

Manitoba
Oriental Vegetable

Research Project



2003 Report



2003 Manitoba Oriental Vegetable Research Project

Project Sponsor

Manitoba Horticultural Productivity Enhancement Centre (MHPEC)

Project Partners

Manitoba Rural Adaptation Council (MRAC)

- 1) Covering New Ground (CNG)
- 2) Manitoba Agriculture, Food and Rural Initiatives (MAFRI)
- 3) Manitoba Crop Diversification Centre (MCDC)
- 4) University of Manitoba, Faculty of Agriculture and Food Sciences
- 5) T&T Seeds
- 6) Garden Market I G A
- 7) Phoenix Gardens
- 8) PlastiTech

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Executive Summary

This project, sponsored by the Manitoba Horticultural Productivity Enhancement Centre Inc., is a multi partner initiative involving public groups such as Vegetable Growers Association of Manitoba, Manitoba Crop Development Centre, Manitoba Agriculture, Food and Rural Initiatives, University of Manitoba as well as local, national and international retail / seed / horticulture supply companies.

Under the supervision of MAFRI's Soils and Crops Branch, the project continues to work toward its objective, which is the commercialization of Oriental vegetable production in Manitoba. The 2003 field season evaluated 11 different vegetable crops and a total of 33 varieties of those crops. Field trials were conducted at the MDCDC site in Portage la Prairie. Where possible produce samples of field tested entries were harvested and sent to IGA Market Garden in Portage la Prairie, Manitoba for evaluation and market research, with the goal of providing producers with current market information.

Results from this year's trials again indicate that a wide range of Oriental crop varieties can be produced in Manitoba, and have strong market potential as locally grown commodities. Many crops performed extremely well this season, including, Taiwanese cabbage, oriental cucumber, oriental watermelon, oriental muskmelon, oriental pepper and diakon. Severe insect damage contributed to significant crop loss in the bok choy and eggplant crops. Market potential exists for many of the successful crops, but further work is required to optimize production and control pests.

This was the third year that organic pest control products were used on oriental vegetable field trials. However, intense insect pressures on most crops (gai lon, eggplant, bok choy) in this trial made the organic pest control products and as well as the conventional pesticide treatments ineffective.

In the mulch trial, it was hoped that mulches could increase soil heat units, thereby accelerating plant maturity in our short Manitoba growing season. As well, the potential mulches were examined as an alternative weed control method. Five mulch types were evaluated: clear, black embossed, red coloured, green coloured and solar mulch materials. Yields increased for all varieties grown on mulch as opposed to bare ground production with the exception of oriental watermelon and oriental muskmelon. All of the mulch types also proved to be effective as an alternative weed control method. Management of weeds required less time and labour with all mulch treatments compared to no mulch.

Market research results indicate a keen interest in pursuing a number of the Oriental vegetable commodities for expanded production in Manitoba. Work undertaken in the oriental-style vegetable segment of the industry has shown that these vegetables can be commercially grown in Manitoba. Producers and processors have the interest and the intensive management ability to grow, harvest, store, process and transport top quality produce to market. There is tremendous potential for developing high value crops with potential for high return.

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Site Specifics

Location: Manitoba Crop Diversification Centre, Portage la Prairie, Manitoba

Soil Type and Fertility:

Soil-Clay Loam; nitrogen 65 lbs/acre, phosphate 41 lbs/acre, potassium 432 lbs/acre, sulfate 160 lbs/acre, pH- 7.8. Entire plot area had fertilizer incorporated prior to transplant and seeding operations.

2003 precipitation and irrigation month by month totals at Portage MCDC

Unit = mm	May	June	July	August	Sept.	Total
Precipitation	58.2	98.6	30.2	50.2	87.8	325.0
Irrigation	0	37.0	100.0	75.0	0	212.0
Total	58.2	135.6	130.2	125.2	87.8	537.0

All data recorded at on site MCDC weather station.

Air Temperature	May	June	July	Aug.	Sept.
2003 Max. Mean	19.6	22.9	25.3	27.5	17.6
2003 Min. Mean	5.6	11.3	13.7	14.3	7.4
1971-2000 Normal Mean Max.	19.3	23.4	26.3	25.1	18.4
1971-2000 Normal Mean Min.	5.5	10.8	13.6	11.8	6.3

Temperatures units are in Celsius. All data recorded at Environment Canada Portage (Southport) weather station.

The first frost of the 2003 growing season occurred on October 1, 2003 for a total of 135 frost free days (Environment Canada Portage (Southport) weather station data).

Participating Seed Companies

- 1) Henan Shencai Science-Technology Industry Company
28 Huayuan Road
Zhengzhou, Henan P.R. China
- 2) Known You Seed Company Ltd.
26 Chung Cheng 2nd Road
Kaohsiun, Taiwan, ROC
- 3) Hungnong Seed America Inc.
3065 Pacheco Pass Hwy.
Gilroy CA. 05020
- 4) Shanghai Seed Company
#5-Five Nong, 2nd
Zong Shang East, Taiwan
- 5) Stokes Seeds Ltd.
39 James St. Box 10
St. Catharines Ontario L2R 6R6
- 6) Richters Seed Company
357 Highway, 47
Goodwood, Ontario L0C 1A0
- 7) Johnny's Select Seeds
Foss Hill Road RFD-Box 2580
Albion Maine 04910
- 8) William Dam Seeds
Box 8400 Dundas, Ontario
L9H 6M1
- 9) Shenyang Seed Company
126 Huanghe Bei Street
Shenyang China Zip Code 110034
- 10) T&T Seeds
Box 1710
Winnipeg, Manitoba, R3C-3P6

Alternative Pest Control Evaluation Trial

Acknowledgements

We would like to acknowledge T&T Seeds for providing the project with the alternative pest control products used in this trial.

Project Objective

To evaluate alternative pest control and conventional products on selected Oriental crops and varieties for irrigated commercial production under Manitoba conditions.

Introduction

Many conventional pesticides are not registered for use on oriental vegetable crops in Canada. For this reason, this trial was conducted to determine the effectiveness of alternative or “organic” pest control products, especially for the control of insect pests.

Methodology

3 reps, RCBD. Planting Information: Wintersteiger Seeder (seeding once only), 3 reps, 1.5 m plot, 4 rows/ plot, except eggplant which are transplants. Eggplant transplanted May 23, bok choy and gai lon seeded June 18. Gai lon reseeded July 8, 2003.

Crops Evaluated

1. Crop- Bok Choy Variety- Jo Choi
2. Gai Lon Variety-Kaazaan
3. Eggplant Variety- Shen Yange

Treatments

- 1) End-All
- 2) Tombstone Powder
- 3) BtK
- 3) Conventional Product - Success
- 4) control- untreated

Product Information

End All - is a type of pyrethrum, the natural form of pyrethroid insecticides.

BTK -contains the active bacteria *Bacillus thuringiensis kurstaki*.

Tombstone Powder – an insect food containing corn bran gluten which reduces foliage damage by providing insects an alternative food source.

Success 480SC- conventional insecticide with supplemental label use on Brassica leafy vegetables (gai lon, bok choy), and fruiting vegetables (eggplant). Active ingredient spinosad (guarantee 480 g/L). This product is derived from the fermentation of *Saccharopolyspora spinosa*.

Treatment Application Rates and Frequency

Applied at recommended rates when insect populations reach estimated economic thresholds, based on weekly pest inspection reports.

Oriental eggplant treatments were applied on June 16, 27; July 3, 11, 18, 25; August 8 and 20. Bok choy treatments were applied on June 30; July 4, 11, 18 and 25. The conventional product Success was delayed in shipping and was not used in the treatments until July 11. In its place the conventional product Sevin was used for the June 16, 27 and July 3 treatments of the oriental eggplant plots. Sevin was also used for the June 30 and July 4 treatments of the bok choy plots. Sevin is a conventional insecticide with registered label use on most vegetable groups. Active ingredient is carbaryl and is formulated as a liquid suspension.

Treatment concentrations per application in the Alternative Pest

<u>Control Evaluation Trial,</u>	<u>Percentage Concentration</u>
<u>2003.Product</u>	
Success	0.015
Sevin	0.145
BTK	0.3
End-All	2
Tombstone (powder)	Broadcast over entire plant

Results

Eggplant

The Colorado potato beetle (Coleoptera) was present at high infestation levels through out late June, July and August. Eggplant suffered severe to moderate damage by the Colorado potato beetle over all treatments. However some marketable fruit was produced and harvested in mid to late August.

The product treatment Success had triple the amount of fruit harvested compared to the control and all other treatments. End-all, BtK and Tombstone all had similar yields as the control (see Table1).

The eggplant crop had almost one month to grow and flower before the Colorado potato beetle reached high infestation levels (see Table 8-12). Although all plants experience insect damage, fruit production still occurred, but with diminished yields. The effectiveness of Success in controlling Colorado Potato beetles was remarkable considering the intense insect infestation. The eggplants treated with Success out yielded all other treatments by a three to one margin.

Bok Choy

This crop experienced exceptional infestations of flea beetles (Coleoptera) throughout the 2003 growing season, especially in June and July. Seeding of bok choy was delayed until June 18 in an attempt to avoid emergence when flea beetle populations were at its highest. This strategy failed as flea beetle numbers were consistently high throughout June and July to cause severe damage on the bok choy and gai lon plants for all treatments. No plants of marketable quality were harvested as a result.

A limited harvest of bok choy was harvested on August 11 to determine if any differences existed between treatments (see Table 2). Although Success and End-All had treatments had the highest yields, the harvest sample was too small to determine significance differences between treatments. The yields for the control, BtK and Tombstone were similar, but again too small to determine significance differences between treatments.

Gai Lon

This crop also experienced exceptional infestations of flea beetles in June and July 2003. Seeding gai lon was also delayed until June 18 in an attempt to avoid emergence when flea beetle populations were at its highest. Gai lon had poor seed emergence and intense flea beetle damage for all treatments as well. A replanting on July 9 of gai lon also experienced intense flea beetle damage, resulting in termination of this crop in the trial. No plants were harvested as a result.

Conclusion

With the extremely high levels of flea beetle and Colorado potato beetle populations present throughout the growing season, especially at emergence, the treatments could not be applied early enough, or often enough for effective control (see Tables 3-12). This was particularly true with the crops of bok choy and gai lon, which were entirely consumed by insect pests immediately after emergence. Within days of emergence these crops were eliminated, with only a few plants per treatment surviving. These surviving plants were too damaged to yield any marketable product however. The number of insecticide applications exceeded levels normally used in commercial vegetable operations.

It should be highlighted the effectiveness Success had in controlling Colorado Potato beetles. It was more remarkable considering the intense insect pressures on the plants. Success represents a new generation of insecticide chemistry and was newly registered for many oriental crop types in 2003. This product is a good complement to any integrated pest management system.

Success consists of metabolites from naturally occurring bacteria, *Saccharopolyspora spinosa*. This chemistry is safe on most beneficial insects with a low risk rate to any applicator. The US Environmental Protection Agency has classified this product as a reduced risk pesticide. Success has been shown to be effective on insects species from the orders Lepidoptera, Diptera, Hymenoptera, Thysanoptera and a few Coleoptera (flea beetles and Colorado potato beetles).

The alternative pest control products, End-all, BtK and Tombstone were unable to protect any of the crops satisfactorily. However, given the extreme levels of insect pest infestation, plant damage started before plants were treated or overwhelmed the treatments effects. A product may actually cause insect fatality, but even if the insect dies after limited feeding, numerous insects causing limited damage results in major plant damage overall.

These alternative products may not be suitable for commercial production only for home-garden or small market garden use. The product Tombstone is applied as a powder on the plant, which is not feasible for large acreage plantings.

Table 1. Alternative Pest Control Evaluation Egg Plant Harvest 2003

Treatment	Total Harvested Fruit	Total Plant Weight (lbs)	Avg. Sample Length (cm)	Avg. Sample Diameter (cm)	Avg. Weight Per Fruit (lbs)
Control	46	34.60	22.51	6.64	0.84
Success	152	151.64	22.39	7.97	0.81
End All	53	37.94	22.54	7.73	0.08
BTK	36	32.58	25.24	7.37	0.78
Tombstone	51	57.87	22.93	7.78	0.80
TOTAL	338	314.63			
AVERAGE			23.122	7.498	0.662

Table 2. Alternative Pest Control Evaluation Bok Choy Harvest 2003

Treatment	Total Harvested Fruit	Total Plant Weight (lbs)	Avg. Sample Length (cm)	Avg. Sample Diameter (cm)	Avg. Weight Per Fruit (lbs)
Control	12.36	38.90	25.06	3.90	0.23
Success	17.86	43.96	26.19	4.46	0.37
End All	20.72	42.68	26.43	4.68	0.59
BTK	14.30	13.75	24.98	4.23	0.24
Tombstone	10.82	40.55	28.09	4.74	0.35
TOTAL	76.06	179.84			
AVERAGE			26.15	4.402	0.356

Table 3. Weekly insect scouting report for Bok Choy Control Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
2-Jul	Flea Beetles	Adult	36%	90%	Shot hole on leaves	Med infestation
4-Jul	Flea Beetles	Adult	10%	87%	Shot hole on leaves	Med infestation
8-Jul	Flea Beetles	Adult	10%	85%	Shot hole on leaves	Med-low infestation
10-Jul	Flea Beetles	Adult	12%	31%	Shot hole on leaves	Low infestation
15-Jul	Flea Beetles	Adult	100%	6%	Shot hole on leaves	High infestation
17-Jul	Flea Beetles	Adult	96%	15%	Shot hole on leaves	High infestation
22-Jul	Flea Beetles	Adult	95%	12%	Shot hole on leaves	High infestation
29-Jul	Flea Beetles	Adult	95%	17%	Shot hole on leaves	High infestation
1-Aug	Flea Beetles	Adult	95%	13%	Shot hole on leaves	High infestation
5-Aug	Flea Beetles	Adult	100%	33%	Shot hole on leaves	High infestation
11-Aug	Flea Beetles	Adult	100%	68%	Shot hole on leaves	High infestation

Table 4. Weekly insect scouting report for Bok Choy End-All Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
2-Jul	Flea Beetles	Adult	36%	40%	Shot hole on leaves	Med infestation
4-Jul	Flea Beetles	Adult	13%	43%	Shot hole on leaves	Med infestation
8-Jul	Flea Beetles	Adult	11%	38%	Shot hole on leaves	Med-low infestation
10-Jul	Flea Beetles	Adult	15%	23%	Shot hole on leaves	Low infestation
15-Jul	Flea Beetles	Adult	95%	10%	Shot hole on leaves	High infestation
17-Jul	Flea Beetles	Adult	95%	15%	Shot hole on leaves	High infestation
22-Jul	Flea Beetles	Adult	95%	13%	Shot hole on leaves	High infestation
29-Jul	Flea Beetles	Adult	95%	15%	Shot hole on leaves	High infestation
1-Aug	Flea Beetles	Adult	95%	18%	Shot hole on leaves	High infestation
5-Aug	Flea Beetles	Adult	100%	18%	Shot hole on leaves	High infestation
11-Aug	Flea Beetles	Adult	100%	65%	Shot hole on leaves	High infestation

Table 5. Weekly insect scouting report for Bok Choy Tombstone Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
2-Jul	Flea Beetles	Adult	17.0%	61.0%	Shot hole on leaves	Medium infestation
4-Jul	Flea Beetles	Adult	13.0%	63.0%	Shot hole on leaves	Med infestation
8-Jul	Flea Beetles	Adult	18.0%	60.0%	Shot hole on leaves	Med-low infestation
10-Jul	Flea Beetles	Adult	20.0%	16.0%	Shot hole on leaves	Low infestation
15-Jul	Flea Beetles	Adult	95.0%	8.0%	Shot hole on leaves	High infestation
17-Jul	Flea Beetles	Adult	90.0%	15.0%	Shot hole on leaves	High infestation
22-Jul	Flea Beetles	Adult	95.0%	15.0%	Shot hole on leaves	High infestation
29-Jul	Flea Beetles	Adult	95.0%	16.0%	Shot hole on leaves	High infestation
1-Aug	Flea Beetles	Adult	96.0%	15.0%	Shot hole on leaves	High infestation
5-Aug	Flea Beetles	Adult	100.0%	27.0%	Shot hole on leaves	High infestation
11-Aug	Flea Beetles	Adult	100.0%	71.6%	Shot hole on leaves	High infestation

Table 6. Weekly insect scouting report for Bok Choy BtK Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
2-Jul	Flea Beetles	Adult	50%	85%	Shot hole on leaves	Med infestation
4-Jul	Flea Beetles	Adult	18%	85%	Shot hole on leaves	Med infestation
8-Jul	Flea Beetles	Adult	19%	80%	Shot hole on leaves	Med-low infestation
10-Jul	Flea Beetles	Adult	20%	35%	Shot hole on leaves	Low infestation
15-Jul	Flea Beetles	Adult	100%	8%	Shot hole on leaves	High infestation
17-Jul	Flea Beetles	Adult	95%	15%	Shot hole on leaves	High infestation
22-Jul	Flea Beetles	Adult	95%	10%	Shot hole on leaves	High infestation
29-Jul	Flea Beetles	Adult	95%	25%	Shot hole on leaves	High infestation
1-Aug	Flea Beetles	Adult	95%	22%	Shot hole on leaves	High infestation
5-Aug	Flea Beetles	Adult	100%	31%	Shot hole on leaves	High infestation
11-Aug	Flea Beetles	Adult	100%	35%	Shot hole on leaves	high infestation

Table 7. Weekly insect scouting report for Bok Choy Success Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
2-Jul	Flea Beetles	Adult	56.0%	33.0%	Shot hole on leaves	High infestation
4-Jul	Flea Beetles	Adult	27.0%	35.0%	Shot hole on leaves	Med infestation
8-Jul	Flea Beetles	Adult	23.0%	29.0%	Shot hole on leaves	Med-low infestation
10-Jul	Flea Beetles	Adult	15.0%	33.0%	Shot hole on leaves	Low infestation
15-Jul	Flea Beetles	Adult	85.0%	10.0%	Shot hole on leaves	High infestation
17-Jul	Flea Beetles	Adult	92.0%	15.0%	Shot hole on leaves	High infestation
22-Jul	Flea Beetles	Adult	90.0%	10.0%	Shot hole on leaves	Medium infestation
29-Jul	Flea Beetles	Adult	95.0%	10.0%	Shot hole on leaves	Low infestation
1-Aug	Flea Beetles	Adult	95.0%	8.3%	Shot hole on leaves	Low infestation
5-Aug	Flea Beetles	Adult	100.0%	23.0%	Shot hole on leaves	High infestation
11-Aug	Flea Beetles	Adult	100.0%	51.6%	Shot hole on leaves	High infestation

Table 8. Weekly insect scouting report for Eggplant Control Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
24-Jun	Potato bug	Adult / Egg	56%	25%	Defoliation	Med Adult/ heavy egg
26-Jun	Potato bug	Adult / Egg	45%	27%	Defoliation	Med Adult/ heavy egg
2-Jul	Potato bug	Larva/Egg/ Adult	42%	13%	Defoliation	Heavy egg/ larva/ low adult
4-Jul	Potato bug	Larva	22%	10%	Defoliation	Heavy Larva
8-Jul	Potato bug	Larva	25%	13%	Defoliation	Heavy Larva
10-Jul	Potato bug	Larva	100%	15%	Defoliation	Heavy Larva
15-Jul	Potato bug	Larva	67%	22%	Defoliation	Heavy Larva
17-Jul	Potato bug	Larva	73%	23%	Defoliation	Heavy Larva
22-Jul	Potato bug	Larva	87%	23%	Defoliation	Heavy Larva
29-Jul	Potato bug	Larva/ Adult	95%	48%	Defoliation	Larva/ Adult
1-Aug	Potato bug	Larva/ Adult	95%	50%	Defoliation	Larva/adult
5-Aug	Potato bug	Larva/ Adult	95%	50%	Defoliation	Larva/adult
11-Aug	Potato bug	Adult	15%	48%	Defoliation	Low adult
19-Aug	Potato bug	Adult	15%	48%	Defoliation	Low adult
14-Aug	Potato bug	Adult	15%	48%	Defoliation	Low adult

Table 9: Weekly insect scouting report for Eggplant End-All Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
24-Jun	Potato bug	Adult / larva/ egg	34%	15.0%	Defoliation	Heavy egg/ low adult & larva
26-Jun	Potato bug	Adult / larva/ egg	36%	15.0%	Defoliation	Med Adult/ heavy egg
2-Jul	Potato bug	Egg/ larva/ adult	26%	7.5%	Defoliation	Heavy egg/ larva/ low adult
4-Jul	Potato bug	Larva	40%	7.5%	Defoliation	Heavy Larva
8-Jul	Potato bug	Larva	19%	5.0%	Defoliation	Heavy Larva
10-Jul	Potato bug	Larva	100%	10.0%	Defoliation	Heavy Larva
15-Jul	Potato bug	Larva	62%	15.0%	Defoliation	Heavy Larva
17-Jul	Potato bug	Larva	68%	15.0%	Defoliation	Heavy Larva
22-Jul	Potato bug	Larva	79%	35.0%	Defoliation	Heavy Larva
29-Jul	Potato bug	Larva/ Adult	90%	42.5%	Defoliation	Larva/adult
1-Aug	Potato bug	Larva/ Adult	95%	52.5%	Defoliation	Larva/adult
5-Aug	Potato bug	Larva/ Adult	95%	52.5%	Defoliation	Larva/adult
11-Aug	Potato bug	Adult	10%	42.5%	Defoliation	Low adult
19-Aug	Potato bug	Adult	10%	42.5%	Defoliation	Low adult
14-Aug	Potato bug	Adult	10%	42.5%	Defoliation	Low adult

Table 10. Weekly insect scouting report for Eggplant Tombstone Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
24-Jun	Potato bug	Adult/ egg	35.0%	12.5%	Defoliation	Low adult/ med egg
26-Jun	Potato bug	Adult/ egg	35.0%	15.0%	Defoliation	Low adult/ med egg
2-Jul	Potato bug	egg/ larva/ adult	33.0%	5.0%	Defoliation	Low adult/ heavy egg/larva
4-Jul	Potato bug	Larva	25.0%	12.5%	Defoliation	Heavy Larva
8-Jul	Potato bug	Larva	29.5%	10.0%	Defoliation	Heavy Larva
10-Jul	Potato bug	Larva	100.0%	10.0%	Defoliation	Heavy Larva
15-Jul	Potato bug	Larva	37.0%	25.0%	Defoliation	Heavy Larva
17-Jul	Potato bug	Larva	75.0%	25.0%	Defoliation	Heavy Larva
22-Jul	Potato bug	Larva	85.0%	45.0%	Defoliation	Heavy Larva
29-Jul	Potato bug	Larva/ Adult	95.0%	67.5%	Defoliation	Larva/adult
1-Aug	Potato bug	Larva/ Adult	95.0%	60.0%	Defoliation	Larva/adult
5-Aug	Potato bug	Larva/ Adult	95.0%	60.0%	Defoliation	Larva/adult
11-Aug	Potato bug	Adult	20.0%	50.0%	Defoliation	Low adult
19-Aug	Potato bug	Adult	20.0%	50.0%	Defoliation	Low adult
14-Aug	Potato bug	Adult	20.0%	50.0%	Defoliation	Low adult

Table 11. Weekly insect scouting report for Eggplant BtK Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
20-Jun	Potato bug	adult		10%		
24-Jun	Potato bug	egg/ larva	40.0%	21.0%	Defoliation	Heavy egg/ low larvae
26-Jun	Potato bug	egg/ larva	38.0%	22.0%	Defoliation	Heavy egg/ med larvae
2-Jul	Potato bug	egg/ larva/ adult	41.5%	17.5%	Defoliation	Heavy larva/ egg low adult
4-Jul	Potato bug	Larva	29.0%	15.0%	Defoliation	Heavy Larva
8-Jul	Potato bug	Larva	20.0%	12.5%	Defoliation	Heavy Larva
10-Jul	Potato bug	Larva	100.0%	17.5%	Defoliation	Heavy Larva
15-Jul	Potato bug	Larva	59.5%	15.0%	Defoliation	Heavy Larva
17-Jul	Potato bug	Larva	70.0%	17.5%	Defoliation	Heavy Larva
22-Jul	Potato bug	Larva	95.0%	50.0%	Defoliation	Heavy Larva
29-Jul	Potato bug	Larva/ Adult	95.0%	57.5%	Defoliation	Larva/adult
1-Aug	Potato bug	Larva/ Adult	95.0%	52.5%	Defoliation	Larva/adult
5-Aug	Potato bug	Larva/ Adult	9.5%	52.5%	Defoliation	Larva/adult
11-Aug	Potato bug	Adult	15.0%	45.0%	Defoliation	Low adult
19-Aug	Potato bug	Adult	15.0%	45.0%	Defoliation	Low adult
14-Aug	Potato bug	Adult	15.0%	45.0%	Defoliation	Low adult

Table 12. Weekly insect scouting report for Eggplant Success Treatment in the alternative pest control trial 2003.

DATE	INSECT	STAGE Present	% PLANTS infested	% of PLANT damaged	TYPE of Feeding	COMMENT
20-Jun	Potato bug	adult		10%	Defoliation	
24-Jun	Potato bug	adult & egg	55.0%	17.5%	Defoliation	Low adults/ heavy egg
26-Jun	Potato bug	adult & egg	35.0%	17.5%	Defoliation	Med adults/ heavy egg
2-Jul	Potato bug	adult larva /egg	29.5%	12.5%	Defoliation	Low adults/ heavy larva- egg
4-Jul	Potato bug	Larva	20.0%	12.5%	Defoliation	Heavy Larva
8-Jul	Potato bug	Larva	20.5%	12.5%	Defoliation	Heavy Larva
10-Jul	Potato bug	Larva	100.0%	12.5%	Defoliation	Heavy Larva
15-Jul	Potato bug	Larva	58.0%	15.0%	Defoliation	Heavy Larva
17-Jul	Potato bug	Larva	60.0%	15.0%	Defoliation	Heavy Larva
22-Jul	Potato bug	Larva	19.0%	10.0%	Defoliation	Heavy Larva
29-Jul	Potato bug	Larva/ Adult	15.0%	10.0%	Defoliation	Larva/adult
1-Aug	Potato bug	Larva/ Adult	5.0%	8.3%	Defoliation	Larva/adult
5-Aug	Potato bug	Larva/ Adult	10.0%	8.3%	Defoliation	Larva/adult
11-Aug	Potato bug	Adult	0.0%	5.0%	Defoliation	Low adult
19-Aug	Potato bug	Adult	0.0%	5.0%	Defoliation	Low adult
14-Aug	Potato bug	Adult	0.0%	5.0%	Defoliation	Low adult

Oriental Vegetable Variety Trials 2003

Bok Choy

General Information:

Bok Choy is a non-heading type of cabbage related to the chard family. Main varieties include 'Pai Tsai', 'Shanghai', 'Pak Choy', 'Lei Choy' and 'Canton Pak Choi'. Depending on variety, plants reach maturity in 30 to 60 days.

Harvest / Storage Information: Cut entire plant at ground level then trim heads to remove any damaged leaves and any remaining root base. Store at 0°C (32°F) and 95-100% relative humidity.

Bok Choy: 30-60 days to maturity, harvest when plants are 30 cm tall.

Baby Bok Choy: 40-60 days to maturity, plants should be approximately 10 cm tall at harvest.

Shanghai Bok Choy: Approximate 40 days to maturity, this variety can also be referred to as Baby Bok when harvested at 25-30 days. Unlike Bok Choy which has white midribs and leaf bases, Shanghai Bok has green midribs and leaf bases and tends to produce more compact, heavier heads. Plants should be 20-30 cm tall at harvest.

Bok Choy Variety Trial 2003:

Methodology: Seeding date: June 18

Plot size: 1.5m wide and 6m in length, which consisted of 4 rows replicated three times in a randomized block design. Plots were direct seeded using a Wintersteiger vegetable seeder. In-row spacing was 15cm and between-row spacing was 30cm, with seeding depth approximately 1cm.

Varieties evaluated: **(1) Joi Choi – check var.**

(2) Shencai #1

(3) Shencai #2

(4) Yellow Heart

(5) Shanghai

Results: Severe flea beetle pest damage after emergence resulted in total crop loss of all varieties. High pest populations had a definite negative impact on the trials this year. No data to present.

Conclusions/Recommendations:

This crop has good potential for expanded commercial production in Manitoba. At present there is limited commercial production being carried out in the province. Interest from both the wholesale and retail sectors, as well as market information gathered over the past six years indicates there is a demand for this crop. Future field research studies should evaluate production techniques to reduce crop loss due to disease and pest damage and improving market quality for retail trade.

Daikon and Lo Bok

General Information:

Daikon:

(Japanese radish) Approximate days to maturity is 60-70, mature roots average between 30-50 cm in length and 5-10 cm in diameter depending on variety, and weigh between .5-1.5 kg.

Harvest / Storage Information: Care must be taken at harvest to avoid damaging roots which break quite easily. Storage is recommended at 32-34°F and 95-100% relative humidity.

Lo Bok:

(Chinese Radish) Approximate days to maturity is 35-60, depending on variety. Mature roots average between 10-30 cm in length and 4-5 cm in diameter, weighing anywhere from 40-300 grams again depending on variety.

Harvest / Storage Information: Lo Bok varieties are more compact and oval in shape compared to the Daikon varieties. Storage is the same as the Daikon radish.

Daikon and Lo Bok Variety Trial 2004:

Methodology: Seeding date: May 12

Plot size: 1.5m wide and 6m in length, which consisted of 4 rows replicated three times in a randomized block design. Plots were direct seeded using a Wintersteiger vegetable seeder. In-row spacing was 15cm and between-row spacing was 30cm, with seeding depth approximately 1cm.

Varieties evaluated: **(1) Omni (Stokes 278)- Daikon check var.**

(2) Early Spring- Daikon

(3) White Slender- Daikon

(4) Red Fleshed- Lo Bok

Results: The Lo Bok variety Red Fleshed bolted early in the season and did not produce any marketable produce. Lorsban insecticide was applied (as a drench) to protect against root maggots as well a one application of Success insecticide to control flea beetles (late June). All varieties suffered minor flea beetle damage early after emergence, however most varieties recovered to produce marketable fruit. Omni and Early Spring performed quite well, with Early Spring yielding significantly higher than all other varieties.

Table 13: Summary of Daikon Variety Performance

Variety	Total Harvested Fruit	Total Plant Weight (lbs)	Total Border Weight (lbs)	Average Sample Length (cm)	Average Sample Diameter (inches)	Average Weight Per Fruit (lbs)
White Slender	9	8.02	12.68	27.25	5.15	1.04
Omni	62	91.93	244.03	32.53	6.09	1.56
Early Spring	116	75.00	212.00	24.93	6.69	1.27
TOTAL	187	174.95	468.71			
AVERAGE				28.24	5.98	1.29

Conclusions/Recommendations:

This crop fits in well with existing carrot production and has good potential for expanded commercial production in Manitoba. At present there is limited commercial production being carried out in the province. Interest from both the wholesale and retail sectors, as well as market information gathered over past years indicates there is a demand for this crop.

Oriental Cucumber

General Information: Oriental cucumber varieties are similar in appearance and growth habit as “Long English” varieties. Days to maturity from transplants are 55-60 days.

Harvest /Storage Information: Cucumbers require continuous hand harvest from initial fruiting to end of season (July- Sept.). Plants should be trellised to promote straight fruit production and easier harvesting. Harvest when fruit is 25-30cm (10-12 inches) in length. Harvested product should be removed from the field and cooled as soon as possible. Can be stored for 10-14 days at 10-12°C (50-55°F) with 95% relative humidity. Cucumbers are chill sensitive and can be damaged if held at temperatures below 10°C (50°F) for more than two days. Do not store cucumbers with other crops, which emit ethylene gas, as this can cause yellowing of the fruit.

Oriental Cucumber Variety Trial 2003:

Methodology: Transplant date: June 21

Plot size: 1.5m wide and 6m in length, which consisted of one row replicated three times in a randomized block design, in-row spacing 60cm and between-row spacing 150cm. Varieties in this trial were transplanted by hand. Plants were grown on black embossed plastic mulch in this trial, and all plots were trellised.

Varieties evaluated: **(1) Orient Express- check var.**

(2) Sitia

(3) Jing Jan

(4) Shen Fenge #3

Results: All of the varieties performed extremely well this season. We did not detect any diseases or insect problems. Plants were very prolific in fruit production with fruit size comparable for all three varieties, with the variety Orient Express having the highest overall yield followed by Shen Fenge#3 and Sitia. Harvesting started early, the first week of July and continued right into early September. Jing Jan had good size but much lower yields than all other varieties.

Cucumbers that grew not on the trellis but on the ground had a tendency to grow into a curled up shape.

Table 14: Summary of Cucumber Variety Performance

Variety	Total Harvested Fruit	Total Plant Weight (lbs)	Average Sample Length (cm)	Average Sample Diameter (cm)	Average Weight /Fruit (lbs)
Sitai	396	382.99	38.66	4.58	0.90
Orient Express	579	529.02	28.21	5.17	0.84
Jing Jan	278	265.97	38.80	4.26	0.90
Shen Fenge# 3	401	377.19	37.75	6.77	0.86
TOTAL	1,654.00	1,555.17			
AVERAGE			35.86	5.20	0.88

Conclusions/Recommendations:

Since consumers are familiar with English Long Cucumbers, their acceptance of this crop type is quite positive. Based on the past three years of field trials, this crop has excellent potential for expanded commercial production. Market evaluation and consumer response has been excellent. Small-scale commercial production of this crop is occurring in Manitoba.

Snow Peas

General Information: Approximate 60 days to maturity, which can vary depending on variety. This is a vine crop grown specifically for the pea pod. This crop requires trellising and therefore it has to be hand harvested.

Harvest / Storage Information: Pod size at harvest can vary greatly depending on variety, but pods should be harvested prior to any pea formation. Pods should be harvested on a regular basis every one to two days, to promote new pod production. In Manitoba plants will produce from mid-July through September. Harvested product should be marketed as soon as possible. Store at 0-2°C (32-36°F) and 85-90% relative humidity.

Oriental Pea Pod Variety Trial 2003:

Methodology: Seeding date: May 22

Plot size: 1.5m wide and 6m in length, which consisted of 1 row replicated three times in a randomized block design with in-row spacing at 30cm and seeding depth of 2.5cm.

For trial purposes plots were seeded by hand and all plots were trellised.

Varieties evaluated: **(1) Ho Lan Dow – check var.**

(2) Red Flower #1

Results: As a result of poor quality seed, few seeds germinated and emerged as plants. With insufficient number of plants across all replicates and for all varieties, no data was collected.

Conclusions/Recommendations:

This crop has excellent potential for commercial production in the province. The snow peas were well received by consumers in market evaluations. This crop, however, is very labor intensive, requiring hand harvesting. The poor seed germination highlights the difficulties of importing seed from abroad, seed quality is always uncertain.

Oriental Carrot

General Information: Oriental carrots are similar to traditional carrots in their production, harvest and storage requirements.

Methodology: Seeding date: May 21

Plot size: 1.5m wide and 6m in length, which consisted of a single four row plot, with in-row spacing of 10cm and between-row spacing 30cm. Varieties were seeded by hand.

Varieties evaluated: **(1) Nantes Half Long – check var.**

(2) Dai Jiang

Results: Both varieties yielded reasonably well this season, with the variety Dai Jiang yielding slightly higher than Nantes Half Long. Both varieties had more deformed roots and growth cracks. The heavy rainfall events and extremely hot weather may have played a role in this effect. Color and texture were good for Dai Jiang and Nantes. Aster yellow problems were identified occurring in 5% of all plants with both varieties.

Table 15: Summary of Carrot Variety Trials

Variety	Total Harvested Fruit	Total Plant Weight (lbs)	Average Sample Length (cm)	Average Sample Diameter (cm)	Average Weight Per Fruit (lbs)
Dai Jiang	160	63.02	17.52	4.46	0.40
Nantes	134	43.42	19.96	3.51	0.29
TOTAL	294	106.44			
AVERAGE			18.74	3.98	0.34

Conclusions / Recommendations: Although there is established commercial production of this crop in Manitoba, oriental carrot varieties could provide producers with different varieties. Potential for commercial production of the oriental varieties is excellent. Similar insect and disease pressures as seen with traditional carrot varieties.

Baby Corn

General Information: Approximately 65 days to maturity, depending on variety. A single planting may require between 6-12 hand harvests.

Harvest / Storage Information: It is crucial that cobs are harvested no more than 1-2 days after silks emerge, as they quickly become oversize and unmarketable as baby corn. Ideal cob size is 4.5-10cm in length and 7-17mm in width at the base (after husking). Harvest generally lasts between 2-4 weeks. Baby corn sold in the husk maintains its moisture and ear quality. Harvested products should be refrigerated and shipped to market as soon as possible. Store at 0-2°C (32-36°F) and 85-90% relative humidity.

Baby Corn Variety Trial 2003:

Methodology: Seeding date: May 22.

Ploy size: 1.5m in width and 6m in length, which consisted of a single row replicated three times in a randomized block design, with a seeding depth approximately 2.5cm. Plots were hand seeded.

Varieties evaluated: **(1) Little Indian -check var.**

(2) Baby Corn #1

(3) Seenog #1

Results: The variety Little Indian performed best, with highest yields and good compact size, followed closely by Baby Corn #1 and Seenog #1. Hand harvesting started August 15 until August 22. The early harvesting of baby corn avoided many of the insect pests common to corn production in Manitoba.

Table 16: Variety Performance Summary

Variety	Total Harvested Fruit	Total Plant Weight	Average Sample Length (cm)	Average Sample Diameter (cm)	Average Weight Per Fruit (lbs)
Seenong #1	543.00	78.58	24.15	2.63	0.16
Little Indian	868.00	80.42	19.00	2.26	0.08
Baby Corn #1	838	76.97	18.84	2.24	0.09
TOTAL	2249	235.97			
AVERAGE			20.66	2.37	0.11

Conclusions/Recommendations:

This is another crop with excellent potential, with positive market feedback. Small-scale commercial production of this crop is occurring in the province. Since harvesting is by hand, labor cost may be a prohibitive factor in any commercial production. Since cobs are harvested immature, pest and disease problems generally associated with sweet corn production are not as prevalent.

Oriental Watermelon

General Information: Approximately 65-90 days to maturity, depending on variety. Watermelon is a warm season vine crop of the *Cucurbitaccae* family. Plants should be started indoors 3-4 weeks prior to planting out. The use of plastic mulch is recommended to increase soil heat units and weed control. Many commercial growers also use floating row crop covers to shorten days to maturity in short season growing areas. Irrigation is recommended to establish plant stand. Drip irrigation is preferred to overhead systems, as it provides a more uniform application of water and minimizes the occurrence of foliar and fruit disease, and does not interfere with bee pollination.

Harvest / Storage Information: There are a number of methods used to determine fruit ripeness when harvesting, i) the tendril where fruit attaches to vine turns brown or dies off, ii) area on which the fruit rests on ground turns yellow, iii) when tapped with the fingers, ripe melons produce a dull hollow sound. Storage is recommended at 4-7°C (40-45°F) and 80-85% relative humidity.

Oriental Watermelon Variety Trial 2003:

Methodology: Transplant date: May 22

Plot size: 1.5m wide and 6m in length, which consisted of one row replicated three times in a randomized block design, with in-row spacing at 60cm. This trial was transplanted by hand for trial purposes. All of the plots in this trial were grown on black plastic embossed mulch.

Varieties evaluated: **(1) Early Harvest – check var.**

(2) Jing Ling

(3) Chun Len

(4) Yellow Skin

Results: All varieties except Chun Len had excellent yields with Yellow Skin, Early Harvest and Jing Ling all producing similar number of fruit. Harvesting began mid-August until early September with no insect or disease problems.

Early Harvest (check variety) had dark red flesh, with very sweet taste, typical black/brown seeds, large oval size, dark green skin with lighter broad lines. Problem with hollow heart with larger sized fruit.

Jing Ling had red flesh, with light green flesh and dark green broad lines, typical brown/black seeds and has a sweet taste.

Chun Len had a round shape, with pink flesh, small white seeds, small size, light green skin with narrow medium green line and had a very sweet taste.

Yellow Skin was typically large to medium oval size, with red flesh, typical brown/black and white seeds and has a sweet taste.

Table 17: Summary of Watermelon Variety Performance

Variety	Total Harvested Fruit	Total Plant Weight (lbs)	Average Sample Length (cm)	Average Sample Diameter (cm)	Average Weight / Fruit (lbs)
Jing Ling	85	425.12	18.85	16.60	5.77
Yellow Skin	97	901.36	27.92	19.07	12.71
Early Harvest	90	879.46	26.88	20.68	11.67
Chun Len	53	535.18	23.52	22.02	12.18
TOTAL	325	2741.12			
AVERAGE			24.29	19.59	10.58

Conclusions / Recommendations:

Based on five years of field trials, oriental watermelons have the potential to be a locally produced. At present, commercial production is limited in Manitoba. These varieties have received positive market response and have performed well in our field trials.

Oriental Muskmelon

General Information: Approximate days to maturity 65-80 depending on variety. Muskmelon is a warm season vine crop often referred to as cantaloupe by the trade sector. For short season growing areas plants should be started indoors 3-4 weeks prior to planting out. Plants are quite sensitive to cool temperatures and growth can be severely affected at temperatures below 60F. Many commercial growers incorporate the use of plastic mulch and row crop covers in the production of this crop. Irrigation is recommended for optimum fruit production, with drip irrigation the preferred method.

Harvest/ Storage Information: For local sale melons are generally harvested at (full slip) when fruit has reached full maturity. When shipping, melons are generally harvested at one-half slip to allow time for processing and transportation. Once harvested melons should be removed from the field and cooled as quickly as possible. Storage is recommended at 50-55°F (10-12°C). Storage temperature below 50°F can cause chilling injury.

Oriental Muskmelon Variety Trial 2003:

Methodology: Transplant date: May 22

Plot size: 1.5m wide and 6m in length, which consisted of one row per plot replicated three times for each variety in a randomized block design, in row spacing 45cm and between row spacing 150cm. This trial was grown on black embossed plastic mulch, and was transplanted by hand for trial purposes.

Varieties evaluated: **(1) Yellow Gold –check var.**

(2) Chang Nong

(3) Ging Feng

(4) New Sweet Long

Results: New sweet long produced the highest yields (most fruit), with Yellow Gold, Chang Nong with slightly lower yields and Ging Feng with slightly less.

Yellow Gold (check variety) had a round shape, yellow skin, white/yellow soft flesh, with a honey dew sweet taste, very popular with the public.

Chang Nong had green/white flesh, round shape, with a mild honeydew taste and soft flesh.

Jing Feng had a pink, firm flesh, oblong shape with a mild cantaloupe taste.

New Sweet Long was small in size with an oblong shape with ribbed sides, green/white coloured skin, mild honeydew taste, and soft off-white flesh.

Harvesting began the third week of August until early September.

No insect problems detected, the only disease problems occurred on melons harvested past full-slip stage. These melons had very short shelf life and became unmarketable very rapidly.

Table 18: Summary of Musk Melon Variety Performance

Variety	Total Harvested Fruit	Total Plant Weight (lbs)	Average Sample Length (cm)	Average Sample Diameter (cm)	Average Weight Per Fruit (lbs)
Yellow Gold	138	253.04	11.75	12.42	1.83
New Long Sweet	256	217.29	12.13	9.20	0.96
Ging Feng	92	394.04	22.9	15.30	5.03
Chang Nong	117	406.4	17.77	14.27	3.96
TOTAL	603	1,270.77			
AVERAGE			16.14	12.80	2.95

Conclusions/Recommendations:

At present there is small-scale commercial production of the Yellow Gold muskmelon variety in Manitoba. Yellow Gold has been well received in market evaluations and has proven to be adaptable to our growing conditions. This variety has excellent potential for expanded commercial production in the province. Market research and promotion of other muskmelon varieties will be a key factor to successful large-scale production of this crop in Manitoba.

Taiwanese Cabbage

General Information: Approximate days to maturity 55-95 depending on variety. These varieties are the same as typical green cabbage varieties. Plants can be direct seeded, but again transplants are recommended for Manitoba growing conditions. Irrigation is recommended to provide continuous moisture. Pest and disease problems are the same as any green cabbage variety.

Harvest / Storage Information: To harvest cut plants off at ground level, and trim any damaged leaves from the cabbage head. Storage is recommended at 0°C (32°F) and 90-95% relative humidity.

Taiwanese Cabbage Variety Trial 2002:

Methodology: Transplant date: May 21

Plot size : 1.5m wide and 6m in length, which consisted of 4 rows replicated three times in a randomized block design, in-row spacing 45cm and between-row spacing 30cm. For trial purposes plots were transplanted by hand.

Varieties evaluated: (1) **Cabbage 98 - checkvar.**

(2) **Jangxi #8**

(3) **Jangi #1**

Results: There were no disease problems detected on these varieties. All of the varieties seemed well adapted to our growing conditions. All three varieties were harvested from July 29 to August 22. Flea beetles caused minor damage in late June and July while the imported cabbage worm caused damage to the outer leaves in mid to late July. All performed quite well, with Jiangxi#1 and #8 having the heaviest weight per head and widest diameter. Jiangxi #1 and #8 are typical oblong / oval Taiwanese cabbage head shape, while Cabbage 98 is a typical green cabbage round head shape.

Table 19: Summary of Cabbage Variety Performance

Variety	Total Harvested Fruit	Total Plant Weight (lbs)	Average Sample Length (cm)	Average Sample Diameter (cm)	Average Weight Per Fruit (lbs)
Jiangxi # 8	33	150.49	9.94	23.34	5.2
Jiangxi# 1	34	178	13.8	19.83	5.34
Cabbage 98	34	126.34	15.46	12.98	3.46
TOTAL	101	454.83			
AVERAGE			13.07	18.72	4.67

Conclusions / Recommendations:

Taiwanese cabbage has great interest from various ethnic groups, eastern European people use it for cabbage rolls and Asian people in stir-fries and soups. This type of cabbage has definite potential for expanded production in the province.

Plastic Mulch Trial

The objective of this trial was to evaluate various mulch types effect on crop production as an alternative weed control method and its effect on yield under growing conditions unique to Manitoba.

Methodology: Treatments consisted of four types of plastic mulch: black embossed, red, green, solar mulch and a bare ground control was used as a check. Soil temperature probes were installed with each treatment in order to monitor soil heat units throughout the growing season. At time of harvest, fruit width, length and weight were recorded.

Table 20: Summary of Oriental Pepper Mulch Trial

Variety	Total Harvested Fruit	Total Plant Weight (lbs)	Average Sample Length (cm)	Average Sample Diameter (cm)	Average Weight Per Fruit (cm)
Check	726	162.19	10.23	6.11	0.16
Solar	1016	175.46	9.17	6.03	0.16
Red	1147	195.28	9.78	6.24	0.17
Green	938	187.00	9.67	6.10	0.17
Black	1022	172.63	9.88	6.30	0.16
TOTAL	4849	892.56			
AVERAGE			9.746	6.156	0.164

Table 21: Summary of Cucumber Mulch Trial

Treatment	Total Harvested Fruit	Total Plant Weight (lbs)	Average Sample Length (cm)	Average Sample Diameter (cm)	Average Weight Per Fruit (lbs)
Check	373.00	358.93	29.28	5.03	0.86
Solar	473.00	469.65	31.16	5.06	0.91
Green	515.00	507.15	30.18	5.02	0.91
Black	443.00	420.78	30.80	5.61	0.88
Red	493.00	451.35	28.55	5.21	0.86
TOTAL	2297	2207.86			
AVERAGE			29.99	5.19	0.88

Table 22: Summary of Muskmelon Mulch Trials

Treatment	Total Harvested Fruit	Total Plant Weight (lbs)	Average Sample Length	Average Sample Diameter	Average Weight Per Fruit
Check	177.00	266.56	10.92	11.30	1.75
Solar	269.00	412.50	10.80	11.32	1.73
Black	209.00	342.36	11.30	11.56	2.02
Red	180.00	400.00	11.50	11.86	1.77
Green	251.00	408.69	11.50	11.84	1.85
TOTAL	1,086.00	1,830.11			
AVERAGE			11.20	11.58	1.82

Table 23: Summary of Mulch Trial for Watermelon

Treatment	Total Harvested Fruit	Total Plant Weight (lbs)	Average Sample Length (cm)	Average Sample Diameter (cm)	Average Weight Per Fruit (lbs)
Check	84	721.86	25.16	18.76	9.03
Black	99	1066.86	27.37	22.27	10.55
Solar	114	634.46	26.75	19.84	10.63
Red	83	961.1	26.97	19.76	10.91
Green	108	1214.37	28.90	20.07	11.82
TOTAL	488	4,598.65			
AVERAGE			27.03	20.14	10.588

Table 24: Average soil temperatures for all treatments with the Watermelon crop from May to September

TREATMENT	AVG TEMP (Celcius)	MAX TEMP (Celcius)	MIN TEMP (Celcius)
CHECK	18.10	28.70	6.62
RED	20.64	36.13	6.62
BLACK	19.45	32.76	7.43
GREEN	19.97	37.00	7.03
SOLAR	20.65	36.13	6.62

Results and Conclusions:

Oriental peppers and Oriental cucumber had higher yields than bare ground treatments, however there was no difference between mulch types for yield. There was little difference among all treatments with muskmelon. However, bare ground, red and black mulch treatments had lower yields compared to the solar and green coloured mulch treatments. For watermelon, all treatments had similar yields, no difference between mulch and no mulch. For all crops tested the treatments had no effect on fruit length, fruit diameter or fruit weight.

Soil temperatures for all crops indicated similar low temperatures for all treatments, but all mulch treatments had higher maximum temperatures than bare ground. Red, green and solar mulch treatments had similar and higher soil temperature maximums than the black mulch treatment. Only watermelon soil temperature data was presented.

Tours

AAFC Special Crops Program personnel toured plots on July 16, and the MCDC Portage Field Day Tour occurred on July 24, 2003.

Many informal tours of the trials by the general public, MAF employees and producers occurred throughout the summer.

An overview of the Oriental Vegetable Research program was presented at the VGAM annual meeting in March 2004.



Bok choy plot in alternative pest control evaluation trial July,2003.



Oriental eggplant in alternative pest control evaluation trial Aug., 2003.



Diakon roots at harvest size.



Oriental cucumber on trellis.



Oriental muskmelon varieties (from left to right): new sweet long, yellow gold, chang nong, and ging feng.



Oriental watermelon varieties (from left to right): early harvest, chun len, yellow skin, and jing ling.



Oriental hot bell pepper harvest.



Oriental watermelon plots.



Baby corn variety seenong #1.



Oriental muskmelon on solar mulch.



Taiwanese cabbage plots.



Diakon plots showing flower bolting of the lo bok variety red fleshed.