

Dale Gies Farm



MUSTARD GREEN MANURES

On-Farm Research Results 1999-2001

On-farm Research Supported by
Paul Lauzier Charitable Foundation
Washington State Potato Commission
Washington State Commission on Pesticide Registration

Center for
Sustaining
Agriculture and
Natural
Resources

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Potato Yields following a Mustard Green Manure Crop,
with and without fumigant
 Gies On-Farm Trials, 1999 - 2001

1999-2000

1999: White mustard, *S. alba* Martigena planted 8/10/99 and incorporated on 10/25/99

Dry biomass yield: 5564 lb/ac
 Biomass N: 93 lb/ac
 Wheat residue: 6007 lb/ac
 Wheat residue N: 34 lb/ac

2000: Fumigated with metham sodium (Vapam) at end of March at a rate of 37.5 gallons per acre
 Russet Norkotah potatoes planted 4/15/00 and harvested on 9/7/00

	Yield	
	Fumigant	No Fumigant
	-----tons/ac ¹ -----	
Total (#1s + #2s + culls)	32.03	31.14
Total U.S. #1's (>4oz.)	26.5 (82.7%)	25.5 (81.8%)
<4 oz ²	3.05	2.58
4-8 oz	9.40	9.40
8-16 oz	14.28	13.94
>16 oz	2.81	2.17
culls and #2s	2.06	2.68

¹ Yields are averages of six paired replications, no significant differences were found

² tubers less than 2" in diameter were not harvested

2000-2001

2000: **White mustard**, *S. alba* Martigena planted 8/9/00 and incorporated on 10/24/00

Dry biomass yield: 4773 lb/ac

2001: Fumigated with metham sodium at end of March at a rate of 37.5 gallons per acre

Russet Norkotah (Colorado 8 selection) potatoes planted 4/20/01 and harvested on 9/17/01

Total N applied during growing season: 160 lbs per acre

	Yield	
	Fumigant	No Fumigant
	-----tons/ac ¹ -----	
Total (#1s + #2s + culls)	34.59	34.06
Total U.S. #1's (>4oz.)	31.00 (89.6%)	29.34 (86.1%)
<4 oz ²	3.04	2.85
4-8 oz	7.77	7.30
8-16 oz	18.48	16.89
>16 oz	4.75	5.15
culls and #2s	0.55	1.87

¹ Yields are averages of five paired replications, no significant differences were found

² tubers less than 2" in diameter were not harvested

2000: **Oriental mustard, *B. juncea*** Pacific Gold planted 8/9/00 and incorporated on 10/24/00

Dry biomass yield: 5023 lb/ac

2001: Fumigated with metham sodium at the end of March at a rate of 37.5 gallons per acre
 Russet Norkotah (Colorado 8 selection) potatoes planted 4/20/01 and harvested on 9/17/01
 Total N applied during growing season: 160 lbs per acre

	Yield	
	Fumigant	No Fumigant
	-----tons/ac ¹ -----	
Total (#1s + #2s + culls)	31.38	31.90
Total U.S. #1's (>4oz.)	27.59 (88%)	27.71 (87%)
<4 oz ²	2.25	1.72
4-8 oz	7.82	7.10
8-16 oz	16.15	14.70
>16 oz	3.62	5.91
culls and #2s	1.53	2.47

¹ Yields are averages of five paired replications, no significant differences were found

² tubers less than 2" in diameter were not harvested

Mustard Green Manure Crop Estimated Variable Costs-2001

Item	Unit	Cost/unit	Quantity	Mustard cost/ac	Normal cost/ac
Seed	lb.	\$2.00	10	\$20.00	\$0.00
Planting	acre	\$6.10	1	\$7.50	\$0.00
Fertilizer	lb.	\$0.38	100	\$38.00	\$0.00
Herbicide	acre	\$15.00	1	\$15.00	\$0.00
Irrigation power	acre-in	\$1.78	9	\$16.02	\$5.34
Chopping	acre	\$6.00	1	\$6.00	\$6.00
Disking/packing	acre	\$5.00	2	\$10.00	\$10.00

Total: \$112.52 \$21.34

Mustard cost over normal practice: \$91.18

Mustard cost over normal practice, without fertilizer costs: \$53.18

Other costs to consider:

- 1) Cost of extra labor, equipment, and management time at a time of the year when the mustard may not be your priority
- 2) Cost of fitting the mustard into your rotation
- 3) Cost of extra irrigation water if you exceed your base amount

1999 Field Measurements, Mustard and Wheat Straw

Biomass, carbon, and nitrogen yields (10/14/1999)

	<u>Crop yield components</u>					
	biomass	C	S	N	C:N	N:S
	-----lb DM/ac-----					
White mustard, <i>S. alba</i> ¹						
Martigena, combine track	6424	2764	16	107	26:1	6.7:1
Martigena, non-combine track	5272	2024	12	79		
Wheat straw	6733	2663	3	34	79:1	10.6:1
Mustard + Wheat Straw					41:1	

¹Mustard planted Aug. 10, 1999

2000 Mustard Variety Trial

Biomass, carbon, sulfur, and nitrogen yields (10/23/00)

	<u>Crop yield components</u>					
	biomass ²	carbon	sulfur	nitrogen	C:N	N:S
	-----lb DM/ac-----					
White mustard, <i>S. alba</i> ¹						
Martigena	4773 b	2061	40	119	17:1	3.0:1
Ida Gold	4177 b	1826	34	102	18:1	3.0:1
Tilney	5843 a	2526	59	157	16:1	2.7:1
Oriental mustard, <i>B. juncea</i> ¹						
Pacific Gold	5022 ab	2138	36	93	23:1	2.6:1

¹Mustard planted second week of August, 2000

² Within columns, means followed by the same letter are not significantly different (LSD, 0.10)

2001 Green Manure Trial

2001 Species and Varieties	Seed Supplier
<i>S. alba</i> , White mustard	
1 Martigena, Germany	SCD, HPS
2 Absolut, Germany	HPS
3 Achilles, Germany	CGG
4 Ida Gold	UI
5 Tilney	
6 Maxi, Germany HPS	HPS
<i>B. juncea</i> , Oriental mustard	
7 Cutlass, Canada HPS	HPS
8 Vulcan, Canada HPS	HPS
9 Pacific Gold, UI	UI
10 ISCI20, Italy	WSU
11 F-E75, Australia	HPS
12 F-L71, Australia	HPS
13 Caliente: <i>S. alba</i> , <i>B. juncea</i> Blend	HPS
<i>R. sativus</i> , Oilseed radish	
14 Commodore, Germany HPS	HPS
<i>B. napus</i> , Rapeseed	
15 Dwarf Essex	
16 502, Australia HPS	HPS
17. <i>Iberis unbellata</i>	WSU

Seed suppliers for variety trials

CGG= Connell Grain Growers

PO Box 220

Connell WA 99326

509 234-2641

HPS= High Performance Seed

#101 210 E. Third Ave., Suite C

Moses Lake, WA 98837

509 750-4850

SCD= Spectrum Crop Development

57 N Marcellus Rd

Ritzville WA 99169

509 659-1757

If you would like to submit varieties for future trials, please contact Andy McGuire

2001 Green Manure Trial Yield Results¹

Harvested 10/24/01

Variety	Ave. Dry Matter Yield -----lb/ac-----	Grouping ²
Pacific Gold	10704	a
Cutlass	10540	a
Caliente	10062	ab
Absolut	9627	abc
Tilney	9331	abc
F-E75	8660	bcd
ISCI20	8557	bcd
Martigena	8433	bcde
Commodore	8121	cde
Vulcan	6988	def
Ida Gold	6685	ef
F-L71	6432	f

Variety (reps)	----lb/ac----	Comments
Maxi (3)	5334	Planted 8/28
Achilles (1)	2603	Planted 8/31
502 (3)	5287	Planted 8/21
I. Umbellata (4)	1301	Poor growth
Dwarf Essex (4)	4838	Poor stand

¹Except where noted, four replications of each entry were planted on August 14th, 2001. Plots were 15' x 3.5'. Seeding rates in lbs/ac were as follows: *S. alba* @ 10, *B. juncea* @ 8, *R. sativus* @ 14, *I. Umbellata* @ 15, Caliente blend @ 10, and *B. napus* @

² Yields followed by the same letter are not significantly different according to LSD (0.10)

2001 Mustard Planting Date Study

Effect of planting date and growing degree days (GDD, base 40) on mustard dry matter (DM) yields (10/24/01)

Planting date	DM Yield		% Yield loss ¹	GDD
	-----lb/ac-----			
14-Aug	4302		na ²	
17-Aug	4758	a	0%	1433
24-Aug	3858	b	19%	1234
31-Aug	3209	c	33%	1026
7-Sep	1142	d	76%	838
14-Sep	0	e	100%	660
21-Sep	0	e	100%	468

¹ Yield loss compared to first planting date

² Loss due to allelopathic effects of fresh millet residue incorporated the

Growing Degree Days (base 40), Long-term average and 2001

Month	GDD	
	1943-79	2001
August	895	1016
Sept.	631	733
October	286	286

2001 Mustard N Fertilizer Response Trial

Applied N, lb/ac	Dry Matter Yield ¹			
	<i>S. alba</i>	Martigena	<i>B. juncea</i>	Cutlass
	-----lb/ac-----			
50	3906	c	3808	c
88	4263	c	5516	bc
125	7731	ab	6013	b
163	8280	a	10479	a
200	6499	b	9911	a

different according to LSD (0.05), Planted 8/14/01, harvested 10/24/01.

Average Infiltration Rates, after consecutive 1" applications of ponded water

Rotation with mustard green manures
Rotation without green manures

Date and Point in rotation	Average Infiltration Rates		
	1st inch	2nd inch	3rd inch
-----in/min-----			
September 3, 1999			
After wheat harvest	1.39a	0.48a	
After wheat harvest	0.13b	0.18b	
November 2, 2000			
After potato harvest	0.20b	0.19a	0.16
After sugarbeet harvest	0.39a	0.05b	
March 7, 2001			
Potatoes/winter	0.57a	0.10a	
Sugarbeets/winter	0.06b	0.05b	
March 5, 2002			
Potatoes/winter	0.14	0.09a	0.08
Fallow/winter	0.10	0.05b	

Other Green Manure Resources available from WSU Cooperative Extension:

Cover Crop Fact Sheets:

- Sudangrass and Sorghum-Sudangrass Hybrids
- White Mustard

Dale Gies System Profile

On-farm Research Results, 1999-2001, Dale Gies Farm

Using Green Manures in Potato Rotations

**This publication and other cover crop
information are available online at
<http://grant-adams.wsu.edu>**

