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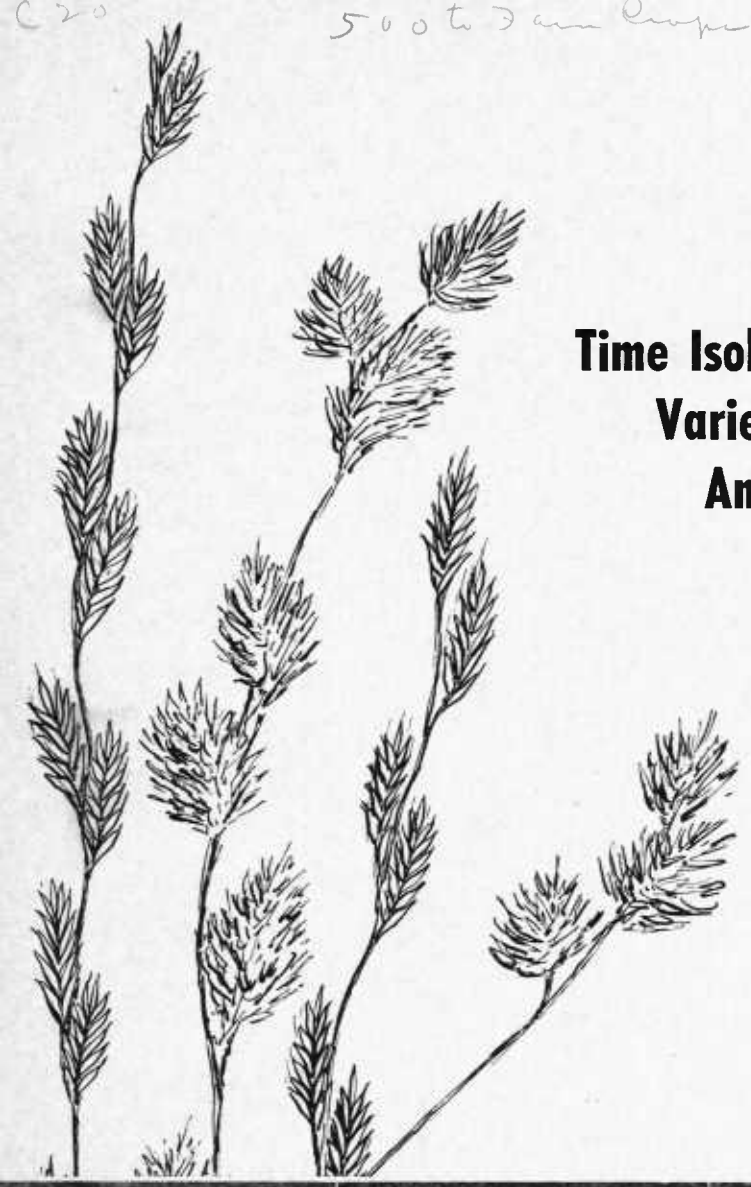

Time Isolation as a Safeguard to Varietal Purity in Perennial Ryegrass, Annual Ryegrass, and Orchardgrass

Corvallis, Oregon

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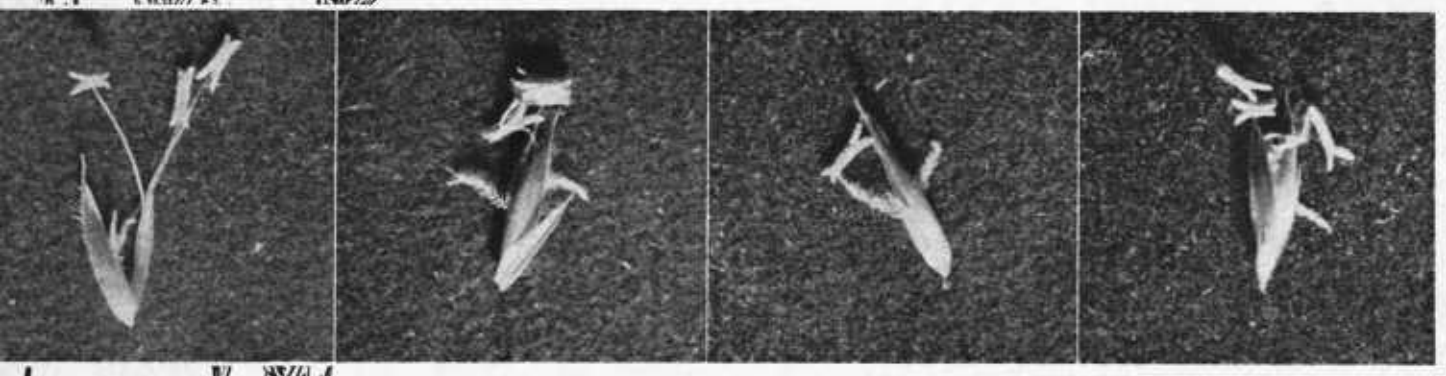

Agricultural Experiment Station
Oregon State University
Corvallis, Oregon

Contents

COVER PHOTO: *Four individual flowers of orchardgrass are shown. From left, opened floret with anthers or male floral parts; stigmas or female parts exerted on each side of floret with anthers above; again, stigmas and one anther; and anthers and one stigma exerted.*

AUTHOR: H. H. Rampton is Research Agronomist, Crops Research Division, Agricultural Research Service, United States Department of Agriculture, cooperating with the Oregon Agricultural Experiment Station, Corvallis, Oregon.

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Time Isolation as a Safeguard to Varietal Purity in Perennial Ryegrass, Annual Ryegrass, and Orchardgrass . . . *Corvallis, Oregon*

H. H. RAMPTON

Time Isolation

Time isolation, or difference in date of flowering, is sometimes used to reduce or eliminate the effect of foreign pollen in breeding and initial seed increase of grasses which otherwise would cross-pollinate readily if flowering were concurrent. In some situations, grass seed growers can make effective use of differential time of flowering to minimize contamination by foreign pollen. It is important to recognize and utilize such opportunities when producing seeds of some of the new improved grasses adapted for seed production in Oregon. The information contained in this report was obtained and compiled to aid those involved in seed production and certification to recognize opportunities for providing time isolation as a safeguard to varietal purity in seed production.

The term "flowering," as used in this report, refers to the time when the emerged seed heads show the following conditions:

- Heads are spread or distended, and each developing floret or seed can be distinguished.

- The two glumes of each floret which enclose the sexual structures are opened, exposing the feathery stigmas (female portion) and the male anthers with their pollen sacs. (See cover photographs.)

- The stigmas are drooped outward from both sides of the opened glumes, exposing their many pollen-catching surfaces.

- The anthers also are drooped outward between the opened glumes, from which position the pollen sacs burst, freeing the pollen.

The ryegrasses and orchardgrasses observed in this study flowered for limited periods during the daylight hours at Corvallis. Night observations were not made, although orchardgrass is known to flower at night.[1] Perennial ryegrass, *Lolium perenne* L., began flowering at approximately 10:15 a.m. Pacific Standard Time and continued until about 1 p.m. Annual ryegrass *L. multiflorum* Lam., sometimes flowered from about 9:30 a.m. until 3:30 p.m., although the period was usually about 10:30 a.m. to 2 p.m. Orchardgrass, *Dactylis glomerta* L., flowering was observed from 8 a.m. until 1:30 p.m. At the conclusion of the day's flowering, the glumes closed and covered the stigmas so that none were exposed until the next flowering period.

The ryegrasses flowered at somewhat lower temperatures than the orchardgrasses. Orchardgrass seldom flowered when temperatures were below 60 F., while ryegrass flowered frequently when temperatures were between 55 F. and 60 F. In 1960, 'Florida Rust Resistant,' an annual ryegrass, flowered on May 19 when the maximum temperature was 50 F. (Table 2). Profuse flowering did not occur as frequently at low temperatures in any of the grasses as when temperatures were around 65 F. and above. Mild temperatures of 60 F. to 70 F. and high atmospheric humidity such as that accompanying light rain showers encouraged profuse flowering.

When moderate to warm temperatures prevailed, flowering was often completed within 10 days. When temperatures were mostly cool, the flowering period was sometimes more than a month, although the later heads were short-stemmed, small, few, and far from maturity at harvest time. These late-flowering heads could be sources of contaminating pollen to nearby fields, but the amount of pollen they produce is relatively small.

[1] T. K. Wolfe. Observations on the blooming of orchardgrass flowers. *Jour. Am. Soc. Agron.*, *17*:605-618. 1925.

Explanation of Tables

In 1960, 1961, and 1962, only hasty observations were made, and attention was given principally to recording the actual length of the flowering period for each species or variety. In 1963 and 1964, more detailed observations were made.

Head emergence dates were determined when the first heads began to emerge from the leaf sheath or "boot." Flowering dates are the dates when opened flowers were observed. No flowering was observed before the first dates or after the last dates recorded; flowering was usually very sparse near the final date. Flowering was roughly classified as sparse, moderate, or profuse. When weather was favorable, profuse flowering often came almost immediately after the onset of flowering; when unfavorable weather prevailed, it was usually delayed. Periods during which profuse flowering occurred are presented in Tables 1, 2, and 3. Profuse flowering did not necessarily occur every day within the various periods recorded under the table heading "Periods of profuse flowering." Profuse flowering was not observed in some cases in 1963 and 1964, although moderate amounts were noted (Table 2).

Periods of heaviest flowering appear to be especially important because it is then that exposure of the stigmas to foreign pollen is greatest and the pollen load in the air is heaviest. We do not know when the stigmas are most receptive to pollen, but until we have more information, we must assume that they are fully receptive whenever they are exposed.

Through a study of the data presented in the tables, information on seasonal and peak flowering periods can be obtained.

Perennial ryegrass

An example comparison of 'Linn' perennial ryegrass, an early variety, with the late 'Norlea' perennial ryegrass (Table 1) shows that:

- In 1961 and 1963, Linn was through flowering before Norlea began.
- In 1962, Linn ceased flowering on the day Norlea began.
- In 1964, Linn flowered profusely on the day Norlea started and continued to flower for 10 days after. However, Norlea did not flower profusely until 12 days after Linn ceased to flower.

A comparison of Linn perennial ryegrass with 'Sceempter,' another late variety, shows that:

- In 1962, Linn continued flowering for four days after Sceempter began, but Sceempter did not flower profusely until 15 days after Linn had ceased flowering.
- In 1963, Linn ceased flowering five days before Sceempter began.
- In 1964, Linn ceased flowering on the day Sceempter began.

When Linn perennial ryegrass is compared with 'RvP' pasture variety for 1961 to 1964, a margin of 6 to 24 days is shown between the last flowering date for Linn and the first flowering date for RvP.

Annual ryegrass

There is little opportunity for time isolation among the varieties of annual ryegrass (Table 2). Even the earliest one, Florida Rust Resistant, had considerable overlapping with the first flowering dates of the late varieties 'Aberystwyth S.22' and Westerwolth 'Barenza.'

In making comparisons it must be remembered that perennial ryegrass and annual ryegrass cross readily, and the same precautions apply as when comparing two varieties of either species.

Orchardgrass

Opportunities for time isolation among the orchardgrass varieties are few (Table 3). The earliest variety in 1963 and 1964 was 'Chinook.' A comparison with late varieties shows:

- In 1963, Chinook ceased flowering on June 17—10 days after 'Aberystwyth S.143' and 'Pennlate' began, and 11 days after 'Latar' began. Moreover, Chinook was still in bloom while Aberystwyth S. 143, Pennlate, and Latar were flowering profusely.
- In 1964, Chinook ceased flowering on June 10, nine days after Aberystwyth S.143, Pennlate, and Latar began but before they flowered profusely.

Discussion

The initial flowering dates were not the same each year for any of the varieties. In some cases the year-to-year variation was 18 days. The last dates of flowering were variable also. This year-to-year variation limits the use of time isolation to maintain purity of the varieties and species considered here, excepting perennial ryegrass. Between some early and late varieties of perennial ryegrass, practically complete time isolation occurred each year. However, the flowering periods of the other perennial ryegrasses, the annual ryegrasses, and orchardgrasses overlapped enough to reduce the usefulness of this method.

Further work and experience are needed to determine the most critical time in the flowering period and the relative influence of light and heavy pollen loads in the air in relation to spatial isolation. Probably the late-flowering heads have the least effect on the developing seed crop because:

1. The later heads, due to their short stems, flower where air circulation is limited, thus reducing their chances to either spread or intercept pollen.

2. The later heads, being small and comparatively few in number, have little capacity to produce pollen or seed.

3. The later heads are usually immature and poorly filled at harvest. Most of these lightweight seeds are blown out when the seed is cleaned.

The information provided here should be useful in producing some varieties of perennial ryegrass under time isolation and with little or no cross-pollination between varieties in the Corvallis area. With other perennial ryegrasses, annual ryegrasses, and orchardgrasses observed in this study, time isolation appears at present to be useful as a supplement to the minimum isolation distances required in seed certification.

Table 1. Dates of head emergence and flowering for varieties of perennial ryegrass at Corvallis, Oregon (1960-1964)

Varieties	Year	Head emergence	Period when flowering was observed		
			First day	Periods of profuse flowering	Last day
A-2243 Waimate	1962	5-8	5-30		7-12
P.I. 267,309 Canterbury S.,	1963	5-3	5-29	6-3 to 6-10	6-12
New Zealand	1964	5-4	5-26	5-29 to 6-13	6-22
A-2244 Rakaia	1962	5-5	5-28		7-7
Canterbury S.,	1963	5-3	5-27	6-3	6-12
New Zealand	1964	5-4	5-29	6-1 to 6-13	6-22
'Aberystwyth S. 23'	1960	5-10	6-10		6-16
Pasture	1961	5-16	6-2		6-26
	1962	6-1	6-20		7-16
	1963	5-24	6-17	6-25	7-15
	1964	5-28	6-19	6-25 to 7-3	7-9
'Aberystwyth S. 24'	1960	—	5-26	5-31	6-16
Hay	1961	4-28	5-22		6-2
	1962	5-4	5-30		6-25
	1963	5-7	5-27	5-31 to 6-10	6-17
	1964	5-6	5-29	6-1	6-19
'Aberystwyth S. 101'	1963	5-29	6-15	6-17	7-15
Pasture and hay	1964	—	6-13	6-19 to 6-25	7-6

Table 1. Continued. Dates of head emergence and flowering for varieties of perennial ryegrass at Corvallis, Oregon (1960-1964)

Varieties	Year	Head emergence	Period when flowering was observed: First day	Periods of profuse flowering	Last day
Anglais 'Bocage' Vilmorin	1962	5-30	6-18		7-20
France P. I. 265,340	1963	5-31	6-17	6-25	7-17
	1964	5-28	6-19	6-19 to 6-25	7-9
Anglais 'Primevere'	1962	5-5	5-30		7-7
P.I. 265,341 Inst. Nat.	1963	5-3	5-27	6-3	6-12
Versailles, France	1964	5-4	5-26	5-29	6-19
'Barenza' Early Hay	1962	5-10	6-4		7-12
Holland	1963	5-15	6-1		6-25
	1964	5-15	6-9	6-13 to 6-19	7-1
'Barenza' Late Hay	1962	5-15	6-15		7-16
Holland	1963	5-19	6-11	6-25	7-15
	1964	5-21	6-13	6-19 to 7-1	7-11
'Barenza' Pasture	1962	5-28	6-15	7-3 to 7-16	7-27
Holland	1963	5-27	6-17		7-16
	1964	5-28	6-19	6-25 to 7-3	7-16
'Bocage' Trifolium	1963	5-29	6-15	6-17	7-15
	1964	5-26	6-19	6-22 to 6-25	7-9
'Devon Eaver'	1962	5-6	5-28		6-22
Ireland P.I. 265,342	1963	5-3	5-25	5-27 to 6-3	6-11
	1964	4-28	5-26	5-29 to 6-1	6-22
de Lacey P.I. 266,107	1962	5-5	5-28		7-9
New Zealand	1963	5-3	5-27	6-3	6-11
	1964	4-28	5-26	6-9	6-25
'Eagle Hill III' Late	1962	5-24	6-11	6-22 to 6-23	7-12
P.I. 265,946	1963	5-18	6-10		7-10
	1964	5-13	6-4	6-19 to 6-25	7-3
'E.F. Early III' Trifolium	1962	5-19	6-11		7-12
Denmark P.I. 265,947	1963	5-19	6-3		7-9
	1964	5-21	6-9	6-19 to 6-25	7-3
'Elete' Trifolium	1963	5-18	6-7		6-25
	1964	—	6-9	6-13 to 6-22	7-1
'Eresta III' Early	1962	5-7	5-30		6-25
Denmark P. I. 265,950	1963	5-3	5-27	6-3	6-12
	1964	5-4	5-29	5-29	6-22
'Glasnevin' pedigree	1962	5-10	6-4		7-7
Ireland P.I. 265,343	1963	5-18	5-31		6-25
	1964	5-18	6-9	6-13	7-1
'Heraf' Holland	1962	6-1	6-20		7-20
P.I. 265,344	1963	5-29	6-17	6-25	7-15
	1964	5-28	6-19	6-25	7-9

Table 1. Continued. Dates of head emergence and flowering for varieties of perennial ryegrass at Corvallis, Oregon (1960-1964)

Varieties	Year	Head emergence	Period when flowering was observed: First day	Periods of profuse flowering	Last day
Linn	1960	4-30	5-26	5-31	6-16
	1961	4-28	5-18		6-2
	1962	5-4	5-28		6-22
	1963	5-3	5-27	5-29 to 6-10	6-12
	1964	4-24	5-26	5-29 to 6-9	6-19
N. Zealand Cert. Mother Seed	1960	—	5-26	5-31	6-16
P.I. 265,345	1961	4-28	5-22		6-2
	1962	5-4	5-28		7-7
	1963	5-7	5-27	5-31 to 6-3	6-12
	1964	4-28	5-26	5-29 to 6-9	6-19
N. Zealand Perm. pasture	1962	5-4	5-28		7-7
P.I. 265,346	1963	5-3	5-27	6-3	6-12
	1964	4-28	5-29	5-29 to 6-9	6-22
P.I. 266,113	1962	5-4	5-28		6-28
New Zealand	1963	5-9	5-29	5-31 to 6-3	6-12
	1964	5-4	5-29	6-1	6-22
Norlea, Canada	1961	5-26	6-12	6-16	6-26
	1962	5-28	6-22	6-28	7-16
	1963	5-31	6-17	6-25	7-15
	1964	5-25	6-9	7-1	7-11
N9-3 Northrup King	1962	6-4	6-22	6-28	7-16
	1963	5-31	6-25		7-20
	1964	5-28	6-19	6-22 to 7-3	7-13
N9-4 Northrup King	1962	5-24	6-15	6-28	7-16
	1963	5-19	6-10		7-15
	1964	5-21	6-9	6-19 to 6-25	7-9
N9-5 Northrup King	1962	5-8	6-1		7-7
	1963	5-7	5-27	6-3	6-25
	1964	5-11	6-9	6-9 to 6-19	7-3
RvP Hay	1960	—	5-27		6-16
Belgium	1961	4-28	5-24		6-26
	1962	5-10	6-4		7-16
	1963	5-16	5-31	6-10	6-25
	1964	5-8	6-1	6-13 to 6-19	7-3
RvP Pasture	1961	6-18	6-26		7-6
Belgium	1962	6-18	7-3	7-9 to 7-16	7-27
	1963	6-11	6-25	7-9 to 7-15	7-18
	1964	6-8	6-25	7-3 to 7-6	7-20
Sceempter Pasture	1962	5-30	6-18	7-7 to 7-9	7-27
P.I. 267,347	1963	5-29	6-17		7-16
	1964	5-21	6-19	6-25 to 7-3	7-16

Table 1. Continued. Dates of head emergence and flowering for varieties of perennial ryegrass at Corvallis, Oregon (1960-1964)

Varieties	Year	Head emergence	Period when flowering was observed: First day	Periods of profuse flowering	Last day
'Stensballe III' Early	1962	5-10	6-4	6-22 to 6-28	7-9
Denmark P.I. 265,948	1963	5-16	6-3		6-26
	1964	5-15	6-9	6-13 to 6-22	7-3
Svensk 01408, No. S.5	1962	5-15	6-15	6-22 to 6-28	7-16
Sweden P.I. 265,335	1963	5-18	6-10		6-25
	1964	5-21	6-13	6-13 to 6-22	7-3
'Verna III' Early	1962	5-5	6-1		6-28
Denmark P.I. 265,949	1963	5-3	5-27	6-11	6-17
	1964	5-8	6-9	6-9 to 6-13	6-25
'Victor III' Trifolium	1963	5-9	5-27		
Denmark	1964	4-24	5-29	6-3 to 6-9	7-3
'Viktoria' A No. 8	1962	5-10	6-4	6-22 to 6-28	7-12
P.I. 265,336 Sweden	1963	5-7	6-10		6-25
Weibull's, Sweden	1963	5-18	5-31		6-25
	1964	5-11	6-3	6-9 to 6-22	7-1
37-S. Chile	1962	5-4	5-28		7-7
P.I. 265,351	1963	5-3	5-27	5-31 to 6-3	6-12
	1964	4-28	5-26	5-29 to 6-1	6-19

Table 2. Dates of head emergence and flowering for varieties of annual ryegrass at Corvallis, Oregon (1960-1964)

Varieties	Year	Head emergence	Period when flowering was observed: First day	Periods of profuse flowering	Last day
Annual Oregon	1960	5-10	5-23		6-7
	1961	5-17	5-31		6-16
	1962	5-20	6-11		6-28
	1963	5-20	5-29		6-25
	1964	5-15	6-2	6-13 to 6-22	7-1
Aberystwyth S. 22	1963	5-18	6-7		6-25
	1964	5-15	6-9	(moderate 6-9)	6-22
'Billion' N9-127	1962	5-20	6-11		7-9
Northrup King	1963	5-18	6-7	6-10 to 6-11	6-25
	1964	5-15	6-3	6-9 to 6-19	6-25

Table 2. Continued. Dates of head emergence and flowering for varieties of annual ryegrass at Corvallis, Oregon (1960-1964)

Varieties	Year	Head emergence	Period when flowering was observed: First day	Periods of profuse flowering	Last day
'Elete' Trifolium	1963	5-18	5-31	6-10	6-17
	1964	5-15	6-3	6-9	6-25
F.A.T. Vilmorin	1963	5-16	5-29	6-7	6-17
	1964	5-11	6-2	6-9	6-19
Florida Rust Resistant	1960	4-18	5-18		6-3
	1961	4-25	5-17	5-19	6-2
	1963	5-7	5-25	5-27 to 5-31	6-10
	1964	4-24	5-23	5-28 to 6-3	6-13
'Gulf'	1960	—	5-23		6-7
	1961	4-28	5-18		6-8
	1962	5-20	5-30		6-28
	1963	5-7	5-27		6-17
	1964	4-24	5-28	6-3 to 6-10	6-19
N9-7 Northrup King	1961	5-8	5-31		6-16
	1962	5-20	6-11		7-9
'Rina' P. I. 265,338 France	1961	5-8	5-31		6-16
	1962	5-27	6-11		6-28
	1963	5-16	5-31	6-11	6-25
	1964	5-15	6-2	6-9 to 6-13	6-15
'Rita' P.I. 265,339	1961	5-12	5-31		6-16
	1962	5-20	6-11		7-9
	1963	5-16	6-7		6-25
	1964	5-11	6-3	6-9	6-19
State College No. 1 Mississippi	1961	4-28	5-18		6-2
	1962	5-22	5-30	6-11	7-3
	1963	5-9	5-27		6-17
	1964	4-28	5-28	6-2 to 6-13	6-19
State College No. 2 Mississippi	1961	4-27	5-18		6-8
	1962	5-22	5-30		6-28
	1963	5-9	5-27		6-17
	1964	4-28	5-28	6-3 to 6-13	6-19
State College No. 3 Mississippi	1961	4-28	5-18		6-8
	1962	5-22	5-30		6-22
	1963	5-8	5-27		6-17
	1964	4-28	5-28	5-29 to 6-13	6-19
State College No. 4 Mississippi	1961	4-27	5-17		6-16
	1962	5-22	5-30		6-26
	1963	5-7	5-27	5-29 to 5-31	6-17
	1964	4-24	5-28	5-28 to 6-13	6-19

Table 2. Continued. Dates of head emergence and flowering for varieties of annual ryegrass at Corvallis, Oregon (1960-1964)

Varieties	Year	Head emergence	Period when flowering was observed: First day	Periods of profuse flowering	Last day
State College No. 5	1961	4-26	5-17		6-16
Mississippi	1962	5-22	5-30		6-26
	1963	5-9	5-27	6-11	6-25
	1964	4-24	5-28	5-29 to 6-10	6-19
Stoneville No. 1	1960	—	6-7		6-16
Mississippi	1961	5-8	5-31		6-9
	1962	5-22	6-11		6-28
	1963	5-18	6-7		6-25
	1964	5-15	6-3	6-10 to 6-13	6-25
Stoneville No. 2	1960	—	5-31		6-16
Mississippi	1961	5-8	5-25		6-16
	1962	5-22	6-4		6-28
	1963	5-18	6-7	6-11	6-25
	1964	5-15	6-2	6-9 to 6-13	6-25
Stoneville No. 3	1960	—	5-31		6-16
Mississippi	1961	4-29	5-23		6-12
	1962	5-22	6-11		6-26
	1963	5-17	5-31	6-11	6-25
	1964	5-11	6-2	6-9 to 6-13	6-25
'Tetrone'	1963	5-18	5-31	6-10	6-25
	1964	5-11	6-2	6-9 to 6-13	6-19
'Tifton No. 1'	1960	—	5-26		6-16
Georgia	1961	5-8	5-30		6-8
	1962	5-12	6-1		6-28
	1963	5-16	5-27	6-7 to 6-10	6-17
	1964	5-11	6-2	6-2 to 6-9	6-19
'Viktoria' Svalof	1963	5-11	5-31	6-10	6-25
	1964	5-4	6-1	6-2 to 6-13	6-15
Vilmorin P.I. 265,337	1961	5-8	5-31		6-9
France	1962	5-20	6-11		7-3
	1963	5-16	5-29	6-7 to 6-10	6-17
	1964	5-4	6-1	6-9 to 6-10	6-19
Westerwolth Barenza	1961	5-17	6-2		6-16
Holland	1963	5-22	6-7		6-25
	1964	5-21	6-9	(moderate 6-10 to 6-13)	6-25

Table 3. Dates of head emergence and flowering for varieties of orchardgrass at Corvallis, Oregon (1960-1964)

Varieties	Year	Head emergence	Period when flowering was observed		
			First day	Periods of profuse flowering	Last day
'Aberystwyth S. 37'	1963	5-7	5-29	6-7 to 6-11	6-25
	1964	4-17	5-23	5-28 to 6-13	6-26
Aberystwyth S. 143	1960[1]	4-30	5-31	6-11	6-18
	1961[1]	5-1	5-25		6-16
	1963[2]	5-19	6-7	6-17	6-27
	1964[2]	5-18	6-1	6-13	7-1
'Akaroa'	1960	4-18	5-31	6-11	6-18
	1961	4-25	5-19	6-8	6-16
'Boone' Kentucky	1963	5-1	5-24	5-27 to 6-10	6-20
	1964	4-10	5-26	5-28 to 6-3	6-19
Chinook	1963	4-30	5-22	5-27 to 6-7	6-17
	1964	4-10	5-23	5-28 to 6-3	6-10
Combi (J.)	1963	5-15	6-6	6-10 to 6-11	6-25
	1964	4-28	5-28	6-10 to 6-13	6-26
Commercial domestic	1960	4-15	5-27		6-13
	1961	4-22	5-16		6-16
	1963	5-2	5-26	5-29 to 6-11	6-20
	1964	4-20	5-26	5-28 to 6-10	6-19
Commercial Danish	1960	4-17	5-27	6-11 to 6-13	6-14
	1961	4-27	5-16		6-16
	1963	5-7	5-27	6-7 to 6-11	6-20
	1964	4-20	5-26	6-1 to 6-10	6-19
'Frode' Sweden	1963	5-16	6-1	6-10 to 6-11	6-25
	1964	4-28	6-1	6-10 to 6-13	6-21
Iowa No. 1	1960	4-18	5-31		6-14
	1961	4-28	5-17		6-16
Latar	1960	4-30	5-31	6-11 to 6-13	6-18
	1961	5-1	6-7		6-16
	1963	5-15	6-6	6-11 to 6-17	6-27
	1964	4-28	6-1	6-13 to 6-26	7-1
'Masshardy'	1963	5-16	6-7	6-17	6-27
	1964	5-4	6-1	6-26	7-6
Pennlate	1960	5-6	6-7	6-11 to 6-13	6-18
	1961	5-1	6-8		6-16
	1963	5-18	6-7	6-11 to 6-17	6-27
	1964	5-13	6-1	6-13	7-1
'Pennmead'	1960	4-30	5-31		6-16
	1961	4-26	5-18		6-16

[1] Domestic-produced seed from Soil Conservation Service.

[2] Stock seed from England.

Table 3. Continued. Dates of head emergence and flowering for varieties of orchardgrass at Corvallis, Oregon (1960-1964)

Varieties	Year	Head emergence	Period when flowering was observed		
			First day	Periods of profuse flowering	Last day
Pennsylvania Early Syn.	1960	4-30	5-31		6-13
	1961	4-28	5-24		6-16
'Potomac'	1960	4-28	5-27		6-14
	1961	4-27	5-19		6-16
	1963	5-3	5-27	5-29 to 6-11	6-20
	1964	4-17	5-26	5-28 to 6-10	6-19
'Sterling'	1960	4-18	5-28		6-18
	1961	4-28	5-18	6-8	6-16
	1963	5-3	5-27	5-29 to 6-11	6-20
	1964	4-17	5-28	6-1 to 6-10	6-19
Wisconsin 52	1963	5-2	5-29	5-29 to 6-11	6-20
	1964	4-20	5-26	5-28 to 6-10	6-19