

TITLE: Preliminary Investigations

PROJECT NUMBER: 5028

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PROBABLE DURATION: Indefinite

EXPERIMENTAL DATA:

INTRODUCTION

The purpose of this project is to investigate and study crops that may have an economic value in Northwestern Montana. Because of restricted acreage of some of the more commonly grown crops, this research becomes one of great importance to the economy of Northwestern Montana.

Crops studied this past season were Agrotana; Calendula and others; flax; mint; and mustard. Except for the Agrotana, the oil properties of these crops are the main factors being considered in these plants.

MATERIALS AND METHODS

Materials for all these crops were supplied by cooperators at the Main Station in Bozeman. Seeding was done with the usual nursery equipment, except mint. Technique of the mint operation will be given under the mint section which follows later in this report. Weed control was all mechanical with no herbicides being used in any of the above crops. The oil crops (Calendula and others) were harvested when ripe. This was also true for flax and mustard.

RESULTS AND DISCUSSION

The results in this section will be reported on an individual crop basis. A discussion on some techniques will be included plus yield data and other information secured.

Agrotana

Agrotana, a wheat grass-wheat hybrid, was grown in field E-3. It was seeded in the fall of 1959 to check for winter habit. Winter wheat was used as a check on the lines. Two varieties of winter

wheat and thirteen Agrotana lines made up the nursery, which was in a randomized block design.

All of the Agrotana lines were very late in maturity. At date of harvest, many of them were still high in moisture. They were all very difficult to thresh. A high incidence of covered smut was found in all lines. There was considerable difference found between Agrotana lines and no Agrotana line was equal to either wheat variety. Yogo was found to be significantly higher in yield than Karmont in this test. Table XXXVI gives complete data for this trial.

Table XXXVI. Yield data from Agrotana - Fall seed, 1959, Creston, Montana. Four-row plots, three replications.

Planted: September 25, 1959 Harvested: September 21, 1960
Size of Plot: 16 square feet

Selection Number	Plot Yield in Grams			Total Grams	Average Pound Per Acre
	I	II	III		
56-11-2	85	70	155	310	620
56-13-4	125	110	85	320	640
56-15-3	160	60	75	295	590
56-19-15	80	75	105	260	520
56-20-5	100	135	125	360	720
56-21-14	150	135	115	400	800
56-23-7	140	150	160	450	900
56-24-11	120	150	145	415	830
56-24-14	100	140	145	385	770
56-25-7	40	80	40	160	320
56-26-5	70	65	75	210	420
56-28-1	180	185	105	470	940
56-29-8	60	80	90	230	460
Yogo	415	540	430	1385	2770
Karmont	405	355	265	1025	2051

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	520.915	
Varieties	14	35896.4286	26.17**
Error	28	1371.7204	
Total	44		

Mean Yield..... 890.
S. E. \bar{x} 128.3419
L. S. D. (5%). 372.
L. S. D. (1%). 500.
C. V. 14.42%

Calendula and Others

This group of plants is grown primarily for testing as potential oil crops. It is our purpose to check maturity and Agronomic characteristics. Oil percentage and iodine numbers will also be determined. They are, however, not included in this report.

Two nurseries were seeded in the spring of 1960. One under dryland conditions and one under irrigation. Both nurseries had forty-seven entries. Not all entries were identical for both. Single row plots were used. There was no statistical design for the experiments.

Stands were poor in both nurseries. Observations indicated no germination of seed as cause of this poor stand. Weeds were quite bad in the irrigated nursery and considerable time was spent in removing them.

The Calendulas as genus were late in maturity. Flowers continued to bloom following frost, which killed other crop plants. Seeds were very uneven in ripening, making harvesting and threshing very difficult. Yield data given is not an indication of potential. Seed of the entire row was harvested. From the Agronomic point, this genus does not look to be a very high potential as a crop.

Some of the Candy Tuft lines did produce mature seed as did Saporaria vascauia lines. Table XXXVII and XXXVIII give data secured on these potential oil crops.

Table XXXVII. Evaluation of some oil crops which may be of value in industry. Dryland

Crop	Type	Variety	Mont. No.	Per Cent Stand	Flow- ering Date	Wt. in Grams ¹
Calendula	Pacific Beauty	Persimmon	283	75		3.2
"	"	Mixture	282	50		8.5
"	"	Lemon	281	95		6.5
"	"	Apricot	285	50		2.7
"	"	Cream	300	65		
"	Crested	Orange	284	55		4.8
"	"	Yellow	290	95	7-20	35.8
"	"	Mixture	280	90	7-20	22.5
"	Giant Double	Mixed	298	70		1.1
"	Bedding	Mixture	279	75		26.0
"	Dwarf Bedding	Lemon	286	70		31.2
"	"	Orange	287	60		3.5
"	"	Lemon	275	70		10.0
"	"	Orange	276	70		4.5
"	"	Masterpiece	277	90		8.7
"	"	Gold	278	80		26.9
"	"	Mixture	288	65		6.3
"	"	Art Shades	289	60		22.7
"	"	Sunshine	301	75		8.7
"	"	Yellow	297	30		7.5
"	"	Mixed	299	50		10.0
Dimorphotheca aurantiaca		Mixed	273	70	7-8	11.0
"	"	Glistening White	274	50	7-16	44.9
Mantha species			P.I.226649	10		94.2
Lallemantia iberica		White	P.I.114610	65	7-9	
"	"	Blue	P.I.114389	20	7-8	28.8
Guizotia abyssinica		India	P.I.248891			
"	"	India	P.I.248889			
"	"	India	P.I.248890			

Continued --

Table XXXVII. (continued)

Crop	Type	Variety	Mont. No.	Per Cent Stand	Flow- ering Date	Wt. in Grams ¹
Candy Tuft		Lavendar	291	10	7-14	
" "		Dwarf Fairy Mix	292	65	7-8	
" "		Flesh Pink	293	5	7-14	
" "		Rose Cardinal	294	65	7-8	4.4
" "		White	295	.5	7-14	
" "		Formula Mix	296	70	7-8	2.9
Lunaria annua		Honesty	303	50		
Matthiola bicornis		Night Scented Stocks	302	95	7-8	
Commercial Oriental Yellow (check)			58-8013	50		2.4
Sisymbrium altissimum			Moccasin	0		3.4
Thlaspi arvense			Moccasin	.1	7-5	10.4
Camelina microcarpa			Moccasin	20		10.0
Conringa orientalis			Moccasin	30		
Amaranthus retroflexus			Bozeman	0		
Descurainia sophia			Moccasin	0		
Saporaria vaccaria			Moccasin	2	7-9	
" "			58-8140	5	7-8	7.9
" "			58-8158	20	7-8	

¹ Figure is the total weight obtained from the row, approximately eighteen feet long, before cleaning.

Table XXXVIII. Evaluation of some oil crops which may be of value in industry. Irrigated

Crop	Type	Variety	Mont. No.	Per Cent Stand	Flow- ering Date	Wt. in Grams ¹
Calendula	Pacific Beauty	Persimmon	283	90	7-20	102.0
"	"	Mixture	282	85	7-20	57.2
"	"	Lemon	281	95	7-20	102.9
"	"	Apricot	285	90	7-18	44.7
"	"	Cream	300	95	7-20	80.5
"	Crested	Orange	284	100	7-13	
"	"	Yellow	290	100	7-13	140.0
"	"	Mixture	280	95	7-11	144.0
"	Giant Double	Mixed	298	80	7-19	90.0
"	Bedding	Mixture	279	90	7-18	170.5
"	Dwarf Bedding	Lemon	286	60	7-19	118.4
"	"	Orange	287	95	7-17	94.2
"	"	Lemon	275	60	7-18	140.0
"	"	Orange	276	70	7-18	91.0
"	"	Masterpiece	277	75	7-14	100.0
"	"	Gold	278	85	7-18	130.4
"	"	Mixture	288	70	7-18	71.7
"	"	Art Shades	289	75	7-17	173.4
"	"	Sunshine	301	70	7-18	52.0
"	"	Yellow	297	45	7-18	77.5
"	"	Mixed	299	85	7-18	35.4
Dimorphotheca aurantiaca		Mixed	273	0		
"	"	Glistening White	274	20	7-16	12.0
Mantha species			P.I.226649	0		
Lallemantia iberica		White	P.I.114610	0		
"	"	Blue	P.I.114389	1 $\frac{2}{2}$	7-11	
Guizotia abyssinica		India	P.I.248891	60		90.7
"	"	India	P.I.248889	60		110.9
"	"	India	P.I.248890	2 $\frac{2}{2}$		84.3

Continued ---

Table XXXVIII. (continued)

Crop	Type	Variety	Mont. No.	Per Cent Stand	Flow-ering Date	Wt. in Grams ¹
Candy Tuft		Lavendar	291	10	7-11	30.1
" "		Dwarf Fairy Mix	292	0		
" "		Flesh Pink	293	0		
" "		Rose Cardinal	294	0		
" "		White	295	0		
" "		Formula Mix	296	0		
Lunaria annua		Honesty	303	0		
Matthiola bicornis		Night Scented Stocks	302	0		
Commercial Oriental Yellow (check)			58-8013	0		
Sisymbrium altissimum			Moccasin	0		
Thlaspi arvense			Moccasin	0		
Camelina microcarpa			Moccasin	0		
Conringa orientalis			Moccasin	3 ²	7-9	11.3
Amaranthus retroflexus			Bozeman	0		
Descurainia sophia			Moccasin	0		
Saporaria vaccaria			Moccasin	60	7-17	
" "			58-8140	5	7-11	20.6
" "			58-8158	100	7-10	34.7

¹ Figure is the total weight obtained from a row approximately eighteen feet long, before cleaning.

² Number of plants.

Flax

Flax is an oil crop producing linseed oil with linseed meal as a by-product. It is a crop adapted to the upper mid-west in the United States. Weather data indicated, in some seasons, early maturing varieties may be adapted to Northwestern Montana.

Seed for this experiment was supplied by the Montana Vegetable Oil Company. Six entries were included in the nursery in a three replication randomized block design.

Yields were somewhat below the average for Minnesota, which is used as a standard. Rajah was the highest yielding entry. It is early in maturity but low in both oil content and quality. There were maturity differences in lines, but this was not recorded. Yields of all lines were found to be non-significant when analyzed statistically. Table XXXIX gives complete data for this study.

Table XXXIX. Agronomic and yield data from flax nursery at Creston, Montana in 1960. Four row plots, five replications. Planted: May 6, 1960 Harvested: August 11, 1960 Size of plot: 16 sq.ft.

Variety	Plot Yield in Grams					Total Grams	Average Pounds Per Acre
	I	II	III	IV	V		
Dakota	85	95	100	115	125	520	624
Arrow	85	100	105	105	105	500	600
B 5128	75	115	110	110	110	520	624
Rajah	100	90	125	105	105	525	630
Bison	95	85	95	100	125	500	600
Bolley	80	85	110	100	120	495	594

Analysis of Variance				Mean Yield.....	612
				S. E. \bar{x}	27.3187
				L. S. D. (5%)...	NS
				C. V.	4.46%
Source	D.F.	Mean Square	F		
Replications	4	747.0825	7.21		
Varieties	5	34.00			
Error	20	103.5835			
Total	29				

Mint

Mint as a potential crop in Northwestern Montana was added to the list because of interest shown and the production of it in neighboring states to the west.

Field number Y-9 (Z-1) was the location of this test on the Station. It was summer fallowed before putting in mint root stocks. It was located in the irrigated section of the Station.

Root stocks were secured, without cost to the Station, from Mr. Donald Deihl of Sandpoint, Idaho. The method of planting was as follows: using a three-bottom moldboard plow, a furrow was made three to six inches, then this was covered with the plow making the row about forty-two inches. Soil conditions were very moist at the time of seeding. Root stocks were believed to be in excellent condition. Seeding date was April 16, 1960.

The plot was irrigated three times during the growing season. Cultivations were made with the attempt to row the planting.

Stands were very poor with only about the first six rows making a stand of any kind. Because of this condition, only six rows were left and will be used as a seed stock source in 1961.

No yield data or oil percentage were secured this season.

Mustard

Of all the crops listed in this report, mustard shows the most promise as an oil crop in Northwestern Montana. Weather records indicate that a crop of mustard could be harvested without too much difficulty.

This crop is handled the same as small grains with the exception of herbicides for weed control.

Two nurseries were grown this season, one on dryland and one under irrigation. Both contained the same number of entries. The mean yield for the irrigated nursery was 977 pounds per acre compared with dryland of 983 pounds per acre. The irrigated nursery was later in maturity than dryland. No significance was found in the irrigated nursery and three entries were lost because of stand. Commercial Oriental was the highest yielding entry in the dryland trial. Table XL and XLI give detail of these two studies.

Table XL. Agronomic data from irrigated mustard yield nursery. Four row plots, four replications. Creston, Montana in 1960.

Planted: May 6, 1960 Harvested: September 12, 1960 Size of Plot: 16 sq. ft.

Variety	Selection Number	Plot Yield in Grams				Total Grams	Ave. Lbs. /Acre
		I	II	III	IV		
Increase B, Yellow	Bulk	280	160	165	150	755	1133
Montana Early	58-8012	205	165	195	160	725	1088
German Yellow Oriental	M-Assoc.	230	175	160	165	730	1096
Oriental	49-5934-2	140	200	165	130	635	953
Commercial Oriental	58-8013	125	260	155	135	675	1013
Commercial Brown	58-8015	190	180	160	160	690	1036
Brown Selection	48-6647	155	160	115	115 ¹	545	818
Triesta	58-8014	150	70	120	115	455	683

¹ Calculated missing plot

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	2859.375	2.18
Varieties	7	2662.0536	2.03
Error	21	1308.7798	
Total	31		

Mean Yield.....	977
S. E. \bar{x}	108.5675
L. S. D. (5%).....	NS
C. V.	11.11%

Table XLI. Agronomic data from dryland mustard yield nursery. Four row plots, four replications at Creston, Montana in 1960.

Planted: April 22, 1960 Harvested: August 5, 1960 Size of Plot: 16 sq. ft.

Variety	Selection Number	Date of Flow- ering	Shattering 0 - 4 ¹	Plot Yield in Grams				Total Grams	Average Pounds Per Acre
				I	II	III	IV		
Increase B, Yellow	Bulk	6-15	2	210	195	120	145	670	1006
Montana Early	58-8012	6-14	2	215	195	135	150	695	1043
German Yellow Oriental	M-Assoc.	6-13	3	185	170	155	190	700	1050
Oriental	49-5934-2	6-22	1	225	210	150	145	730	1096
Commercial Oriental	58-8013	6-20	2	245	215	225	230	915	1373
Commercial Brown	58-8015	6-21	0	255	265	195	165	880	1321
Brown Selection	48-6647	6-24	1	225	220	160	160	765	1148
Triesta	58-8014	6-21	3	150	170	80	115	515	773
Sarson Yellow	58-8161	6-24	2	105	65	110	75	355	533
Sarson Brown	58-8202	6-16	0 2	150	170	130	120	570	856
Sweet German Rape		6-23	0 2	130	115	80	85	410	615

- ¹ 0 = no shattering
4 = severe shattering
2 Cut early

Mean Yield..... 983
S. E. \bar{x} 65.4182
L. S. D. (5%)..... 189
L. S. D. (1%)..... 254
C. V. 6.66%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	7246.0227	15.25**
Varieties	10	7916.35	16.66**
Error	30	475.1894	
Total	43		