**Table 3.** Crop yields at each rotation phase of two cropping systems at Moccasin, MT in 2009 and 2010 crop years.

**Phase I:** **Yield (kg ha-1) Oil Content (g kg-1)**

2009 969 ± 57a§ 347±13

2010 1088 ± 57a 339±17

Fallow (in Fallow-W. Wheat) 0 b

Camelina (in camelina-W. Wheat) 1144 ± 80a 343±15

**Phase II: Yield (kg ha-1) Protein (g kg-1)**

2009 1933 ± 80b 165±3.6a

2010 3082 ± 80a 119±3.6b

W. Wheat (in Fallow-W. Wheat) 2853 ± 113a 143±7.1a

W. Wheat (in camelina-W. Wheat) 2487 ± 113b 144±7.1a

§ Different letters following the values within year or rotation treatments indicate significant differences according to Protected LSD test at P≤0.05 level.

**Table 4.** Crop residue return to soil after crop harvest in two different cropping systems at Moccasin, MT during the 2009 and 2010 crop years.

**Phase I:** **Straw Yield (kg ha-1)**

2009 1498 ± 112b§

2010 1829 ± 112a

Fallow (in Fallow-W. Wheat) 0 b

Camelina (in camelina-W. Wheat) 2317 ± 159a

**Phase II: Straw Yield (kg ha-1)**

2009 2287 ± 91b

2010 3656 ± 91a

W. Wheat (in Fallow-W. Wheat) 3377 ± 128a

W. Wheat (in camelina-W. Wheat) 2920 ± 128b

§ Different letters following the values within year or rotation treatments indicate significant differences according to Protected LSD test at P≤0.05 level.

**Table 5.** Camelina yield and harvest index over three years following winter wheat in dryland crop rotation at SAREC near Lingle ,WY.

|  |  |  |
| --- | --- | --- |
| Year | Yield (lb/a) | Harvest index |
| 2008 | 314 B | NA |
| 2009 | 92 A | 18.3 |
| 2010 | 709 C | 24.8 |
| Mean | 371 | 21.4 |
| LSD 0.05 | 134 | NA |

**Table 6.** Comparison of winter wheat yield (bu/acre) over two years following camelina or fallow in dryland crop rotations at SAREC near Lingle ,WY.

|  |  |  |  |
| --- | --- | --- | --- |
| Year | 2009 | 2010 | Two year mean |
| Camelina | 3.2 | 24.1 | 13.7 |
| Fallow | 13.2 | 25.6 | 19.4 |
| Mean | 8.2 | 24.8 | 16.5 |
| LSD 0.05 | NS | NS | NS |

**Table 7.** Results from the commercially available camelina variety trials in 2009 at Lingle and Spotted Horse, WY.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ----------------------------Lingle Irrigated -------------------------- | | | | | | Spotted Horse Rainfed | |
| Cultivar | Lodging  % | Stand  % | 50% Bloom  June | Plant height  in | Test weight  lbs/bu | Grain yield  lbs/acre | Plant height  in | Grain yield  lbs/acre |
| Celine | 33 | 75 | 8 | 38 | 47.8 | 1225 | 28 | 392 |
| Ligena | 50 | 81 | 8 | 36 | 47.4 | 1048 | 30 | 378 |
| Calena | 14 | 78 | 8 | 37 | 49.9 | 1022 | 29 | 443 |
| Cheyenne | 25 | 81 | 8 | 37 | 49.9 | 965 | 29 | 349 |
| MT-5 | 30 | 84 | 7 | 37 | 49.7 | 938 | 26 | 261 |
| Jungle Gold | 53 | 79 | 9 | 36 | 50.1 | 801 | 28 | 254 |
| MT-1 | --- | --- | --- | --- | --- | --- | 28 | 261 |
| **Mean** | 34 | 80 | 8 | 37 | 49.1 | 1000 | 28 | 334 |
| **LSD (0.05)** | 26 | 8 | 0.5 | NS | NS | 189 | 3 | 210 |

Harvest index for Lingle irrigated = 31.6, Spotted Horse rainfed = 13.6

**Table 8.** Summary of results from a 2009 advanced experimental line irrigated nurseries at SAREC near Lingle , WY.

|  |  |  |
| --- | --- | --- |
| **Top three lines** | **Lingle**  **Yield lb/acre** | **Lagrange**  **Yield lb/acre** |
| CS6 | 2300 | 457 |
| CS32 | 2173 | 447 |
| CS2 | 2163 |  |
| CS33 |  | 434 |
| **Trial mean** | 2004 | 378 |
| **LSD (0.05)** | 304 | 108 |

**Table 9.** Dry matter intake and growth performance of developing replacement beef heifers fed supplements1 for 60 d before the breeding season.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Control | Camelina | Glycerin | SE2 | *P*-value |
| DMI, kg |  |  |  |  |  |
| Forage | 6.67 | 6.64 | 6.67 | 0.01 | 0.187 |
| Total | 7.60 | 7.57 | 7.56 | 0.01 | 0.089 |
| BW, kg |  |  |  |  |  |
| d 0 | 297.4 | 296.7 | 296.5 | 0.6 | 0.585 |
| d 30 | 330.5 | 328.2 | 329.0 | 1.3 | 0.440 |
| d 60 | 356.2 | 354.6 | 356.3 | 1.1 | 0.495 |
| 60-d gain, kg | 59.3 | 57.3 | 58.9 | 1.1 | 0.221 |
| ADG, kg/d |  |  |  |  |  |
| d 0 to 30 | 1.14 | 1.09 | 1.12 | 0.04 | 0.589 |
| d 31 to 60 | 0.85 | 0.87 | 0.88 | 0.04 | 0.630 |

1Supplements (as-fed) consisted of 50% finely ground corn and 50% soybean meal (Control), mechanically extracted camelina meal (Camelina), and 50% soybean meal, 33% finely ground corn, 15% crude glycerin, and 2% corn gluten meal (Glycerin). Supplements were provided at 0.95 and 0.99 kg·heifer-1·d-1 (as-fed) during d 0 through 30 and d 31 through 60, respectively. Hay was offered immediately after supplements were consumed. On the next morning, any hay remaining in the bunks was removed before offering the supplements, weighed and recorded for forage DMI estimate.

2n = 10/treatment.

**Table 10.** Mean concentrations of fatty acids in plasma (mg of fatty acid/g of freeze dried plasma) of developing replacement beef heifers fed supplements1 for 60 d before the breeding season.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fatty acids | Control | Camelina | Glycerin | SE2 | *P-*value |
| 14:0 | 0.20 | 0.16 | 0.17 | 0.018 | 0.540 |
| 14:1 | 0.134b | 0.117a | 0.124ab | 0.004 | 0.014 |
| 15:0 | 0.17 | 0.18 | 0.17 | 0.007 | 0.502 |
| 15:1 | 0.22 | 0.23 | 0.22 | 0.006 | 0.409 |
| 16:0 | 2.59a | 2.76b | 2.59a | 0.051 | 0.047 |
| 16:1*trans-*9 | 0.41a | 0.51b | 0.44ab | 0.025 | 0.042 |
| 16:1*cis-*9 | 0.25 | 0.27 | 0.25 | 0.008 | 0.096 |
| 17:0 | 0.17 | 0.15 | 0.16 | 0.005 | 0.304 |
| 17:1 | 0.06 | 0.06 | 0.06 | 0.006 | 0.944 |
| 18:0 | 3.36 | 3.85 | 3.48 | 0.151 | 0.070 |
| 18:1*trans-*11 | 0.18a | 0.35b | 0.21a | 0.037 | 0.003 |
| 18:*1trans-*12 | 0.001a | 0.04b | 0.01ab | 0.010 | 0.067 |
| 18:1*trans-*13 | 0.01a | 0.15b | 0.03b | 0.025 | 0.002 |
| 18:1*cis-*9 | 2.26a | 3.00b | 2.39a | 0.194 | 0.025 |
| 18:1*cis-*10 | 0.11a | 0.12b | 0.11a | 0.005 | 0.032 |
| 18:1*cis-*11 | 0.01a | 0.10b | 0.03a | 0.032 | 0.027 |
| 18:1*cis-*12 | 0.00a | 0.04b | 0.003a | 0.007 | 0.002 |
| 18:2*n-*6 | 4.67a | 5.18b | 4.60a | 0.129 | 0.009 |
| 20:1*n-*9 | 0.14 | 0.15 | 0.14 | 0.009 | 0.615 |
| 18:3*n-*3 | 1.85a | 2.47b | 1.99a | 0.137 | 0.012 |
| CLA3 | 0.02a | 0.03b | 0.02a | 0.004 | 0.003 |
| 20:3*n-*6 | 0.30 | 0.29 | 0.29 | 0.008 | 0.595 |
| 22:1*n-*9 | 0.00a | 0.01b | 0.00a | 0.002 | 0.001 |
| 20:4*n-*6 | 0.60 | 0.65 | 0.61 | 0.016 | 0.071 |
| 20:5*n-*3 | 0.37 | 0.43 | 0.38 | 0.019 | 0.121 |
| 22:5*n-*3 | 0.27 | 0.26 | 0.27 | 0.008 | 0.415 |
| 22:6*n-*6 | 0.10 | 0.10 | 0.11 | 0.009 | 0.695 |
| Unidentified4 | 1.84 | 2.20 | 2.08 | 0.305 | 0.583 |
| *Trans-*isomers5 | 0.60a | 1.07b | 0.71a | 0.103 | 0.008 |
| *Cis-*isomers6 | 9.14a | 11.19b | 9.38a | 0.473 | 0.010 |
| UFA7 | 11.95a | 14.60b | 12.31a | 0.627 | 0.012 |
| Total | 20.29a | 23.90b | 20.96a | 1.069 | 0.033 |

1Supplements (as-fed) consisted of 50% finely ground corn and 50% soybean meal (Control), mechanically extracted camelina meal (Camelina), and 50% soybean meal, 33% finely ground corn, 15% crude glycerin, and 2% corn gluten meal (Glycerin).

2n = 5 pens/treatment with 3 sampling times (d 0, 30, and 60) in both yrs = 30/treatment.

3CLA = *cis-*9, *trans-*11-CLA.

4Fatty acids not identified with purified standards.

5*Trans*-isomers = 16:1*trans-*9 + 18:1*trans-*10 + 18:1*trans-*11 + 18:1*trans-*12 + 18:1*trans-*13.

6*Cis*-isomers = 16:1*cis-*9 + 18:1*cis-*9 + 18:1*cis-*10 + 18:1*cis-*11 + 18:1*cis-*12 + 18:2*n-*6 + 18:3*n-*3.

7UFA = unsaturated fatty acids = 14:1 + 15:1 + 17:1 + 20:1*n-*9 + CLA + 20:3*n-*6 + 22:1*n-*9 + 20:4*n-*6 + 20:5*n-*3 + 22:5*n-*3 + 22:6*n-*6 + *trans*-isomers + *cis*-isomers.

a,bWithin a row, means without a common superscript differ (*P* < 0.05).

**Table 11.** Mean concentrations of thyroid hormones (T4 and T3), glucose, insulin, and β-hydroxybutyrate (BHBA) in serum of developing replacement beef heifers fed supplements1 for 60 d before the breeding season.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Control | Camelina | Glycerin | SE2 | *P*-value |
| T4, ng/mL | 40.4 | 40.4 | 40.9 | 1.5 | 0.956 |
| T3, ng/mL | 0.89a | 0.97b | 0.90a | 0.02 | 0.045 |
| Glucose, mg/dL | 66.6 | 67.0 | 66.0 | 0.7 | 0.585 |
| Insulin, ng/mL | 0.12 | 0.11 | 0.10 | 0.01 | 0.440 |
| BHBA, µmol/L | 139.5 | 140.3 | 148.2 | 5.3 | 0.461 |

1Supplements (as-fed) consisted of 50% finely ground corn and 50% soybean meal (Control), mechanically extracted camelina meal (Camelina), and 50% soybean meal, 33% finely ground corn, 15% crude glycerin, and 2% corn gluten meal (Glycerin).

2n = 5 pens/treatment with 3 sampling times (d 0, 30, and 60) in both yrs = 30/treatment.

a,bWithin a row, means without a common superscript differ (*P* < 0.05).

**Table 12.** Reproductive performance of developing replacement beef heifers fed supplements1 for 60 d before being synchronized for estrus2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Control | Camelina | Glycerin | SE3 | *P*-value |
| Detected in estrus, % | 42.7 | 41.5 | 48.2 | 8.3 | 0.825 |
| Pregnancy rates to AI, % |  |  |  |  |  |
| By heat4 | 54.2 | 53.3 | 49.3 | 13.6 | 0.965 |
| Timed-AI5 | 24.2a,b | 43.2b | 17.5a | 6.2 | 0.046 |
| Overall6 | 37.1 | 45.2 | 34.0 | 7.5 | 0.577 |
| Final pregnancy rate7, % | 61.0 | 71.2 | 62.1 | 5.3 | 0.376 |

1Supplements (as-fed) consisted of 50% finely ground corn and 50% soybean meal (Control), mechanically extracted camelina meal (Camelina), and 50% soybean meal, 33% finely ground corn, 15% crude glycerin, and 2% corn gluten meal (Glycerin).

2On d 60 and 70, each heifer received an intramuscular injection containing a 25 mg of PGF2α. Heifers were artificially inseminated 12 h after estrus was first detected. Heifers that were not detected in estrus were given an intramuscular injection containing 100 µg of GnRH (Fertagyl, Intervet, Inc., Millsboro, DE) at 0800 and artificially inseminated by 66 h after the second PGF2α injection. Any heifer detected in estrus by d 75 was inseminated again 12 h after they were detected in estrus.

3n = 10/treatment.

4First-service pregnancy rate of heifers bred 12 h after being detected in estrus.

5First-service pregnancy rates of heifers bred via timed-AI on d 74 after a 2 mL injection of GnRH.

6Overall first-service pregnancy rates.

7Final pregnancy rates after first-service AI, second-service AI (yr 1) and bull exposure (yr 2).

a,bWithin a row, means without a common superscript differ (*P* < 0.05).

**Table 13.** Daily cost of supplementing developing replacement beef heifers fed the control, camelina meal, and crude glycerin supplements1 for 60 d before the breeding season.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | % | kg·heifer-1·d-1 | $/kg2 | Cost $·heifer-1·d-1 |
| Control |  |  |  |  |
| Soybean meal | 50 | 0.49 | 0.33 | 0.16 |
| Finely ground corn | 50 | 0.49 | 0.20 | 0.10 |
| Total | 100 | 0.97 |  | 0.26 |
| Glycerin |  |  |  |  |
| Soybean meal | 50 | 0.49 | 0.33 | 0.16 |
| Finely ground corn | 33 | 0.32 | 0.20 | 0.06 |
| Crude glycerin | 15 | 0.14 | 0.11 | 0.02 |
| Corn gluten meal | 2 | 0.02 | 1.11 | 0.02 |
| Total | 100 | 0.97 |  | 0.26 |
|  |  |  |  |  |
| Camelina meal | 100 | 0.97 | 0.20 | 0.19 |

1Supplements (as-fed) consisted of 50% finely ground corn and 50% soybean meal (Control), mechanically extracted camelina meal (Camelina), and 50% soybean meal, 33% finely ground corn, 15% crude glycerin, and 2% corn gluten meal (Glycerin).

2Total cost of camelina meal was equal to the cost of camelina seeds ($0.12/kg) plus the cost ($0.08/kg) of transporting seed to and meal from the processing plant.