Project Title: Canola Planting Date and Population Study – 2016.

Objective: To identify the optimum canola planting date and density for northwestern Montana.

Materials and Methods:

The factorial treatment arrangement consisted of two canola varieties, three seeding dates and three plant densities. The two varieties selected were DKL 30-03 and DKL 70-07, representing early and late maturity groups, respectively. The three seeding dates were April 13, May 3, and May 16. The first seeding date was the earliest date we could get into the field. Subsequent planting dates were targeted at increments of 300 growing degree days at base 32F (GDD32), which represents the number of GDD necessary for the first true leaves to emerge. 347 GDD separated the first and second seeding date and 285 GDD had accumulated between the second and third date. Targeted plant densities were 4, 8, and 16 plants per square foot. Seeding rates were calculated using the following formula: lb/A = (9.6 x desired plant density per sqft x thousand kernel weights) / percent survival (Table 1). The experimental design was a split plot randomized complete block with three replications, where the main plot factor was seeding date, and the sub plot factor consisted of plant density and variety combinations.

Soil test results showed 116-22-250-46 pounds of available nutrients and a fertilizer blend of 125-30-30-20 was broadcast and incorporated one day prior to each seeding date. Each seeding date was treated with glyphosate, Warrior II, and Endura for the control of weeds, insects, and diseases, respectively.

An economic analysis was performed for each treatment by calculating adjusted gross returns (AGR). Adjusted gross returns were determined using a market price of $7.50/bu, multiplied by yield, minus the seed cost at $9.50/ lb.

Table 1. Seeding rates and associated costs.

Variety	TKW	Plant/sqft	Rate (lb/ac)	Seed cost per acrea @ $9.50/lb
DKL 30-03	4.997	4	2.6	24.3
DKL 30-03	4.997	8	5.1	48.6
DKL 30-03	4.997	16	10.2	97.2
DKL 70-07	4.841	4	2.5	23.5
DKL 70-07	4.841	8	5.0	47.1
DKL 70-07	4.841	16	9.9	94.2

Estimated survival rate: 75%

lb/A = (9.6 x TKW x Desired Plant Density)/75

Results:

Varietal differences were significant for flowering, lodging, height, yield, test weight, and adjusted gross returns (Table 2). DKL 30-03 was the earliest maturing variety, reaching flowering two days earlier than DKL 70-07. Although DKL 30-03 was the shortest variety, it had the greatest lodging. Biomass was similar between the two varieties, but DKL 70-07 produced an additional 6.4 bu/A compared to DKL 30-03. At the same time, DKL 70-07 was the most profitable, generating an additional $51.30 per acre as compared to DKL 30-03.

The plant density counts were taken prior to bolt (STAND 1) and at pod fill (STAND 2). The populations obtained in the field were, on average, very close to the targeted populations of 4, 8, and 16 plants/sqft (Table 3). The main effect of plant density had significant effects on several variables. As density increased, plant height decreased, and percent lodging increased. This year, but not in past years, yield increased with an increase in plant density. The most profitable seeding rate was 8 plants/sqft with an AGR of $414.90/A.

Of the three main effects, seeding date had the least influence on the response variables measured (Table 4). The number of days necessary to achieve fifty percent flowering decreased with delayed seeding. Additionally, the number of plants per square foot decreased with delayed seeding. The first two seeding dates achieved the greatest percent survival. No significant difference was observed in yield with delayed seeding. This is in contrast to the data from 2014 and 2015 were there was a significant yield reduction with delayed seeding. It is possible that the “cool” air temperatures (72-77°F) during flowering allowed for relatively consistent yields across all three seeding dates.

Summary:

In summary, the highest seed quality, greatest yield and adjusted gross return was afforded with a targeted plant density of 8 plants per square foot (Table 3).

Table 2. Main effect of variety on agronomic performance of canola - 2016.

	EMERG	FLWR	STAND 1	STAND 2	LOD	HT	YLD[1]	BIO	OIL[1]	TWT[1]	AGR
	dap	dap	sqft	sqft	%	in	bu/A	g/sqft	%	lb/bu	$/A
DKL 30-03	10	55	12.5	10.9	9.8	47.3	53.7	100.2	49.5	49.3	359.3
DKL 70-07	10	57	12.7	11.1	6.0	49.7	60.1	104.8	49.5	49.8	410.6
LSD	ns	0.4	ns	ns	2.5	0.9	4.0	ns	ns	0.2	31.05
Pr>0.05	0.7354	0.0001	0.6667	0.7101	0.0052	0.0001	0.0037	0.5145	0.6909	0.0001	0.0028

Table 3. Main effect of plant density on agronomic performance of canola - 2016.

	EMERG	FLWR	STAND 1	STAND 2	LOD	HT	YLD[1]	BIO	OIL[1]	TWT[1]	AGR
	dap	dap	sqft	sqft	%	in	bu/A	g/sqft	%	lb/bu	$/A
4 plants/ sqft	10	56	5.8	5.6	3.3	50.4	50.3	104.7	49.6	49.4	365.5
8 plants/sqft	10	56	11.5	10.4	7.4	48.7	59.7	103.4	49.6	49.5	414.9
16 plants/sqft	10	55	20.5	16.9	13.1	46.6	60.7	99.5	49.3	49.8	374.4
LSD	ns	ns	2.1	2.5	4.9	1.8	3.6	ns	ns	0.2	27.64
Pr>0.05	0.6912	0.3236	0.0001	0.0001	0.0036	0.0023	0.0001	0.8728	0.2081	0.003	0.0048

Table 4. Main effect of seeding date on agronomic performance of canola - 2016.

	EMERG	FLWR	STAND 1	STAND 2	LOD	HT	YLD[1]	BIO	OIL[1]	TWT[1]	AGR
	dap	dap	sqft	sqft	%	in	bu/A	g/sqft	%	lb/bu	$/A
4/13	12	60	13.9	11.4	8.7	46.5	53.4	94.7	49.4	49.4	358.3
5/3	7	56	14.0	12.3	11.9	47.2	57.3	123.7	49.8	49.6	388.4
5/16	10	50	9.8	8.6	3.2	51.9	59.9	89.2	49.2	49.8	408.1
LSD	0.5	0.4	2.1	ns	ns	4.0	ns	ns	ns	ns	ns
Pr>0.05	0.0001	0.0001	0.0078	0.1020	0.1584	0.0365	0.5155	0.0995	0.1889	0.2043	0.5155

FLWR: 50% flowering, dap: days after planting, STAND 1: plant density prior to bolt, STAND 2: plant density at pod fill, LOD: lodigng, HT: height, YLD: yield, BIO: biomass, TWT: test weight, AGR: adjusted gross return, ns: nonsignificant.
[1] adjusted to 8% moisture content.