 43 | 49 | 41 | 46 | 8/1 | 8/2 | 7/27 | 7/28 | 2.0 | 3.3 | 1.6 | 2.3 |
| Engmo | 752 | 457 | 481 | 315 | 526 | 43 | 37 | 41 | 38 | 40 | 8/2 | 8/2 | 8/1 | 7/28 | 2.0 | 4.9 | 4.0 | 3.6 |
| Essex | 384 | 386 | 356 | 117 | 311 | 48 | 38 | 46 | 40 | 43 | 7/31 | 7/17 | 8/9 | 7/28 | 1.6 | 3.5 | 3.0 | 2.7 |
| Hay Strain Erecta (Mille) | 626 | 326 | 357 | 320 | 407 | 44 | 34 | 44 | 35 | 39 | 8/1 | 8/2 | 8/1 | 7/28 | 2.0 | 3.5 | 2.3 | 2.6 |
| Heidemij | 645 | 355 | 415 | 219 | 401 | 40 | 36 | 39 | 37 | 38 | 8/18 | 8/17 | 8/22 | 8/17 | 2.0 | 2.9 | 2.0 | 2.3 |
| Itasca | 665 | 348 | 327 | 240 | 395 | 46 | 39 | 46 | 38 | 42 | 7/31 | 8/2 | 7/27 | 7/28 | 1.3 | 3.2 | 1.6 | 2.1 |
| Lorain | 499 | 355 | 364 | 352 | 393 | 50 | 43 | 48 | 41 | 46 | 7/31 | 8/2 | 7/27 | 7/28 | 1.5 | 3.6 | 1.0 | 2.0 |
| Motim | 542 | 366 | 425 | 187 | 380 | 41 | 41 | 39 | 39 | 40 | 8/18 | 8/17 | 8/15 | 8/1 | 4.3 | 3.8 | 4.0 | 4.0 |
| Olympia | 606 | 278 | 259 | 187 | 333 | 41 | 35 | 36 | 33 | 36 | 8/18 | 8/17 | 8/28 | 8/17 | 3.0 | 3.3 | 2.3 | 2.9 |
| Sata | 483 | 409 | 596 | 288 | 444 | 44 | 35 | 41 | 36 | 39 | 7/31 | 8/2 | 8/1 | 7/28 | 1.0 | 3.6 | 3.3 | 2.6 |
| Tarmo | 625 | 569 | 510 | 304 | 502 | 41 | 38 | 41 | 39 | 40 | 7/31 | 8/2 | 7/27 | 7/27 | 3.0 | 4.9 | 3.6 | 3.8 |
| Verdant | 458 | 260 | 434 | 203 | 339 | 47 | 42 | 46 | 44 | 45 | 8/1 | 8/2 | 8/2 | 7/28 | 3.0 | 3.4 | 2.6 | 3.0 |
| Wisconsin T-10 | 569 | 349 | 478 | 267 | 416 | 47 | 44 | 50 | 44 | 46 | 8/1 | 8/2 | 8/1 | 7/28 | 2.0 | 2.8 | 2.3 | 2.3 |
| LSD 5% level | 166 | 119 | 128 | 24 | | | | | | | | | | | | | | |
| 1% level | 222 | 160 | 268 | 33 | | | | | | | | | | | | | | |

* Plant height recorded early and most varieties were taller at harvest.

** Lodging score: 1 = upright, 5 = severely lodged.

Seed yields, date of heading, plant height, harvest date and date of bloom for timothy varieties, Welin farm, Roseau in 1973. (Seed yields followed by same letter are not significantly different.)

| Variety | MSP No. | Seed yield (lbs/ac) | % Headed 6-20-73 | Height 6-19-73 | Height at harvest | Harvest date | % Bloom June 26 | June 27 | June 29 | July 2 | July 5 | July 9 | July 11 | July 18 | July 21 | July 25 | Aug 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Astra | 448 | 277 cde | 80 | 27 | 36 | 7-28 | T | 10 | T | 75 | 100 | 20 | 10 | 0 | 0 | 0 | 0 |
| Barmoti | 276 | 272 cde | 75 | 25 | 32 | 7-28 | T | 3 | 8 | 85 | 95 | 8 | T | 0 | 0 | 0 | 0 |
| Bariton | 449 | 112 a | T | 17 | 29 | 8-8 | 0 | 0 | 0 | T | 5 | 40 | 85 | 70 | 8 | 20 | T |
| Barmoti | 277 | 315 cde | 75 | 24 | 34 | 7-28 | 5 | 5 | 3 | 100 | 100 | 5 | 5 | 0 | 0 | 0 | 0 |
| Bariton | 278 | 139 ab | 10 | 16 | 32 | 8-8 | 0 | T | 0 | 75 | 30 | 50 | 85 | 60 | T | T | T |
| Bottinia II | 279 | 421 fgh | 80 | 26 | 35 | 7-28 | 0 | 5 | 0 | 100 | 100 | 5 | 5 | 0 | 0 | 0 | 0 |
| C.B. | 280 | 107 a | 225 | 20 | 32 | 7-30 | 3 | 0 | 0 | 60 | 65 | 100 | 100 | 8 | T | 0 | 0 |
| Champ | 281 | 416 fg | 90 | 32 | 42 | 7-25 | 40 | T | 0 | 100 | 45 | 0 | 0 | 0 | 0 | 0 | 0 |
| Clair | 282 | 400 fg | 100 | 34 | 37 | 7-24 | 90 | 75 | 0 | 70 | 3 | T | 0 | T | 0 | 0 | 0 |
| Climax | 283 | 283 cde | 80 | 30 | 40 | 7-28 | 0 | 0 | 0 | 95 | 100 | 45 | T | T | 0 | 0 | 0 |
| Climax | 284 | 331 de | 90 | 29 | 39 | 7-28 | 0 | 0 | 0 | 50 | 100 | 20 | T | T | 0 | 0 | 0 |
| Comet | 450 | 107 a | 0 | 16 | 29 | 8-11 | 0 | 0 | 0 | T | 3 | 10 | 40 | 90 | 30 | 45 | T |
| Dolema (Pp) | 421 | 139 ab | 0 | 12 | 30 | 8-17 | 0 | 0 | 0 | T | 6 | 3 | 3 | 85 | 35 | 75 | 55 |
| Drummond | 290 | 133 a | 10 | 18 | 35 | 8-1 | 0 | T | 0 | T | 20 | 100 | 100 | 15 | 0 | T | 0 |
| Dural | 291 | 443 fgh | 95 | 29 | 40 | 7-28 | 55 | 0 | 0 | 90 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dural | 451 | 357 ef | 95 | 29 | 39 | 7-28 | 60 | 3 | 0 | 90 | 95 | T | 0 | 0 | 0 | 0 | 0 |
| Engmo | 292 | 485 hij | 90 | 27 | 39 | 7-28 | 20 | 5 | 0 | 80 | 100 | 45 | 15 | 0 | 0 | 0 | 0 |
| Erecta | 293 | 304 de | 75 | 24 | 36 | 7-28 | 0 | T | 0 | 85 | 100 | 55 | 30 | 0 | 0 | 0 | 0 |
| Eskimo | 294 | 416 fg | 90 | 26 | 41 | 7-28 | 10 | 3 | 0 | 85 | 95 | T | 0 | 0 | 0 | 0 | 0 |
| Essex | 301 | 192 abc | 55 | 22 | 38 | 7-30 | 0 | 0 | 0 | T | 85 | 100 | 95 | T | 0 | 0 | 0 |
| Evergreen (WW) | 403 | 208 bc | 95 | 12 | 24 | 8-8 | 40 | 0 | 0 | 100 | 100 | 100 | 90 | 0 | 0 | 0 | T |
| Evergreen (WW) | 452 | 293 cde | 50 | 19 | 35 | 8-1 | T | 0 | 0 | T | 45 | 100 | 100 | 10 | 0 | T | 0 |
| Farol | 415 | 155 ab | T | 19 | 30 | 8-1 | 0 | 0 | 0 | 0 | 4 | 75 | 90 | 50 | 5 | 10 | 0 |
| Farol | 480 | 176 ab | T | 18 | 35 | 8-8 | 0 | 0 | 0 | T | 5 | 75 | 90 | 55 | 3 | 10 | 0 |
| Gem | 306 | 181 ab | T | 18 | 35 | 8-8 | 0 | 0 | 0 | 0 | 3 | 85 | 95 | 33 | 5 | 20 | 0 |

cont.

Welin farm, 1973 cont.

| Variety | MSP No. | Seed yield (lbs/ac) | % Headed 6-20-73 | Height 6-19-73 | Height at harvest | Harvest date | % Bloom June 26 | June 27 | June 29 | July 2 | July 5 | July 9 | July 11 | July 18 | July 21 | July 25 | Aug 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Georgikon | 307 | 411 fg | 85 | 28 | 40 | 7-28 | T | 3 | 0 | 70 | 100 | T | T | 0 | 0 | 0 | 0 |
| Glasnevin Gem | 453 | 123 a | T | 18 | 35 | 8-1 | 0 | 0 | 0 | T | 5 | 80 | 100 | 33 | 0 | 10 | 0 |
| Heidemij | 318 | 235 bcd | T | 18 | 32 | 8-13 | 0 | 0 | 0 | T | 2 | 10 | 55 | 90 | 5 | 40 | T |
| Holea | 420 | 165 ab | 95 | 15 | 27 | 8-8 | 4 | 0 | 5 | 95 | 100 | 35 | T | 0 | 0 | 0 | 0 |
| Itasca | 325 | 373 fg | 100 | 32 | 43 | 7-28 | T | 0 | 0 | 75 | 100 | T | T | 0 | 0 | 0 | 0 |
| Kampe | 454 | 469 ghij | 100 | 32 | 39 | 7-28 | 20 | T | 0 | 85 | 100 | T | 0 | 0 | 0 | 0 | 0 |
| Kampe II | 564 | 555 ij | 100 | 32 | 41 | 7-28 | 0 | 5 | 0 | 40 | 100 | T | T | 0 | 0 | 0 | 0 |
| King | | 197 abc | T | 16 | 34 | 8-11 | 0 | 0 | 0 | T | 2 | 5 | 35 | 85 | 50 | 65 | 20 |
| Lorain | 332 | 427 fgh | 90 | 28 | 43 | 7-28 | 0 | 0 | 0 | 35 | 100 | 10 | 20 | 0 | 0 | 0 | 0 |
| Mahndorfer | 419 | 437 fgh | 100 | 31 | 41 | 7-28 | 0 | 3 | T | 40 | 95 | T | T | 0 | 0 | 0 | 0 |
| Match | 406 | 85 a | 95 | 15 | 24 | 7-30 | 100 | 100 | 100 | 40 | 5 | T | 0 | 0 | T | 0 | 0 |
| Melusine | 414 | 352 ef | 90 | 30 | 38 | 7-28 | T | 8 | 5 | 100 | 100 | T | T | 0 | 0 | 0 | 0 |
| Melusine | 455 | 309 de | 95 | 32 | 40 | 7-28 | 20 | 5 | 3 | 100 | 100 | T | T | 0 | 0 | 0 | 0 |
| Milton | 338 | 421 fg | 95 | 32 | 42 | 7-28 | 15 | 5 | 0 | 80 | 100 | 5 | 0 | 0 | 0 | 0 | 0 |
| Mommersteeg's (WI) | 339 | 197 abc | 0 | 18 | 31 | 8-17 | 0 | 0 | 0 | 0 | 0 | T | T | 10 | 30 | 70 | 20 |
| Motterwitzer | 340 | 379 fg | 95 | 29 | 37 | 7-28 | 60 | 15 | 15 | 90 | 100 | T | T | 0 | 0 | 0 | 0 |
| Murra | 474 | 251 bcd | 90 | 30 | 40 | 7-28 | 65 | 5 | 15 | 85 | 45 | T | T | 0 | 0 | 0 | 0 |
| "N" | 405 | 403 fg | 100 | 30 | 32 | 7-28 | 50 | 45 | 20 | 45 | 25 | 0 | T | 0 | 0 | 0 | 0 |
| N1-125 | 342 | 347 def | 70 | 27 | 39 | 7-28 | 0 | 10 | 5 | 40 | 90 | 65 | 20 | 0 | 0 | 0 | 0 |
| N7-127 | 344 | 421 fg | 90 | 32 | 40 | 7-28 | 0 | 0 | 0 | 0 | 50 | T | 0 | 0 | 0 | 0 | 0 |
| Neuga | 357 | 357 ef | 90 | 32 | 36 | 7-28 | 15 | 0 | 0 | 0 | 35 | T | 0 | 0 | 0 | 0 | 0 |
| "O" | 404 | 336 de | 80 | 25 | 36 | 7-30 | T | 0 | 0 | 50 | 100 | 65 | 25 | 0 | T | T | 0 |
| Oakmere | 418 | 224 bc | 0 | 15 | 35 | 8-17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 30 | 80 | 35 |
| Oakmere | 456 | 229 bc | T | 15 | 33 | 8-17 | 0 | 0 | 0 | 0 | 0 | T | T | 30 | 35 | 90 | 35 |
| Olympia | 457 | 203 bc | 0 | 15 | 31 | 8-13 | 0 | 0 | 0 | 0 | T | 5 | 10 | 80 | 18 | 55 | 5 |
| Omnia | 350 | 571 ij | 95 | 28 | 38 | 7-28 | 0 | 3 | 0 | 85 | 100 | 30 | 5 | 0 | 0 | 0 | 0 |
| Otofte Topas | 351 | 501 hij | 95 | 28 | 39 | 7-28 | 30 | 0 | 0 | 45 | 100 | 30 | 5 | 0 | 0 | 0 | 0 |
| Pecora | 352 | 251 bcd | 45 | 19 | 38 | 8-8 | 0 | 0 | 0 | T | 18 | 100 | 100 | 5 | 0 | 0 | 0 |
| Pergo | 417 | 427 fgh | 95 | 28 | 38 | 7-28 | 0 | 0 | 0 | 85 | 100 | 5 | T | T | 0 | 0 | 0 |
| S-48 | 271 | 267 cde | T | 16 | 30 | 8-17 | 0 | 0 | 0 | 0 | 0 | T | T | 90 | 65 | 80 | 20 |

cont.

Welin farm, 1973 cont.

| Variety | MSP No. | Seed yield (lbs/ac) | % Headed 6-20-73 | Height 6-19-73 | Height at harvest | Harvest date | % Bloom June 26 | June 27 | June 29 | June 2 | July 5 | July 9 | July 11 | July 18 | July 21 | July 25 | Aug 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S-50 | 274 | 176 ab | 90 | 15 | 25 | 8-8 | 40 | 10 | 15 | 100 | 100 | 65 | 25 | 0 | T | 0 | 0 |
| S-352 | 275 | 395 fg | 95 | 28 | 38 | 7-25 | 40 | 5 | 5 | 95 | 80 | T | 0 | 0 | 0 | 0 | 0 |
| Sceempter (Intenso) | 356 | 213 bc | 0 | 16 | 33 | 8-17 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 75 | 80 | 80 | 25 |
| Sceempter (Intenso) | 355 | 240 bcd | T | 15 | 32 | 8-17 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 85 | 80 | 85 | 20 |
| Scotia | 357 | 347 def | 80 | 24 | 39 | 7-30 | 0 | 0 | 0 | 80 | 100 | 90 | 85 | 0 | 0 | 0 | 18 |
| Sport | 458 | 176 ab | 90 | 15 | 27 | 8-8 | 65 | 0 | 3 | 100 | 100 | 65 | 10 | 5 | 3 | T | T |
| Swallow | 358 | 480 ghi | 90 | 28 | 40 | 7-28 | 20 | 5 | 0 | 90 | 100 | 5 | 0 | 0 | 0 | 0 | 0 |
| T-41 | 367 | 421 fg | 85 | 29 | 41 | 7-28 | 15 | 3 | 0 | 90 | 100 | 60 | 35 | 0 | 0 | 0 | 0 |
| Th-71-3 | 410 | 139 ab | 55 | 23 | 32 | 7-30 | 0 | 0 | 0 | 70 | 75 | 100 | 95 | 3 | 0 | T | 0 |
| Thl-70 | 411 | 534 hij | 85 | 27 | 37 | 7-28 | 0 | 0 | 0 | 70 | 100 | 55 | 20 | 0 | 0 | 0 | 0 |
| tt3-70 | 412 | 277 cde | T | 17 | 35 | 8-16 | 0 | 0 | 0 | 0 | T | 5 | 15 | 35 | 20 | 75 | 18 |
| Tw4-70 | 413 | 256 cde | T | 19 | 36 | 8-13 | 0 | 0 | 0 | 0 | T | 0 | 3 | 55 | 70 | 80 | 35 |
| Tiran | 416 | 283 cde | T | 20 | 36 | 8-13 | 0 | 0 | 0 | T | 5 | 20 | 35 | 60 | 60 | 55 | 20 |
| Tiran | 481 | 293 cde | T | 20 | 36 | 8-13 | 3 | 0 | 0 | T | 10 | 30 | 40 | 65 | 45 | 50 | T |
| Toro | 422 | 464 ghij | 100 | 31 | 40 | 7-24 | 85 | 10 | 0 | 85 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Toro | 459 | 475 ghij | 100 | 32 | 41 | 7-24 | 70 | 5 | 0 | 85 | 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| Toro | 482 | 619 j | 100 | 33 | 42 | 7-24 | 70 | 5 | 0 | 85 | 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| Trifolium (Early) | 365 | 411 fg | 90 | 30 | 41 | 7-28 | 0 | 0 | 0 | 85 | 100 | 20 | T | 0 | 0 | 0 | 0 |
| Trifolium (Late) | 366 | 256 cde | T | 22 | 38 | 8-8 | 0 | 0 | 0 | 35 | 13 | 70 | 100 | 8 | 0 | T | T |
| Vanadis | 460 | 453 fgh | 95 | 29 | 41 | 7-28 | 3 | 3 | 0 | 80 | 85 | T | 0 | 0 | 0 | 0 | 0 |
| Vanadis | 368 | 421 fg | 90 | 28 | 41 | 7-28 | 10 | 15 | 0 | 95 | 85 | 5 | 0 | 0 | 0 | 0 | 0 |
| Verdant | 369 | 181 ab | 80 | 27 | 41 | 7-28 | 0 | 0 | 0 | 90 | 85 | 45 | 40 | 8 | T | T | 0 |
| WWT-48 | 461 | 277 cde | 80 | 26 | 40 | 7-28 | 0 | 0 | 0 | 95 | 100 | 50 | 40 | 0 | 0 | 0 | 0 |
| WWT-49 | 408 | 325 de | 75 | 26 | 39 | 7-30 | 0 | 0 | 0 | 85 | 100 | 55 | 45 | 0 | 0 | 0 | 0 |
| WWT-93 | 407 | 485 hij | 85 | 27 | 39 | 7-28 | 0 | 0 | 0 | 90 | 100 | 55 | 40 | 0 | 0 | 0 | 0 |
| WWT 14 (Pn) | 409 | 208 bc | 85 | 15 | 24 | 8-1 | 0 | 0 | 0 | 50 | 100 | 100 | 90 | 0 | 0 | T | 0 |
| XT-709 | 373 | 363 ef | 90 | 29 | 39 | 7-28 | 40 | 15 | 0 | 100 | 90 | 10 | T | 0 | 0 | 0 | 0 |
| Z 2009 | 477 | 261 cde | T | 15 | 27 | 8-14 | 0 | 0 | 0 | 0 | T | 5 | 25 | 80 | 10 | 50 | 3 |
| Z 2010 | 478 | 229 bc | T | 15 | 30 | 8-14 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 85 | 65 | 70 | 30 |
| Z 2022 | 479 | 149 ab | T | 19 | 32 | 8-11 | 0 | 0 | 0 | 0 | T | 65 | 95 | 60 | T | T | T |

cont.

Welin farm, 1973 cont.

| Variety | MSP No. | Seed yield (lbs/ac) | % Headed 6-20-73 | Height 6-19-73 | Height at harvest | Harvest date | % Bloom June 26 | June 27 | June 29 | July 2 | July 5 | July 9 | July 11 | July 18 | July 21 | July 25 | Aug 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Z 9011 | 374 | 469 ghij | 95 | 32 | 40 | 7-28 | 65 | 20 | 10 | 80 | 100 | 5 | T | 0 | 0 | 0 | 0 |
| KO-133 (Z 9011) | 487 | 469 ghij | 95 | 31 | 42 | 7-28 | 25 | 20 | 5 | 85 | 100 | 5 | T | 0 | 0 | 0 | 0 |
| KO-136 (Topas) | 486 | 459 fghi | 90 | 31 | 42 | 7-28 | 15 | 20 | 3 | 90 | 100 | 10 | T | 0 | 0 | 0 | 0 |
| KO-192 (Toro) | 485 | 512 hij | 95 | 31 | 39 | 7-24 | 50 | 15 | 5 | 95 | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| K1-53 (Comet) | 483 | 224 bc | T | 17 | 35 | 8-16 | 0 | 0 | 3 | 0 | T | T | 25 | 75 | 40 | 70 | T |
| K1-63 (Z9006) | 489 | 501 hij | 90 | 18 | 38 | 7-28 | 0 | 3 | 0 | 95 | 100 | 25 | T | 0 | 0 | 0 | 0 |
| K1-67 (Gem) | 488 | 197 abc | T | 20 | 35 | 8-8 | 0 | 0 | 0 | 0 | T | 70 | 95 | 25 | 0 | 5 | T |
| K2-54 (Z 2010) | 490 | 224 bc | T | 16 | 31 | 8-14 | 0 | 0 | 0 | 0 | 0 | 0 | T | 75 | 60 | 80 | 23 |
| K2-55 (Z2009) | 491 | 299 cde | T | 17 | 30 | 8-14 | 0 | 0 | 0 | 0 | 0 | T | 25 | 75 | 35 | 80 | 5 |
| K2-71 (Z 2022) | 494 | 245 bcd | T | 22 | 36 | 8-8 | 0 | 0 | 0 | 0 | T | 75 | 95 | 35 | 15 | 10 | 0 |
| K9-117 | 495 | 283 cde | 85 | 30 | 42 | 7-30 | 0 | 0 | 0 | 95 | 100 | 95 | 90 | 0 | 0 | 0 | 0 |
| K9-118 | 493 | 379 fg | 85 | 31 | 42 | 7-28 | 0 | 0 | 0 | 90 | 100 | 70 | 40 | 0 | 0 | 0 | 0 |
| N1 45 (Lorain) | 494 | 459 ghij | 85 | 30 | 44 | 7-28 | 0 | 0 | 0 | 85 | 100 | 55 | 30 | 0 | 0 | 0 | 0 |
| N7-128 (Timfor) | 492 | 453 fghi | 95 | 30 | 43 | 7-28 | 0 | 0 | 0 | 70 | 100 | 40 | 20 | 0 | 0 | 0 | 0 |

# The Interaction of Variety by Fertilizer Rate for Seed Yield in Timothy

Most of the fertilizer studies conducted by the University of Minnesota researchers have been in a field of a given variety. Some people have suggested there may be rather specific requirements for various varieties. As a preliminary study to determine whether varieties respond differently to fertilizer rates, we seeded three varieties, Climax, Evergreen and Heidemij. These were seeded in replicated trials at three seeding rates in two row widths: 18-inch rows at 0.5 and 1.0 lbs per acre and in 6-inch rows at 1.5 lbs per acre. In the fall of 1969 for 1970 seed production, we applied two fertilizer rates, 50+25+25 and 100+50+50. In 1970 for 1971 production, we applied 60+30+30 and 120+60+60, and for 1972 and 1973 production 60+30+30 and 100+50+50. The reason we changed rates was the severe lodging observed in 1971 production from the 120+60+60 rate. We maintained the 60+30+30 as the lower rate for 1972 and 1973 production.

Seed yields are shown in the table. Heidemij seed yields from the higher fertility rate were considerably greater in 1972 and 1973 than from the low rate. The response of Heidemij to the high rate was considerably more than the response of Climax in comparable comparisons. We have chosen to omit the yields from Evergreen since the seed stock used for this seeding was not typical for the variety.

This preliminary study suggests that a higher rate of fertilizer should be applied on older stands of Heidemij than on Climax. Heidemij matures about 18 days later than Climax and appears to produce more leaves and regrowth.

We are not sure that other varieties will respond to fertilizer as Climax and Heidemij have done. However, varieties like Bariton, Comet, Intenso, King and S-48 appear to have growth habits much like Heidemij. The maturity of Heidemij and these pasture types is ery similar. Growers may wish to consider a higher fertilizer rate on these types of varieties than normally applied to Climax.

We have presented these data for your consideration. We have a more complete study seeded on the Magnusson farm which includes four varieties of the Heidemij type and two of the Climax type. These are seeded at two rates, 0.5 pounds per acre in 18-inch rows, and 1.0 pound per acre in 6-inch rows, with three residue management regimes, and we will apply three fertilizer rates. Data should be available during the winter of 1974-75, although the past 2 years, 1972 and 1973, have been very dry and we could not harvest yields.

This study has been destroyed because of invasion of quackgrass.

Seed yields for Climax and Heidemij timothy at three seeding rates and two fertilizer rates for four years.

| Variety | Fertilizer rate | Seeding rate in pounds per acre | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.5 | | | | | 1.0 | | | | | 1.5 | | | | |
| | | 1970 | 1971 | 1972 | 1973 | 4-year average | 1970 | 1971 | 1972 | 1973 | 4-year average | 1970 | 1971 | 1972 | 1973 | 4-year average |
| Climax | Low* | 503 | 464 | 343 | 245 | 389 | 493 | 397 | 336 | 315 | 385 | 604 | 445 | 350 | 235 | 409 |
| | High** | 432 | 458 | 415 | 245 | 388 | 492 | 425 | 312 | 299 | 382 | 558 | 492 | 445 | 373 | 467 |
| Heidemij | Low* | 545 | 447 | 212 | 155 | 340 | 579 | 440 | 240 | 171 | 358 | 574 | 438 | 163 | 149 | 331 |
| | High** | 630 | 484 | 360 | 224 | 425 | 659 | 538 | 538 | 320 | 514 | 702 | 466 | 456 | 272 | 474 |

* Fertilizer rate for 1970 crop was 50+25+25; for 1971, 1972 and 1973, 60+30+30.
** Fertilizer rate for 1970, 1972 and 1973 was 100+50+50; for 1971, 120+60+60.

# Chemical Control of Weeds and Volunteer Seedlings in Established Stands of Grasses and Legumes

Drs. Behrens and Elling are screening and testing chemicals for weed and volunteer seedling control in established stands.

There appears to be four chemicals which can be used in established stands of grasses and legumes to control volunteer seedlings and weed seedlings. We recognize that much of the soil is contaminated with clovers, bluegrass and timothy, in addition to the various weed seeds in the soil. We need chemicals which will eradicate clovers from trefoil, or prevent establishment of timothy seedlings from seed shattered and lost from the combine.

The results from this type of work is limited, but some results are available and it appears pertinent to make these available to you. We hasten to add, however, that as we prepare this information, we do not have clearance for these particular chemicals for these uses. We have requested limited clearance for several, but until we have confirmation, it is understood that they cannot be used. If you have interest in this type use for herbicides, carefully check out the procedure for application, use of chemical, rate of use, and clearance restrictions.

## Karmex (Diuron) Sprayed on Established Timothy to Control Volunteer Timothy Seedlings and Weeds

Two trials are reported here. In 1972 Melle (Erecta) timothy on the Carroll Hanson farm, southeast of Warroad, and in 1973 Climax timothy on the Curtis Skrutvold farm 1 mile west of Roseau were sprayed. The Carroll Hanson timothy had been burned and plants were just beginning to recover when Karmex was applied on May 5, 1972. The Climax timothy on the Curtis Skrutvold farm was beginning to grow but had made little growth when sprayed on April 25, 1973.

In both studies the plots were 100' long and 12' wide. Karmex was applied with a self-propelled power sprayer at 1 lb per acre and to obtain the 2 and 3 lbs/a. treatments, the plots were sprayed two or three times. Four square-yard samples were harvested from each plot, dried and threshed. The yields reported are lbs/acre on the basis of the four samples per plot. Seed yields were not significantly different in either trial.

Melle timothy on Carroll Hanson farm - 1972

| Chemical | Rate | Seed yield | Percent germination* |
|---|---|---|---|
| Karmex | 0.0 | 81 | 83 |
| Karmex | 1.0 | 83 | 86 |
| Karmex | 2.0 | 84 | 85 |
| Karmex | 3.0 | 84 | 84 |

* 12 samples per treatment.

Climax timothy on Curtis Skrutvold farm - 1973

| Chemical | Rate | % depression to chemical* | Height at harvest | Harvest date | Seed yield+ |
|---|---|---|---|---|---|
| Karmex | 0.0 | 0 | 43 | 7-31 | 281 |
| Karmex | 1.0 | 7 | 42 | 7-31 | 306 |
| Karmex | 2.0 | 15 | 40 | 7-31 | 224 |
| Karmex | 3.0 | 30 | 37 | 7-31 | 295 |

* Visual estimate.
+ Lower yield in 2.0 treatment primarily due to one plot.

Depression of plant growth and seed yields on five crops and weeds as affected by by varying rates of five chemicals applied on established legumes on May 3, 1972.

| Herbicide | Rate | Trefoil* | Milk vetch* | Alfalfa* | Red clover* | Bluegrass* | Perennial sowthistle* | Annual weeds* | Seed yields | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Leo | Carroll | Milk vetch |
| Simazine | 1.50 | 0 | 30 | 10 | 30 | 90 | 100 | 100 | 371 | 419 | 189 |
| | 2.25 | 0 | 20 | 25 | 70 | 100 | 100 | 100 | 488 | 515 | 165 |
| | 3.00 | 0 | 60 | 30 | 100 | 100 | 100 | 100 | 411 | 485 | 149 |
| Karmex | 2.00 | 10 | 20 | 5 | 25 | 90 | 0 | 100 | 427 | 304 | 171 |
| | 3.00 | 10 | 50 | 20 | 80 | 90 | 0 | 100 | 485 | 371 | 136 |
| | 4.00 | 20 | 50 | 30 | 90 | 90 | 0 | 100 | 515 | 448 | 184 |
| Amiben | 3.00 | 0 | 0 | 0 | 0 | 00 | 0 | 0 | ---Not harvested--- | | |
| | 4.50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | " | " | |
| Terbacil | 0.25 | 10 | 0 | 5 | 5 | 50 | 0 | 100 | 272 | 392 | 256 |
| | 0.50 | 35 | 45 | 10 | 90 | 100 | 0 | 100 | 229 | 251 | 339 |
| | 0.75 | 75 | 65 | 10 | 59 | 100 | 0 | 100 | ---Not harvested--- | | |
| Sencor | 0.25 | 10 | 20 | 5 | 60 | 25 | 0 | 100 | 512 | 499 | 237 |
| | 0.50 | 45 | 35 | 15 | 90 | 100 | 0 | 100 | ---Not harvested--- | | |
| Check | -- | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 456 | 357 | 208 |

* Visual estimate of plant depression due to chemical.

Depression of plant growth, control of weeds, seed yields and harvest dates as affected by varying rates of five chemicals applied on established legumes on April 24, 1973. Same plots as 1972 study.

| Herbicide | Rate | Trefoil* | Milk vetch* | Alfalfa* | Red clover | Bluegrass | Perennial sowthistle+ | Canada thistle | Annual weeds in August** | Seed yields | | | Harvest dates+ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Leo | Carroll | Milk vetch | Leo | Carroll | Milk vetch |
| Simazine | 1.5 | 5 | 15 | 20 | Not present | Present only in Amiben plots | Few | Yes | Few | 249 | 292 | 402 | 11 | 10 | 12 |
| | 2.25 | 10 | 30 | 50 | | | 0 | Yes | 0 | 217 | 384 | 381 | 16 | 14 | 12 |
| | 3.00 | 40 | 95 | 90 | | | 0 | Yes | 0 | 217 | 146 | 32 | 16 | 14 | 11 |
| Karmex | 2.00 | 0 | 0 | 0 | | | Yes | Yes | 0 | 292 | 292 | 523 | 9 | 11 | 12 |
| | 3.00 | 0 | 10 | 5 | | | Yes | Yes | 0 | 352 | 377 | 555 | 9 | 10 | 12 |
| | 4.00 | 15 | 20 | 10 | | | Yes | Yes | 0 | 277 | 292 | 516 | 11 | 10 | 12 |
| Amiben | 3.00 | 0 | 0 | 0 | | | Yes | Yes | Yes | 309 | 324 | 487 | 10 | 10 | 13 |
| | 4.50 | 0 | 0 | 0 | | | Yes | Yes | Yes | 338 | 327 | 345 | 10 | 11 | 13 |
| Terbacil | 0.25 | 10 | 1 | 10 | | | Yes | Yes | Yes | 349 | 292 | 512 | 13 | 10 | 12 |
| | 0.50 | 10 | 5 | 0 | | | Yes | Yes | Yes | 242 | 302 | 345 | 10 | 9 | 12 |
| | 0.75 | 45 | 10 | 15 | | | Yes | Yes | Yes | 224 | 217 | 370 | 14 | 16 | 12 |
| Sencor | 0.25 | 0 | 5 | 10 | | | Yes | Yes | Yes | 494 | 306 | 466 | 13 | 14 | 12 |
| | 0.50 | 20 | 5 | 10 | | | Yes | Yes | Yes | 352 | 317 | 487 | 11 | 14 | 12 |
| | 0.75 | 40 | 25 | 15 | | | Yes | Yes | Yes | 217 | 338 | 441 | 16 | 15 | 12 |
| Check | -- | 0 | 0 | 0 | | | Yes | Yes | Yes | 274 | 324 | 359 | 11 | 10 | 12 |

* Percent depression due to chemical (visual estimate).

\+ Perennial sowthistle apparently controlled by 2.25 and 3.0 rates of Simazine, few remained in 1.5 rate.

** All annual weeds controlled until August in all but check and in the Amiben plots. The, Amiben, Terbacil and Sencor plots the annual weeds started to show.

\+ Harvest dates all refer to August.