

SEED YIELD PERFORMANCE AND FLOWERING INITIATION OF TWELVE RED CLOVER VARIETIES (YEAR 1)

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Introduction

Forage legume seed crops, such as red clover (*Trifolium pratense* L.), continue to be a vital part of seed production enterprises and a valuable rotation crop for grass seed and cereal crops grown in Oregon. Red clover, a biennial seed crop, is the most widely grown legume species in Oregon. According to OSU Extension seed crop estimates, the estimated value of red clover seed produced in Oregon in 2018 was \$11.5 million, with approximately 20,000 acres harvested (Anderson, 2019). Consistent seed movement and decent prices have allowed this crop to be a profitable rotation in Oregon field cropping systems for many years.

The most commonly grown clover variety in Oregon is 'Medium Red'. While its origins are speculated, this variety has not been recognized as a certified variety for many years. It has high yield potential, possibly due to environmental adaptation, but does not always fulfill the highest quality and performance characteristics desired by end users. Breeding efforts in the U.S. and elsewhere have resulted in the release of new genetic material, but seed yield potential for many of these varieties is unknown, and seed growers are hesitant to plant them.

The objectives of this 2-year study were to measure the seed yield potential of 12 red clover varieties. 'Medium Red' and another historically common variety ('Kenland') were used as control treatments. We also evaluated percent bloom from early inflorescence emergence to harvest in order to better understand flowering length and crop maturity differences between varieties. Results from the first year of this study are presented in this report.

Materials and Methods

The field trial was planted on September 27, 2018 at OSU's Hyslop Research Farm. Plot size was 8 feet x 40 feet. The experimental design for this trial was a randomized complete block with four replications. In addition to the controls, ten proprietary varieties were entered from seven different seed companies.

The following red clover varieties were included as treatments:

- 'Medium Red' (control)
- 'Kenland' (control)

- 'Blaze'
- 'Vulcano'
- 'Freedom! MR'
- 'Redomon'
- 'CISCO'
- 'Relish'
- 'FS3662'
- 'Secretariat'
- 'Dynamite'
- 'DLFPS-102/3'

Preplant fertilizer included nitrogen (N), sulfur (S), and boron (B) at 25 lb N/acre, 21 lb S/acre, and 2 lb B/acre. Fertilizer was broadcast and incorporated before planting. All red clover seed was inoculated with N-Dure true clover inoculant and planted at a rate of 7.5 lb/acre with 6-inch row spacing using a conventional drill. Due to extended dry weather in the fall, 0.5 inch of irrigation was applied with an overhead linear system on September 15 and September 17 to ensure uniform stand emergence. Routine herbicide, molluscicide, and insecticide treatments were applied to manage pests as needed. Spring N was applied to all plots at a rate of 20 lb N/acre. An additional 4 inches of irrigation was applied on May 7 due to abnormally dry conditions. All plots were flailed to a height of 2–3 inches on May 22 and in the reverse direction on May 24. When regrowth reached the two-node growth stage (BBCH 32), trinexapac-ethyl plant growth regulator (Palisade EC) was applied at a rate of 2 pt/acre. A final irrigation of 4 inches of water was applied on June 21. Pollination was aided by honeybee hives placed nearby and by the presence of native bumblebees.

Above-ground biomass samples were taken from each plot near crop maturity, and dry weight of the standing crop was determined. Inflorescence number and number of florets/inflorescence were determined from the above-ground biomass samples.

Plots were swathed with a modified John Deere 2280 swather and combined with a Hege 180 plot combine. Subsamples of harvested seed were collected from each plot and were cleaned using a Clipper M2B cleaner to determine cleanout percentage and clean

seed yield. Seed weight was determined by counting two 1,000-seed samples with an electronic seed counter and weighing these samples on a laboratory balance. Harvest index (HI), the ratio of seed yield to above-ground biomass, was also quantified.

Results and Discussion

In this first-year trial, seed yields from ‘Medium Red’ and ‘Kenland’ were 499 and 356 lb/acre, respectively (Table 1). Four varieties, including ‘Redomon’, ‘Secretariat’, ‘Dynamite’, and ‘DLFPS-102/3’, produced significantly higher seed yields compared to ‘Kenland’, while ‘Dynamite’ was the only variety that produced a significantly higher seed yield (14%) than ‘Medium Red’. All other varieties produced seed yields equal to or lower than the controls.

The two varieties with the highest seed yields, ‘Secretariat’ and ‘Dynamite’, had larger seed numbers compared to the two controls (Table 1). There were mixed effects on seed weight, with some varieties producing lower seed weights compared to the controls and some having higher seed weights. There were no differences in above-ground biomass between varieties. Both ‘Relish’ and ‘Secretariat’ had a higher inflorescence number compared to the controls. Inflorescences from all varieties contained floret numbers that were equal to or less than both controls. The HI for ‘Medium Red’ was significantly higher than for ‘Kenland’. All other varieties had a lower HI

compared to ‘Medium Red’ except for ‘Secretariat’ and ‘Dynamite’, which were statistically the same.

Flowering initiation varied between varieties (Table 2). ‘Vulcano’, ‘FS3662’, and ‘Secretariat’ began flowering earlier than all other varieties, but differences were less apparent by the second week of bloom. There were some differences in percent flowering near the end of bloom; however, only one variety, ‘FS3662’ reached full bloom earlier than all other varieties. There is no obvious trend that would indicate a relationship between flowering initiation and seed yield.

This is the first year of a 2-year trial. Results for year 2 of the trial will be reported in the 2020 OSU seed production research report.

References

Anderson, N.P. 2019. Extension estimates for Oregon legume seed crop acreage and production, 2018. <https://cropandsoil.oregonstate.edu/seed-crops/oregon-grass-and-legume-seed-production>

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Table 1. First-year seed yield, yield components, and growth characteristics of 12 red clover varieties.¹

Variety	Seed company	Seed yield	Cleanout	Seed weight	Seed number	Biomass	Inflorescences	Florets/inflorescence	Harvest index
		(lb/a)	(%)	(mg/seed)	(no./m ²)	(kg/ha)	(no./ft ²)	(no.)	(%)
Medium Red	—	499 ef	11.2 c	1.741 ef	31.8 d	5,939	46 a	115 cde	9.5 cd
Kenland	—	356 bc	7.3 b	1.688 cdef	23.3 b	6,288	49 ab	118 de	6.8 ab
Blaze	Mountain View	344 abc	3.5 a	1.715 def	22.3 ab	6,014	50 ab	113 bcde	6.8 ab
Vulcano	Gentos	314 ab	4.0 a	1.609 abc	21.5 ab	5,619	39 a	116 de	6.6 ab
Freedom! MR	Barenbrug USA	386 cd	5.4 ab	2.150 g	19.8 a	6,710	55 abcd	105 ab	6.6 ab
Redomon	Van Dyke Seed	481 e	6.6 ab	1.620 abcd	33.0 de	7,100	50 ab	123 e	7.8 bc
CISCO	Van Dyke Seed	353 bc	4.6 ab	1.579 ab	24.5 bc	7,268	47 a	120 e	5.5 a
Relish	PGG Wrightson	295 a	14.7 d	1.636 bcd	19.8 a	6,055	71 cd	106 abc	6.1 ab
FS3662	PGG Wrightson	302 a	12.0 cd	1.526 a	22.0 ab	4,982	69 bcd	102 a	6.9 ab
Secretariat	PGG Wrightson	542 fg	7.4 b	1.644 bcde	36.3 e	6,705	73 d	114 cde	9.5 cd
Dynamite	Grassland Oregon	568 g	10.6 c	1.772 f	35.5 e	5,626	52 abc	109 abcd	11.5 d
DLFPS-102/3	DLF Pickseed	411 d	11.5 c	1.660 bcde	27.5 c	5,987	56 abcd	119 e	7.8 bc
<i>P</i> -value		0.0000	0.0000	0.0000	0.0000	0.3679	0.0287	0.0007	0.0002

¹Numbers followed by the same letter are not significantly different at LSD (0.05).

Table 2. Percent bloom from flowering initiation to full bloom in 12 red clover varieties.¹

Variety	Seed company	June 20	June 28	July 5	July 12	July 19
		----- (% bloom) -----				
Medium Red	—	2.8 a	16.3 cde	50.0 c	83.8 ab	100.0
Kenland	—	2.0 a	17.5 de	50.0 c	88.8 bcd	100.0
Blaze	Mountain View	1.8 a	13.8 bc	37.5 b	88.8 bcd	100.0
Vulcano	Gentos	8.8 b	15.0 cd	36.3 b	86.3 abc	100.0
Freedom! MR	Barenbrug USA	2.0 a	16.3 cde	48.8 c	91.3 cd	100.0
Redomon	Van Dyke Seed	1.8 a	10.0 a	28.8 a	81.3 a	100.0
CISCO	Van Dyke Seed	1.8 a	11.3 ab	36.3 b	86.3 abc	100.0
Relish	PGG Wrightson	2.0 a	13.8 bc	52.5 c	90.0 cd	100.0
FS3662	PGG Wrightson	10.0 c	17.5 de	60.0 d	97.3 e	100.0
Secretariat	PGG Wrightson	10.0 c	18.8 e	48.8 c	91.3 cd	100.0
Dynamite	Grassland Oregon	1.8 a	16.3 cde	50.0 c	90.0 cd	100.0
DLFPS-102/3	DLF Pickseed	2.0 a	18.8 e	50.0 c	92.5 de	100.0
<i>P</i> -value		0.0000	0.0001	0.0000	0.0003	

¹Numbers followed by the same letter are not significantly different at LSD (0.05).