

Nominate **safflower line C24 or Baldy** for use in bird and ruminant wildlife food plots, cover crop mixtures, annual late summer and fall graze and for grain (birdseed). It is suited to areas with elevations between 3300 to 2600 feet. Its tolerance to Alternaria blight is untested, therefore avoid higher humidity areas at this time.

C24 OR Baldy selected from the grow out of seeds from 3 spineless white flowered plants found as contaminates in two of the white flower entries of the Montana uniform oilseed safflower trial [lines 02B2108 2 plants and 07B6567 1 plant] in 2009. There was some variation in boll size and flowering date of the off spring. The spineless white flowered lines appear to have a good leaf retention (no leaf retention data recorded).

Table 1 presents the results of a 2014 May 1 seeded safflower trial seeding at the CARC. C24 ranked 7th and Baldy ranked 12th of 25 entries. At the Geraldine location, April 21 seed date, C24 ranked 3 and Baldy 10th. At Geraldine, both C24 and Baldy yields were similar to the high yield (P=0.05). Both lines were inserted into the Montana Uniform Oilseed Safflower trial in 2014 and 2013. In 2011, both C24 and Baldy produced seed yields similar to the birdseed standards Cardinal and Finch (P=0.05) [Table 4]. In 2013, both lines had yields lower than the mean of 36 entry trial [Table 5]. However, for both NARC trials, C24 and Baldy had test weights more than five lbs per bushel above the nursery means.

Why C24 OR Baldy in addition to C17? It is perceived that these two white flowered lines have a greater yield potential in longer season areas more suited to standard safflower varieties. Since the white flowered lines have a distinct visual difference from the red-orange flowered C17, there would be no chance of confusing the two lines. Because the white flowered lines have been evaluated just the last four years, no inference can be made on their performance in cooler growing season.

We do not have resources to spend on a minor use crop such as spineless safflower for habitat, forage and some grain production. The market has developed for spineless safflower amongst Ag producers and upland bird development enthusiast and they are asking, "When can they get some spineless safflower seed?" The cover crops for grazing forage is an emerging market, at present. The quantity of seed on hand needs to be verified. It is thought there is at least 50 lbs of seed for either one and maybe as much as 200 lbs.

Suggested name: Big Baldy. It is bald when it comes to spines and it has a white top like Baldy peak, in the little Belts, often has.



See safflower narrative at end of document.

Table 1 2014 CARC CC Spineless Safflower Development Line Evaluations 1477701
Exp 1477701 Central Agricultural Research Center, Moccasin, Montana

Code ID	Source	Entry	Flower	Flower	Plant	Seed	Test	Oil	Oil	Flower
			31-Jul	5-Aug	Ht14Oct	Yield	Weight	Content	Yield	Color
			%	%	cm	lbs/ac	lbs/bu	%	lbs/ac	
SaffD 14	orange	25	36	91	74	881	43.8	26.5	234	YO Y
C18	Short 6S C18	5	9	92	72	828				O rdd
C17	2013Sdpass53,54,5	4	11	93	68	778	43.3	26.3	204	O rdd
SaffD 24		23	11	94	74	749	43.9	25.5	171	Y O YO
A311	11Saf11	15	15	93	78	746	43.5	26.8	199	YO O Y
C16	red 13 S C16	3	10	96	72	715				OY
C24	C24	11	12	98	71	689	45.1	25.0	171	white
C21	4th S C21	8	13	97	67	685	43.7	26.5	181	O rdd
C22	11th S C22	9	8	96	69	682	44.6	24.8	170	YW
SaffD 13	orange	24	14	95	75	678				YO O
C14	Red 3 S C14	1	13	94	68	676	42.4	25.6	192	O rdd
C08	Baldy47 N C8	12	11	97	68	670	45.0	24.5	164	white
C19	5th S 105 C19	6	12	98	72	653				white
C20	12th S C20	7	7	95	70	645				white
A308	11Saf15	20	11	81	72	643	43.5	25.5	164	Y YO
A309	11Saf10	16	10	80	71	642				Y YO
C23	2S C23	10	8	98	72	635	44.0	24.0	153	white
C15	red 14 S C15	2	13	90	71	633	42.1	24.8	159	OY
A301	11Saf18	13	9	81	82	629				Y YO
A315	11Saf22	17	20	66	75	627				Y O spined,
A304	11Saf21	19	9	79	68	613				Y O
A303	11Saf17	21	13	85	73	611	43.2	26.3	161	Y O YO
A302	11Saf01	18	8	74	71	589	41.5	26.3	173	Y YO
A314	11Saf13	14	13	91	76	586				O YO
SaffD 11	orange	22	11	91	75	524	43.1	25.7	140	O rdd
Mean			12.19	89.79	72.16	672.2	43.5	25.59	175.7	
P-value			0.60	0.00		0.10	0.00	0.00	0.18	
CV1			96.6	6.7		19.0	2.5	3.3	21.4	
LSD(0.05 by t)			ns	8.49		180.3ns	1.814	1.398	ns	

Seeddate: May 1, 2014 into tilled CC winter wheat stubble.

Weed Control Fall applied trifluralin (1 lb ai/a), pre-emerge 1 pt glyphosate.

Hand weed field pennycress. The fpcr competed with safflower prior to being controlled.

Fertilizer: 10-10-10-05 NPKS w/seed. Top dress 45 N as urea, post plant

Harvest: 14-Oct-14

Table 2 2014 Geraldine Spineless Safflower Cultivar Evaluations 147772
 Exp 14777201 Central Agricultural Research Center, Moccasin, Montana

Code ID	Source	Entry	Flower 28-Jul	Plant Ht Oct 14	Seed Yield	Test Weight	Oil Content	Oil Yield	Blossom color
			%	cm	lbs/ac	lbs/bu	%	lbs/ac	
A302	11Saf01	18	25	87	1542	43.3	29.5	456	Y YO
C14	Red 3 S C14	1	40	78	1451	44.8	29.5	430	Orange
C24	C24	11	48	74	1411	43.5	26.8	377	white
C21	4th S C21	8	41	81	1410	45.0	29.8	418	Orange
C17	2013Sdpass53,54,	4	39	79	1403	43.5	29.8	415	Orange
A308	11Saf15	20	19	90	1391	44.3	29.0	402	Y YO
A301	11Saf18	13	28	82	1321				Y YO
SaffD 11	orange	22	34	88	1315	43.5	30.8	403	Orange
SaffD 13	orange	24	33	84	1303				YO O
C08	Baldy47 N C8	12	58	79	1302	44.3	26.8	347	white
SaffD 14	orange	25	39	81	1300	43.8	29.0	375	YO Y
C23	2S C23	10	49	77	1297	43.8	27.0	349	white
A304	11Saf21	19	21	84	1258				Y O
A311	11Saf11	15	31	85	1244	44.3	29.3	363	YO O Y
A309	11Saf10	16	20	82	1228				Y YO
C19	5th S 105 C19	6	51	75	1210				white
C22	11th S C22	9	51	76	1189	43.3	27.3	321	YW
SaffD 24	???	23	36	85	1176				Y O YO
A314	11Saf13	14	28	81	1172				O YO
A303	11Saf17	21	24	83	1170	43.5	29.0	341	Y O YO
C20	12th S C20	7	51	77	1167				white
C15	red 14 S C15	2	48	82	1152	44.3	29.0	333	OY
A315	11Saf22	17	16	83	1141				Y O spined
C18	Short 6S C18	5	34	81	1125				Orange
C16	red 13 S C16	3	45	76	1107				OY
Mean			36.3	80.9	1271	43.91	28.73	380.4	
P-value			0.00	0.00	0.08	0.76	0.00	0.04	
CV 1			21.3	3.6	14.6	3.0	1.5	15.1	
LSD(0.05 by			10.86	6.077	261.8	1.89	0.6021	82.18	

Seed Date April 21, 2014 No-till CC into heavy winter wheat stubble. Stand variable.

Soil: 2" depth temp.: 11 C Moist Probe Depth: 19 inches.

Weed control: Post plant 2 pints of pendimethalin in mix with glyphosate at 1.5 pt.

Hand weeded some kochia and wild oat.

Harvest: 24-Sep

Table 3 2014 CARC NTCC #2 Spineless Safflower Development Line Evaluations 1477702
 Exp 1477702 Central Agricultural Research Center, Moccasin, Montana

Code ID	Source		Flower	Plant	Seed	Test	Oil	Oil	Flower Color
	2013 ID/plot	code	5-Aug	Ht14Oct	Yield	Weight	Content	Yield	
			%	cm	lbs/ac	lbs/bu	%	lbs/ac	
132SAF03	SaffD 18	12saff4 404yl	86	73	927				Y YO
132SAF18	B123	B23	88	77	926	44.5	26.9	269	YO OY
132SAF10	124 13Pass73-75	C24	95	71	914	45.5	25.0	230	white
132SAF01	SaffD 12	12Saf2	83	77	892	44.5	27.5	244	Y YO OY
132SAF02	SaffD 17	12saff4 404Orng	80	74	858	43.8	27.5	236	YO
132SAF19	A405	11Saf13	87	71	858	40.4	27.5	253	YO Y
132SAF12	12Saf2red	B126	92	74	855				OY YO *
132SAF14	13sdpass41,42,43	B15,C15,12-1277	93	71	851	42.5	28.9	251	YO*
132SAF21	A403	11Saf18	78	73	849	44.3	26.5	228	Y YO O
132SAF07	SE8strp 15	C07	70	73	823	42.9	28.3	260	Y YO
132SAF06	SaffD 22	12saff 2 22y	79	76	821				YO
132SAF15	B103	B03	94	67	820	42.9	27.8	209	Y white
132SAF11	119 13Pass59-61	C19	94	70	817				white *
132SAF13	B109	2Saf4 401whiteflwrnS	97	70	803				white
132SAF17	13sdpass 53,54,55	C17, B121	94	70	794	45.5	25.9	221	O YO*
132SAF23	A413	Saf3	75	78	791	41.9	28.2	206	O Y YO spined toss
132SAF22	A410	11Saf22	74	73	757				Y yodd
132SAF04	SaffD 19	12saff 2 19y	74	71	740				Y YO
132SAF05	SaffD 20	12saff 2 20y	78	75	718				YO
132SAF16	B110	B10	73	74	713				Yellow toss
132SAF20	A406	11Saf11	85	74	688				Y YO O
132SAF24	A411	11Saf01	39	71	596				Y YO O toss
132SAF09	113	C13	71	68	573				spined YO toss
132SAF08	111	C11	48	65	565				spined YO toss
Mean			80.1	72.3	789.6	43.51	27.27	237.0	
P-value			0.00		0.00	0.02	0.00	0.57	
CV1			9.4		16.9	3.6	3.0	14.8	
LSD(0.05 by t)			10.63		188.2	2.657	1.384	59.78	

Seed date: 4/24/2014 CC in till wwht stubble, fall applied 1.0 ai. Trifluralin, post plant glyphosate.

Soil: Soil Temp. 2 Inch 5 C, probe depth 15 to 18"

Fertilizer: 10-10-10-5 w/seed, 45 N topdress as urea.

Weed control: Some weeding. In general the herbicides worked well in this trial.

TABLE 4. Montana Safflower Cultivar Evaluation Nursery Grown On-Station Under No-Till Dryland Fallow Conditions at Northern Agricultural Research Center. Havre, Montana. 2014. (Exp# 14-7702-SA)

ENTRY	OIL TYPE	STAND PLANTS		1/	2/		TEST WT	MOIST	OIL %		OIL Lbs/Ac
		%	SqFt	FLWR DATE	PLNT HT Inches	YIELD Lbs/Ac			Lbs/Bu	0%Mois.	
03B8069	Linoleic	73.5	3.4	202.7	25.1	1714.9	42.0	5.3	38.5	41.8	716.8
10B1233	Linoleic	82.0	4.0	203.3	25.4	939.5	37.9	4.6	43.7	47.4	445.9
10SC11	Linoleic	69.2	2.3	200.0	25.9	1732.3	47.2	5.5	26.8	29.2	505.7
11 Saff 21	Linoleic	69.1	2.9	203.0	26.9	1946.7	46.3	5.6	29.7	32.3	629.6
Baldy Safflower	Linoleic	62.2	2.7	200.0	27.0	1681.4	47.4	5.6	27.3	29.6	498.5
Cardinal	Linoleic	70.2	3.2	203.0	26.3	1802.3	44.2	5.5	37.2	40.5	729.6
Finch	Linoleic	67.7	3.0	201.7	25.4	1494.9	43.8	5.3	38.1	41.5	620.6
Morlin	Linoleic	63.2	3.4	204.0	23.7	1002.2	40.4	5.1	40.0	43.5	436.1
NutraSaff	Linoleic	74.0	3.4	201.0	25.1	434.6	36.8	4.3	48.6	52.8	229.3
Saff 4-401 [C24]	Linoleic	66.1	2.8	200.7	26.9	1639.0	47.6	5.6	26.9	29.3	480.7
06B3172	Oleic	72.5	2.9	203.3	25.3	1647.9	39.8	5.1	40.8	44.3	730.1
10B6015	Oleic	68.5	3.0	205.0	25.2	1382.9	42.4	5.2	37.9	41.1	568.6
10B7451	Oleic	78.8	4.0	201.3	24.6	1083.0	37.8	4.6	44.0	47.9	518.1
Hybrid 1601	Oleic	75.7	2.9	201.7	27.5	1279.8	37.2	4.9	40.1	43.6	558.0
Hybrid 200	Oleic	65.7	2.9	202.7	25.4	2008.0	44.0	5.5	33.7	36.6	734.6
Hybrid 446	Oleic	61.2	2.2	202.7	25.6	1831.0	43.3	5.5	34.1	37.0	678.9
Hybrid 528	Oleic	58.3	2.3	203.7	23.9	1313.2	32.6	4.6	44.3	48.2	632.6
Hybrid 621	Oleic	64.8	2.5	202.3	25.6	1240.6	37.4	4.7	42.6	46.3	575.1
Hybrid 9049	Oleic	67.3	3.6	200.7	26.5	1988.1	44.1	5.4	32.5	35.3	701.3
MonDak	Oleic	64.4	2.8	204.0	24.8	1303.1	42.5	5.2	37.1	40.3	525.7
Montola 2003	Oleic	72.1	3.3	204.7	23.5	1219.5	41.8	5.1	39.3	42.7	521.0
STI 1201	Oleic	69.2	4.4	203.7	22.4	1318.1	37.3	4.6	44.5	48.4	637.5
EXPERIMENTAL MEANS		68.9	3.1	202.5	25.4	1454.7	41.5	5.1	37.6	40.9	576.1
LSD (0.05)		11.8	0.9	1.3	1.6	275.8	0.9	0.2	1.4	1.4	11.6
C.V.: (S / MEAN)*100		10.4	17.5	0.4	3.8	11.5	1.3	1.8	0.9	0.9	110.4
P-VALUE (Entries)		0.0	0.0005	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Bold Indicates highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

Bold Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

1/ No. Days from January 1 (202 = July 21)

2/ Volumetric yields are based on plot weights adjusted to uniform 8 percent grain moisture.

NutraSaff had a reduced yield due to bird feeding late in the season.

TABLE 5. Montana Safflower Cultivar Evaluation Nursery Grown On-Station Under No-Till Dryland Fallow Conditions at Northern Agricultural Research Center. Havre, Montana. 2013. (Exp# 13-7702-SA)

ENTRY	OIL TYPE	STAND %	1/		2/		TEST WT Lbs/Bu	MOIST %	OIL %		OIL Lbs/Ac
			FLWR DATE	PLNT HT Inches	SHATTER %	YIELD Lbs/Ac			0%Mois.	8%Mois.	
00B1597-3	Linoleic	93.6	206.3	28.0	15.0	1693.8	44.3	6.9	41.1	44.7	757.4
03B8069	Linoleic	92.3	204.7	21.0	18.3	1935.5	44.5	6.9	40.8	44.3	855.9
05B3401	Linoleic	89.7	205.7	22.9	5.3	1374.3	38.5	6.5	44.9	48.8	671.2
06B1044	Linoleic	90.6	207.7	26.0	15.0	1663.7	40.9	6.9	40.6	44.1	735.7
08B1008	Linoleic	92.5	206.7	26.6	5.0	1685.7	38.9	6.5	45.5	49.5	833.8
10B1186	Linoleic	85.9	206.0	26.1	5.0	1905.8	39.0	6.3	45.7	49.7	947.0
10B1233	Linoleic	88.7	205.3	25.4	8.3	1853.3	38.7	6.2	46.9	51.0	944.9
10B1334	Linoleic	91.8	204.7	25.6	11.7	1725.6	41.0	6.8	44.5	48.3	834.1
10B1357	Linoleic	94.1	205.7	27.8	12.3	1683.9	41.7	6.9	43.2	46.9	791.1
10B6803	Linoleic	93.7	203.3	27.6	16.7	1831.9	45.5	6.9	39.7	43.2	791.4
World Bulk	Linoleic	92.5	208.0	33.0	21.7	1622.0	47.4	7.3	31.4	34.1	553.0
Cardinal	Linoleic	95.7	205.7	29.7	20.0	1721.0	45.4	7.0	39.3	42.7	734.5
Finch	Linoleic	89.1	203.7	25.2	5.3	1565.7	46.3	7.0	39.1	42.5	666.0
NutraSaff	Linoleic	91.8	205.3	25.4	1.0	1288.9	38.1	5.9	52.5	57.1	736.8
Morlin	Linoleic	92.3	207.3	20.9	3.7	1828.3	40.1	6.5	43.6	47.3	865.1
Baldy	Linoleic	94.4	202.7	26.9	11.7	1500.2	48.2	7.1	27.6	30.0	450.5
Crescent	Linoleic	90.9	206.7	31.2	25.0	981.9	44.1	7.1	35.1	38.2	375.9
Saff4-401 [C24]	Linoleic	96.0	203.7	23.0	10.3	1427.0	47.9	7.2	27.1	29.4	421.7
11 Saff 21	Linoleic	97.6	201.3	27.0	13.3	1668.9	47.4	7.2	30.7	33.3	556.1
04B7563	Oleic	88.2	207.7	23.0	15.0	1806.9	43.1	6.8	39.0	42.3	765.5
06B3172	Oleic	86.7	204.0	23.6	5.3	1721.7	41.5	6.7	42.1	45.8	789.4
08B6146	Oleic	89.5	202.3	21.0	2.3	1646.2	39.2	6.3	46.4	50.4	830.6
10B6005	Oleic	86.2	204.0	25.1	15.0	1672.9	42.8	6.9	39.5	43.0	719.3
10B6015	Oleic	91.3	206.7	22.4	7.0	1767.0	43.8	6.8	39.3	42.8	756.0
10B7451	Oleic	96.7	201.7	20.5	3.7	1682.9	38.7	6.1	46.5	50.5	849.4
Hybrid 200	Oleic	79.4	204.7	24.1	8.3	1866.4	44.6	7.0	35.4	38.5	719.5
Hybrid 528	Oleic	74.9	202.7	23.2	2.3	1721.4	34.8	6.4	48.4	52.6	904.8
Hybrid 621	Oleic	83.0	207.3	24.4	3.7	1620.2	38.1	6.6	45.2	49.1	798.3
ST1 1201	Oleic	95.2	204.3	21.1	1.0	1882.2	37.6	6.3	48.8	53.1	999.2
MonDak	Oleic	85.3	206.0	23.7	8.7	1814.0	44.3	7.0	39.8	43.3	786.0
Montola 2003	Oleic	94.7	205.3	21.8	11.7	1931.6	43.9	6.8	41.5	45.1	871.7
Hybrid 1601	Oleic	90.1	204.7	23.8	8.7	1588.1	37.8	6.5	43.4	47.2	753.9
Hybrid 9049	Oleic	87.4	201.0	23.8	8.3	1815.9	44.3	7.0	34.1	37.1	673.1
Hybrid 446	Oleic	75.9	203.3	26.2	10.0	1947.0	44.2	6.9	36.4	39.5	769.9
CW 3268	Oleic	96.2	204.3	24.7	6.7	1768.2	44.4	6.7	42.2	45.9	813.4
CW 1221	Oleic	89.3	201.7	24.8	4.0	2039.1	40.2	6.6	46.0	50.0	1015.0
EXPERIMENTAL MEANS		90.1	204.8	24.9	9.6	1701.4	42.3	6.7	40.9	44.5	759.4
LSD (0.05)		7.7	3.4	3.5	8.2	314.0	1.1	0.3	2.0	2.2	153.3
C.V.: (S / MEAN)*100		5.3	1.0	8.7	52.2	11.3	1.5	2.5	3.0	3.0	12.4
P-VALUE (Entries)		<.0001	0.0006	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Bold Indicates cultivars yielding equal to the highest yielding entry based on Fisher's Protected LSD at the 0.05 probability level.

1/ No. Days from January 1 (205 = July 22)

2/ Volumetric yields are based on plot weights adjusted to uniform 8 percent grain moisture.

Safflower narrative:

Safflower, a deep rooting warm season oilseed crop, has been produced commercially in Montana and the Northern Great Plains for over 50 years. It is generally recommended that safflower be grown at elevations of 3000 ft., or lower, to insure the crop consistently receives sufficient heat units to fill the safflower seed. However, some commercial producers whose land lies at elevations in 3000 to 3500 ft elevation have extended history of raising safflower. Though their safflower seed yields tend to be somewhat less than grown in warmer conditions. Safflower's greater rooting depth and higher water use make it a suitable tool in managing some saline seeps associated with annual cropping systems.

Safflower has a wide range of genetic variability for, seed coat color and thickness, blossom colors and leaf types. White is the most prominent seed coat color. Yellow and yellow-red are most frequent flower color. Most prominent commercial varieties have lance shaped leaves with numerous spines along the margins of leaves and bracts. Higher seed yields and higher oil content, along with less insect damage, are characters associated with spined type safflower versus reduced spines or spineless safflower.

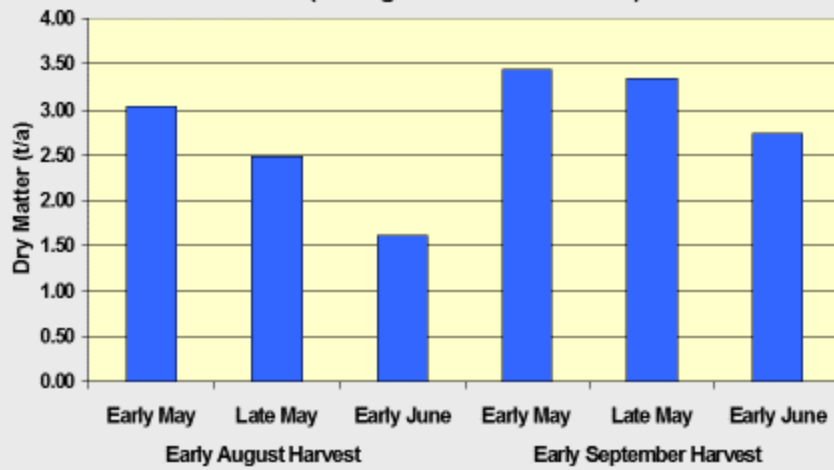
Through various events, and some research observations, it is known that cattle will readily consume safflower plants, in spite of the spines. In some case preferring safflower over alfalfa hay. The cool growing season of 1991 and 1992, resulted in thousands of acres of safflower have deficient heat unit accumulation and thus empty seeds. While the safflower crop was total loss for some, other producers swathed, baled and fed the crop residue. Others let their cattle graze standing safflower through the fall. See illustrations at end

In 1987, the Sidney world collection of safflower seed was planted at the Central Agricultural Research Center with the purpose of developing a safflower population adapted to the cooler shorter growing season typical of the 4,300 elevation of the CARC. Later, Partial Hull, safflower line with some mechanical male sterility was introduced to the population with the objective to increase out crossing. Partial Hull has an orange red flower and a degree of dwarf variants (hts. of 3 to 6 inches). Early flowering and spineless plants were harvested separately starting in the mid- 1990s. Early spineless selections generally had smaller bolls and very low seed yields. Overtime spineless plants with larger bolls and more leaves were selected. In 2009, three spineless white flowered plants were observed as contaminates in two of the white flower entries of the Montana uniform oilseed safflower trial [lines 02B2108 2 plants and 07B6567 1 plant] and added to the seed increase and evaluation trials. Illustrations 1, 2 and 3 display the yield and quality results obtained safflower for forage evaluations conducted in the mid-1990s.

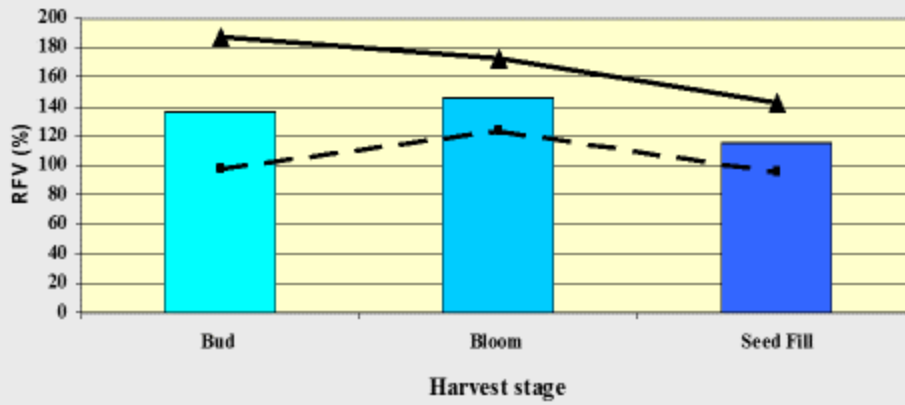
MSU Range Scientist, Dr. Clayton Marlow evaluated safflower as a component of upland game bird food and shelter in the Roy area. Safflower was found to provide excellent shelter and food for partridge. Mule deer, at the CARC have found the spineless safflower to provide both food and shelter. Photo: shows mule deer grazing on safflower bolls and leaves at the CARC.



**1995 Effect of seeding and harvest date on safflower yield.
(Averaged across 7 locations)**



The mean relative feed value of safflower forage produced in high, moderate and low yield environments.



Planting date and harvest date effect on safflower yield in high yield environments.

