Location	Date	# Aphids	# Parasitized	% Parasitism
Alamance	3-May	6	1	16.67
	10-May	27	1	3.70
	16-May	49	0	0.00
	23-May	45	0	0.00
	30-May	22	3	13.64
	7-Jun	6	0	0.00
	13-Jun	17	3	17.65
	20-Jun	23	5	21.74
	27-Jun	33	1	3.03
Granville	11-May	26	0	0.00
1st Planting	17-May	212	0	0.00
	25-May	210	2	0.95
	31-May	80	3	3.75
	8-Jun	34	0	0.00
	14-Jun	72	0	0.00
	21-Jun	45	2	4.44
	28-Jun	41	0	0.00
	5-Jul	49	0	0.00
	11-Jul	29	0	0.00
	18-Jul	15	0	0.00
Granville	18-Jul	6	0	0.00
2nd Planting	24-Jul	35	0	0.00
	31-Jul	28	0	0.00
	7-Aug	17	2	11.76
	14-Aug	12	1	8.33
Orange	10-May	10	0	0.00
1st Planting	16-May	9	0	0.00
	23-May	2	0	0.00
	30-May	17	0	0.00
	7-Jun	43	1	2.33
	13-Jun	26	1	3.85
	20-Jun	144	4	2.78
	30-Jun	80	1	1.25
	7-Jul	52	0	0.00
	11-Jul	21	0	0.00
	18-Jul	10	0	0.00
	24-Jul	16	2	12.50
Orange	31-Jul	55	0	0.00
2nd Planting	7-Aug	30	0	0.00
	14-Aug	49	2	4.08
Sampson	9-May	2	0	0.00
	15-May	41	0	0.00
	22-May	66	0	0.00
	29-May	12	0	0.00
	5-Jun	39	0	0.00
	12-Jun	55	0	0.00
	22-Jun	50	1	2.00
	26-Jun	46	0	0.00
	3-Jul	45	0	0.00
	10-Jul	27	0	0.00
	17-Jul	71	0	0.00

Table 2a. Incidence of parasitism of potato aphid in organically grown tomatoes in four locations in North Carolina during 1995.

Location	Date	# Aphids	# Parasitized	% Parasitism
Alamance	6-May	1	1	100.00
1st Planting	13-May	3	0	0.00
	10-Jun	20	7	35.00
	17-Jun	35	14	40.00
	24-Jun	28	9	32.14
	1-Jul	32	11	34.38
	8-Jul	22	0	0.00
	15-Jul	42	1	2.38
	22-Jul	37	1	2.70
	29-Jul	26	2	7.69
Alamance	29-Jul	8	0	0.00
2nd Planting	5-Aug	28	0	0.00
	12-Aug	32	0	0.00
	19-Aug	28	0	0.00
Granville	10-Jul	2	2	100.00
	30-Jul	11	0	0.00
	6-Aug	34	0	0.00
	13-Aug	39	0	0.00
	20-Aug	29	0	0.00
Orange	3-Jun	13	6	46.15
1st Planting	10-Jun	10	0	0.00
	17-Jun	9	2	22.22
	24-Jun	24	0	0.00
	1-Jul	22	0	0.00
	8-Jul	19	0	0.00
	15-Jul	29	1	3.45
	22-Jul	33	1	3.03
Orange	29-Jul	20	0	0.00
2nd Planting	5-Aug	30	1	3.33
	12-Aug	33	0	0.00
	19-Aug	33	0	0.00
Sampson	21-May	2	0	0.00
	4-Jun	13	2	15.38
	11-Jun	10	1	10.00
	18-Jun	4	2	50.00
	25-Jun	19	0	0.00
	2-Jul	14	0	0.00
	9-Jul	19	1	5.26

Table 2b. Incidence of parasitism of potato aphid in organically grown tomatoes in four locations in North Carolina during 1996.

Location	Date	Coccinelidae C. macaculata	C. septempunctata	Harmonia spp.	H. convergens	Unknown	Syrphidae Syrphid fly	Chrysopidae Green lacewing	Aranae Spider	Reduviidae Assassin bug	Sum
Alamance	3-May	0	0	0	0	2	0	0	4	0	6
	10-May	0	0	0	0	0	2	0	12	0	14
	16-May	1	0	0	0	0	4	0	11	0	16
	23-May	6	0	0	0	0	2	0	11	3	22
	30-May	1	0	0	0	1	0	0	4	0	6
	7-Jun	1	0	0	0	0	0	0	13	0	14
	13-Jun	2	0	0	0	0	0	0	2	1	5
	20-Jun	1	0	0	0	0	1	0	17	0	19
	27-Jun	3	0	0	0	0	0	0	10	0	13
Granville	11-May	0	0	0	0	0	0	0	5	0	5
1st Planting	17-May	0	0	0	0	0	0	0	8	1	9
	25-May	0	1	0	0	0	3	0	12	0	16
	31-May	1	1	0	0	0	0	0	10	1	13
	8-Jun	0	0	0	0	0	0	0	14	1	15
	14-Jun	1	0	0	0	0	0	1	17	0	19
	21-Jun	1	0	1	2	0	0	15	24	1	44
	28-Jun	0	1	0	0	0	2	11	20	3	37
	5-Jul	1	0	0	0	1	7	11	20	1	41
	11-Jul	1	0	0	0	0	4	8	35	7	55
	18-Jul	0	0	0	0	0	4	0	32	9	45
	24-Jul	0	0	0	0	0	0	0	48	4	52
	31-Jul	1	0	0	0	0	0	0	26	1	28
	7-Aug	0	0	0	2	0	0	0	42	0	44
Granville	11-Jul	0	0	0	0	0	0	0	9	2	11
2nd Plting	18-Jul	0	0	0	0	0	4	1	6	0	11
	24-Jul	0	0	0	0	0	0	0	9	0	9
	31-Jul	0	0	0	1	0	3	0	29	1	34
	7-Aug	0	0	0	2	0	6	0	35	0	43
	14-Aug	0	0	0	0	0	4	0	63	0	67
Orange	27-Apr	0	0	0	0	0	0	0	1	0	1
1st Planting	3-May	0	0	0	0	0	0	0	3	0	3
	10-May	0	0	0	0	0	0	0	10	0	10
	16-May	0	0	0	0	0	1	0	3	0	4
	23-May	1	0	0	0	0	0	0	10	0	11
	30-May	2	2	0	0	0	3	0	12	0	19
	7-Jun	2	1	0	0	0	19	0	6	0	28
	13-Jun	2	0	0	0	0	0	1	3	0	6
	20-Jun	0	0	0	0	0	0	2	10	0	12
	27-Jun	1	0	0	1	0	2	11	5	0	20
	7-Jul	0	0	0	2	0	6	11	8	0	27
	11-Jul	2	0	1	0	1	11	23	12	0	50
	18-Jul	1	0	0	2	0	3	1	5	0	12
	24-Jul	2	0	0	0	0	12	3	9	1	27
	31-Jul	1	0	0	0	2	7	0	3	2	15
Orange	11-Jul	0	0	0	0	0	0	0	1	0	1
2nd Plting	18-Jul	0	0	0	0	0	1	2	1	0	4
	24-Jul	0	0	0	0	0	0	0	5	1	6
	31-Jul	1	0	0	2	0	1	0	14	0	18
	7-Aug	0	0	1	4	0	10	14	23	1	53
	14-Aug	2	0	0	1	1	2	1	23	7	37
Sampson	26-Apr	0	0	0	0	0	0	0	4	0	4
	2-May	0	0	0	0	0	0	0	13	0	13
	9-May	0	0	0	0	2	0	0	25	0	27
	15-May	0	0	0	0	1	0	0	31	0	32
	22-May	1	0	0	0	1	0	0	25	0	27
	29-May	12	0	0	0	0	0	0	15	0	27
	5-Jun	4	0	0	0	0	0	0	14	2	20
	12-Jun	2	1	0	0	0	1	1	30	0	35
	22-Jun	0	0	0	0	0	0	0	37	0	37
	26-Jun	0	0	0	0	0	0	1	17	0	18
	3-Jul	0	0	0	0	0	0	0	20	0	20
	10-Jul	0	0	0	0	0	0	0	14	1	15
	17-Jul	2	0	0	0	0	4	1	34	0	41
Totals		59	7	3	19	12	129	119	994	51	1393

Table 3a. Generalist predators (6 plots - 4 plants per plot) on organically grown tomatoes in four locations in North Carolina during 1995.

Location	Date	Coccinelidae C. maculata	C. septempunctata	Harmonia spp.	H. convergens	Unknown	Syrphidae Syrphid fly	Chrysopidae Green lacewing	Aranae Spider	Reduviidae Assassin bug	Sum
Alamance	29-Apr	0	0	0	0	0	0	0	2	0	2
1st Planting	6-May	0	0	0	0	0	0	0	2	0	2
	13-May	0	0	0	0	0	0	0	2	0	2
	20-May	0	1	0	0	0	0	0	9	2	12
	3-Jun	0	0	0	0	0	2	0	2	3	7
	10-Jun	0	0	0	0	0	0	4	6	0	10
	17-Jun	0	0	0	0	0	0	2	13	0	15
	24-Jun	1	0	0	0	0	0	0	13	0	14
	1-Jul	0	0	0	0	0	0	2	15	0	17
	8-Jul	0	0	0	0	0	0	3	15	0	18
	15-Jul	1	0	0	0	0	2	1	16	1	21
Alamance	22-Jul	13	0	0	0	0	0	0	27	3	43
2nd Plting	29-Jul	9	0	0	0	1	0	0	33	1	44
	5-Aug	6	0	0	0	0	14	0	41	1	62
	12-Aug	4	0	0	0	0	0	0	49	0	53
	19-Aug	3	0	0	0	0	6	2	65	2	78
Granville	8-May	1	14	0	0	0	1	0	4	0	20
	15-May	0	1	0	0	0	0	0	4	0	5
	22-May	0	0	0	0	0	3	0	3	0	6
	5-Jun	17	0	0	0	0	0	0	10	1	28
	12-Jun	7	0	0	0	0	0	2	37	0	46
	19-Jun	19	0	0	0	0	1	4	31	0	55
	26-Jun	0	0	0	0	0	0	5	43	0	48
	3-Jul	1	0	0	0	0	0	9	48	0	58
	10-Jul	0	0	0	0	0	0	6	33	1	40
	16-Jul	1	0	0	0	0	0	3	52	0	56
	23-Jul	1	0	0	0	0	0	1	69	0	71
	30-Jul	0	0	0	0	0	0	7	50	0	57
	6-Aug	0	0	0	0	0	0	2	56	0	58
	13-Aug	0	0	0	0	0	0	1	52	1	54
	20-Aug	0	0	0	0	0	6	7	57	2	72
Orange	29-Apr	0	0	0	0	0	0	0	8	0	8
1st Planting	6-May	0	0	0	0	0	0	0	1	0	1
	13-May	0	0	0	0	0	0	0	3	0	3
	20-May	0	0	0	0	0	0	1	3	0	4
	3-Jun	0	0	0	0	0	1	0	4	0	5
	10-Jun	0	0	0	0	0	0	2	1	0	3
	17-Jun	0	0	0	0	0	1	8	18	1	28
	24-Jun	0	0	0	0	0	0	1	20	0	21
	1-Jul	2	0	0	0	0	0	0	20	0	22
	8-Jul	1	0	0	0	0	0	5	16	4	26
	15-Jul	0	0	0	0	0	0	5	10	0	15
	22-Jul	0	0	0	0	0	0	2	18	0	20
Orange	29-Jul	5	0	0	0	0	0	2	16	1	24
2nd Plting	5-Aug	5	0	0	0	0	0	2	20	0	27
	12-Aug	1	0	0	0	0	0	5	23	0	29
	19-Aug	0	1	2	2	1	1	2	19	0	28
Sampson	7-May	0	0	0	0	0	0	0	4	0	4
	14-May	0	0	0	0	0	0	0	7	0	7
	21-May	0	0	0	0	0	1	0	12	0	13
	4-Jun	3	0	0	0	0	0	1	13	0	17
	11-Jun	0	0	0	0	0	1	1	8	0	10
	18-Jun	1	0	0	0	0	0	0	10	0	11
	25-Jun	0	0	0	0	0	0	0	18	0	18
	2-Jul	0	0	0	0	0	0	1	25	0	26
	9-Jul	0	0	0	0	0	0	4	26	0	30
Totals		102	17	2	2	2	40	103	1182	24	1474

Table 3b. Generalist predators (6 plots - 4 plants per plot) on organically grown tomatoes in four locations in North Carolina during 1996.

		Naturally-Oviposited Eggs		Egg Clusters					
Year	Planting	Percent Parasitism	Standard Error	Percent Parasitism	Standard Error	Percent Predation	Standard Error	Percent Mortality	Standard Error
1995	Early	6.25	23.27	47.09	10.43	19.64	4.04	62.50	11.29
1995	Late	63.04	5.41	78.12	9.40	17.70	3.64	89.15	10.18
1996	Early	47.58	11.44	45.40	5.71	7.78	2.21	51.87	6.19
1996	Late	53.34	4.91	78.10	12.43	5.83	4.81	81.13	13.46

Table 4a - Means and standard errors for factors of mortality in naturally oviposited eggs and egg clusters in the early and late plantings of 1995 and 1996. GLM Procedure; LS Means.

	Naturally-Oviposited Eggs	Egg Clusters		
Independent Variables	Percent Parasitism	Percent Parasitism	Percent Predation	Percent Mortality
Year Effect	0.2472	0.9251	0.0128	0.3904
Planting Effect	0.0488	0.0117	0.6222	0.0300
Interaction	0.0948	0.9345	0.9983	0.9055

Table 4b - P-values from tests on year and planting effects in regard to mortality factors in naturally oviposited and egg clusters. Means separation by GLM; LS Means.

Source	Percent Emergence During Shipping	Total Percent Emergence	Percent Female	Percent Female Brachyptery	Longevity - Days	Percent Male Brachyptery	Percent Releasable Macropterous Females
ARBICO	0.8 - 65.4	51.6 - 86.8	55.0 - 99.09	26.0 - 66.0	3.85 - 11.0	50.0 - 85.71	7.6 - 26.57
Beneficial Insectary	0.4 - 3.2	61.0 - 81.2	59.0 - 100.0	49.0 - 82.0	3.5 - 9.4	51.92 - 77.0	14.09 - 29.85
Biofac	6.2 - 86.8	61.2 - 93.8	37.0 - 56.0	31.82 - 62.46	4.55 - 8.4	37.27 - 76.04	0.0 - 24.19
Bo-Biotrol	0.2 - 19.8	46.4 - 78.2	55.0 - 100.0	48.0 - 85.0	2.05 - 9.39	46.0 - 76.54	6.79 - 20.63
Bozeman Bio-Tech	3.0 - 85.6	40.0 - 84.4	82.0 - 100.0	54.0 - 71.82	3.45 - 8.2	63.64 - 76.92	1.09 - 18.29
Buena Biosystems	0.0 - 67.2	71.2 - 96.0	41.82 - 47.0	31.0 - 84.0	3.23 - 10.6	37.36 - 60.0	5.02 - 22.67
Gardens Alive	2.0 - 60.67	62.0 - 90.0	36.67 - 63.33	33.33 - 80.0	6.83 - 10.33	30.0 - 66.67	5.88 - 29.06
IPM Laboratories	1.8 - 19.8	17.2 - 87.0	66.0 - 99.0	58.0 - 81.0	3.0 - 8.15	64.0 - 100.0	2.18 - 27.21
Kunafin Insectaries	5.2 - 76.8	5.4 - 76.8	47.27 - 70.31	16.36 - 42.0	2.3 - 13.45	22.0 - 53.58	1.19 - 16.76
M&R Durango	0.0 - 2.6	63.2 - 84.2	80.0 - 100.0	43.0 - 81.0	2.25 - 9.35	51.71 - 84.21	14.98 - 27.74
Peaceful Valley	0.4 - 11.4	59.4 - 79.4	71.0 - 100.0	60.0 - 69.0	2.4 - 8.35	45.83 - 75.99	14.76 - 26.75
Rincon-Vitova	0.0 - 3.2	74.4 - 97.4	32.0 - 65.0	54.0 - 94.0	3.5 - 11.7	37.0 - 84.0	9.65 - 23.05

Table 5 - Range of mean values for the listed parameters for each company across shipments from 1995 and 1996.

1995 Trichogramma Orders																					
	Percent Emergence During Shipping			Total Percent Emergence			Percent Female			Percent Female Brachyptery			Longevity			Percent Male Brachyptery			Percent Releasable Macropterous Females		
Source	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
ARBICO	20	0.90	1.21	20	59.00	11.34	20	62.00	11.96	20	35.50	15.38	40	9.58	5.34	20	61.00	67.20	20	22.82	7.60
Beneficial	20	1.90	2.55	20	63.40	6.56	20	78.00	21.42	20	50.50	17.91	40	6.45	4.21	20	68.42	49.82	20	23.72	12.18
IPM Labs.	20	7.30	6.63	20	18.50	5.58	20	79.00	14.83	20	68.50	14.96	40	5.45	4.40	19	87.80	36.55	20	2.53	1.74
Kunafin	20	34.80	6.91	20	56.30	10.27	20	60.50	19.05	20	32.50	22.21	40	4.85	5.11	20	36.50	58.29	20	9.03	5.46
M&R Durango	20	2.30	1.98	20	63.40	6.36	20	83.00	10.81	20	45.50	13.17	40	9.25	5.04	20	68.50	48.42	20	27.72	8.02
Rincon-Vitova	20	2.30	2.18	20	91.70	3.69	20	55.00	13.95	20	61.00	13.34	40	10.85	4.38	20	38.00	40.52	20	18.79	7.26

1996 Trichogramma Orders																					
	Percent Emergence During Shipping			Total Percent Emergence			Percent Female			Percent Female Brachyptery			Longevity			Percent Male Brachyptery			Percent Releasable Macropterous Females		
Source	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
ARBICO	40	48.35	15.08	40	77.05	9.60	41	87.32	18.17	41	48.29	22.35	100	5.44	4.27	28	63.53	49.77	40	12.47	6.71
Beneficial	40	0.90	1.28	40	78.75	5.83	40	99.25	2.67	40	78.50	15.11	80	6.25	2.98	38	58.26	50.36	40	16.86	12.33
Biofac	50	63.18	30.51	50	77.14	15.43	53	46.79	16.73	52	47.54	21.61	120	6.80	3.91	53	54.39	73.28	49	5.73	10.34
Bo-Biotrol	40	6.75	8.31	40	66.35	17.69	40	69.58	22.15	40	59.25	26.54	96	5.18	5.08	32	55.40	65.12	40	17.16	12.51
Bozeman Bio-Tech	40	45.55	36.00	40	62.60	23.39	39	94.62	9.96	39	62.05	19.49	73	6.10	3.93	23	73.51	46.69	38	6.61	8.24
Buena Biosystems	50	13.72	27.17	50	87.88	10.71	51	44.51	17.92	51	59.61	26.98	119	7.09	4.11	50	51.12	52.27	50	13.03	11.76
Gardens Alive	18	23.33	21.02	18	77.78	12.61	18	50.56	15.89	18	51.67	24.79	29	8.21	2.99	18	51.11	54.11	18	13.91	10.56
IPM Labs.	20	13.60	7.61	20	71.20	17.14	25	95.60	7.68	25	70.00	16.33	40	6.05	3.33	18	70.88	44.12	20	18.10	11.55
Kunafin	49	41.10	30.81	50	49.32	31.71	39	57.76	18.14	39	22.66	19.27	60	10.08	4.82	38	33.94	50.40	36	6.58	7.08
M&R Durango	40	0.25	0.67	40	76.85	8.39	40	99.75	1.58	40	75.00	14.32	79	5.70	3.04	37	72.64	41.23	40	19.24	11.68
Peaceful Valley	40	6.60	6.78	40	70.90	9.75	40	92.25	15.10	40	63.25	16.70	80	5.43	3.59	37	64.29	48.94	40	21.30	10.84
Rincon-Vitova	40	0.35	1.00	45	88.40	9.43	45	56.89	20.09	45	75.33	15.61	80	6.04	3.92	45	47.78	67.38	40	14.03	9.34

Table 6 - Means of listed parameters for each company over all shipments. N = number of $1cm^2$ subsections for all parameters except longevity (50 eggs/subsection for emergence data, 10 *Trichoramma*/subsection for data related to females, male brachyptery was weighted based on the number of males found per subsection). For longevity N = number of female *Trichogramma*.

Source	Card	Packaging	Directions	Replacement
ARBICO shipments 1, 2	1 Card 10 Sections (1"x1")	Cardboard box Styrofoam cooler Newspaper padding Cold pack Water resistant envelope for egg card	Basic information on biology and release	None Requested
Beneficial Insectary shipments 1, 2	1 Card 30 Sections (1"x1")	Cardboard box Styrofoam cooler No padding Cold pack Paper bag for egg card	Basic information on biology and release	None Requested
IPM Laboratories shipments 1, 2	10 Cards (1"x1")	Cardboard box Newspaper padding Cold pack Paper bag Plastic cups for each egg card	Product profile	None Requested
Kunafin Insectaries shipments 1, 2	1 Strip (1"x8")	Cardboard box Newspaper padding Cold pack Newspaper and egg card were damp - fungus was growing on the egg card	None Provided	None Requested
M&R Durango shipment 1	1 Card 30 Sections (1"x1")	Cardboard box Styrofoam cooler No padding Cold pack Paper bag for egg card	None Provided	None Requested
shipment 2	2 Cards 15 Sections (1"x1")	Cardboard box Styrofoam siding Wood shaving padding Cold pack Plastic bag for egg card	None Provided	None Requested
Rincon-Vitova shipments 1, 2	1 Card 30 Sections (1"x1")	Cardboard box Newspaper padding Cold pack Paper envelope for egg card	None Provided	None Requested

Table 7 - Description of the packaging of the 1995 *Trichogramma* quality control shipments.

Source	Card	Packaging	Directions	Replacement
ARBICO shipment 1	3 Cards (1"x1")	Cardboard box Newspaper padding Cold pack Plastic cup for all egg cards	Basic information on biology and release	None Requested
shipment 2	1 Card 3 Sections (1"x1")	Cardboard box No padding No cooling Card in zip-lock bag	None Provided	None Requested
shipment 3				Fly parasitoids sent instead of *Trichogramma*
shipment 4	1 Card 3 Sections (1"x1")	Cardboard box Styrofoam cooler Cold pack Card in zip-lock bag	None Provided	None Requested
shipment replacement	3 Cards (1"x1")	Cardboard box Styrofoam cooler Cold pack Paper bag Plastic cup for all egg cards	Basic information on biology and release	
Beneficial Insectary shipments 1, 2, 3, 4	1 Card 30 Sections (1"x1")	Cardboard box Styrofoam cooler No padding Cold pack Paper bag for egg card	None Provided	None Requested
Biofac shipment 1	1/4 Card 8 Sections with hanging holes	Padded envelope No cooling Egg card between cardboard slats wrapped in paper towel	Basic information on release	None Requested
shipment 2	1/4 Card 8 Sections with hanging holes	Cardboard box Packing peanuts No cooling Egg card between cardboard slats wrapped in paper towel	Basic information on release	None Requested
shipment 3	1/4 Card 8 Sections with hanging holes	Cardboard box Packing peanuts No cooling Egg card between cardboard slats wrapped in paper towel	None Provided	No subsequent emergence Called 8 Aug. 1996 No hesitation to replace
shipments 4, replacement	1/4 Card 8 Sections with hanging holes	Cardboard box Newspaper padding No cooling Egg card between cardboard slats wrapped in paper towel	None Provided	None Requested
Bo-Biotrol shipments 1, 2, 3, 4	1 Card 30 Sections (1"x1")	Cardboard box Styrofoam cooler Newspaper padding Cold pack Paper bag for egg card	Basic information on biology and release	None Requested
Bozeman Bio-Tech shipments 1, 2, 3, 4	10 Cards (1"x1")	Cardboard box No padding No cooling Paper bag Plastic cups for each egg card	Basis information on release	None Requested

Table 8a - Description of the packaging of the 1996 *Trichogramma* quality control shipments.

Source	Card	Packaging	Directions	Replacement
Buena Biosystems shipments 1, 3, 4	1 Card 30 Sections (1"x3")	Cardboard box Packing pop padding Cold pack Water resistant envelope for egg card	None Provided	None Requested
shipment 2	1 Card 30 Sections (1"x3")	Cardboard box Packing pop padding Cold pack Water resistant envelope for egg card	None Provided	Many dead insects in envelope Called 5 July 1996 No hesitation to replace but none sent Called again 17 July 1996 Overnighted shipment 18 July 1996
shipment replacement	1 Card 30 Sections (1"x3")	Cardboard box Packing pop padding Cold pack Water resistant envelope for egg card Many larvae from host eggs had emerged		
Gardens Alive shipments 1, 3	1 Card (1"x1")	Padded envelope Card in zip-lock bag Many eggs appeared smashed	Basic information on biology and release	None Requested
shipments 2, 4, 5, 6	1 Card (1"x1")	Padded envelope Card in zip-lock bag	Basic information on biology and release	None Requested
IPM Laboratories shipment 1	No card - eggs sent loose	Cardboard box Newspaper padding Cold pack Plastic cup for eggs	None Provided	Most dead Called 5 July 1996 No hesitation to replace and send egg cards
shipment replacement	3 Cards (1"x1")	Cardboard box Newspaper padding Cold pack Paper bag Plastic cup for all egg cards	None Provided	None Requested
shipment 2	3 Cards (1"x1")	Cardboard box No padding No cooling Paper bag Plastic cup for all egg cards	None Provided	None Requested
Kunafin Insectaries shipments 1, replacement	4 Strips (1"x6")	Cardboard box No padding Cold pack wrapped in newspaper 2 strips per water resistant envelope	None Provided	No subsequent emergence Called 5 July 1996 Sales person expressed some hesitation to replace but sent replacement
shipment 2	4 Strips (1"x6")	Cardboard box No padding Cold pack wrapped in newspaper 2 strips per water resistant envelope Many eggs on strips were smashed	None Provided	None Requested
shipment 3	4 Strips (1"x6")	Cardboard box No padding Cold pack wrapped in newspaper 2 strips per water resistant envelope	None Provided	None Requested
shipment 4	4 Strips (1"x6")	Cardboard box No padding Cold pack in paper bag 2 strips per water resistant envelope Many eggs on strips were smashed	None Provided	No subsequent emergence but no replacement requested

Table 8b - Description of the packaging of the 1996 *Trichogramma* quality control shipments.

Source	Card	Packaging	Directions	Replacement
M&R Durango shipments 1, 2, 3	1 Card 30 Sections (1"x1")	Cardboard box Styrofoam siding Wood shaving padding Cold pack Plastic bag for egg card wrapped in paper towel	Basic information on biology and release	None Requested
shipment 4	2 Cards 15 Sections (1"x1")	Cardboard box Styrofoam siding Wood shaving padding Cold pack Plastic bag for egg card wrapped in paper towel	None Provided	None Requested
Peaceful Valley Farm Supply shipments 1,4, replacement	1 Card 30 Sections (1"x1")	Cardboard box Styrofoam cooler Newspaper padding Cold pack Paper bag for egg card	None Provided	None Requested
shipment 2	1 Card 30 Sections (1"x1")	Cardboard box Styrofoam cooler Newspaper padding Cold pack Paper bag for egg card	Basic information on biology and release	None Requested
shipment 3	1 Card 30 Sections (1"x1")	Cardboard box Styrofoam cooler Newspaper padding Cold pack Paper bag for egg card	None Provided	None arrived Called 5 Aug. 1996 Sales person said it was shipped
Rincon-Vitova shipments 1, 2	1 Card 30 Sections (1"x1")	Cardboard box Newspaper padding Cold pack Paper envelope for egg card	Detailed information on biology, release, host, and general	None Requested
shipment 3	1 Card 30 Sections (1"x1")	Cardboard box Newspaper padding Cold pack Paper envelope for egg card	Detailed information on biology, release, host, and general	Delayed because wrongly addressed Called 5 Aug. 1996
shipment 4	1 Card 30 Sections (1"x1")	Cardboard box Newspaper padding Cold pack Paper envelope for egg card	Detailed information on biology, release, host, and general	None Requested
shipment replacement	1 Card 30 Sections (1"x1")	Cardboard box Styrofoam cooler Newspaper padding Cold pack Paper envelope for egg card	Detailed information on biology, release, host, and general	

Table 8c - Description of the packaging of the 1996 *Trichogramma* quality control shipments.

1995 *Trichogramma* Orders													
	Claimed number *of Trichogramma*	Cost / 100,000 *Trichogramma*			Cost / 100,000 Releasable Macropterous Females			Days to Ship			Deviation from Expected Arrival Date		
Source	per shipment	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
ARBICO	40,000	2	35.25	0.00	2	135.94	30.04	2	1.00	0.00	2	0.00	0.00
Beneficial	100,000							2	1.00	0.00	2	0.00	0.00
IPM Labs.	50,000	2	30.00	0.00	2	618.55	119.53	2	1.50	0.71	2	0.50	0.71
Kunafin	200,000	2	30.75	0.00	2	345.23	58.09	2	3.00	1.41	2	2.00	1.41
M&R Durango	100,000	2	19.50	0.00	2	50.79	0.04	2	2.50	0.71	2	0.50	0.71
Rincon-Vitova	100,000	2	22.83	0.00	2	91.99	26.98	2	2.00	0.00	2	0.00	0.00

1996 *Trichogramma* Orders													
	Claimed number *of Trichogramma*	Cost / 100,000 *Trichogramma*			Cost / 100,000 Releasable Macropterous Females			Days to Ship			Deviation from Expected Arrival Date		
Source	per shipment	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
ARBICO	12,000	4	47.75	0.00	4	388.74	157.11	4	2.00	0.00	4	0.50	1.00
Beneficial	100,000							4	1.00	0.00	4	0.00	0.00
Biofac	40,000	4	36.75	0.29	4	5270.37	3686.27	5	2.60	0.55	5	0.60	1.52
Bo-Biotrol	120,000	4	22.55	1.21	4	132.55	75.99	4	1.50	0.58	4	0.25	0.50
Bozeman Bio-Tech	50,000	4	25.50	0.00	4	1034.04	1000.39	4	2.75	0.96	4	0.25	0.50
Buena Biosystems	125,000	4	20.00	0.00	4	153.05	95.94	5	2.40	1.52	5	0.60	1.34
Gardens Alive	4,000	6	126.99	0.00	6	1227.30	664.97	6	2.17	0.41	6	0.33	0.52
IPM Labs.	10,000	2	53.50	0.00	1	187.26	.	3	2.67	1.16	3	1.67	2.89
Kunafin	80,000	4	62.50	0.00	3	2919.10	2205.58	5	1.40	0.55	5	-0.40	0.55
M&R Durango	100,000	4	28.00	0.00	4	81.37	15.13	4	1.50	0.58	4	0.00	0.00
Peaceful Valley	100,000	4	28.00	0.00	4	106.37	26.01	4	2.00	0.00	4	0.50	1.00
Rincon-Vitova	100,000	4	20.60	0.54	3	90.58	16.41	5	3.20	2.68	5	1.20	2.68

Table 9 - Means of listed parameter for each company over all shipments. N = number of shipments used to obtain the mean of the corresponding parameter. Beneficial Insectary was made aware of the study and did not charge for the insects and thus was not compared with the other companies as to cost in this table.

	Insectary Reared *Trichogramma*			Endemic *Trichogramma*			Approximate Z - Test	
	N	Mean	Standard Error	N	Mean	Standard Error	Z values	P values
Percent Female	591	72.62	1.04	384	71.2	0.63	1.17	not significant
Female Brachyptery	590	57.25	1.02	383	4.21	0.35	45.92	P<0.001
Male Brachyptery	538	57.53	1.19	380	7.32	0.55	38.36	P<0.001

Table 10 - Means, standard errors and approximate Z-Test of listed parameters between insectary reared *Trichogramma* and endemic populations obtained using *Helicoverpa zea* egg clusters. N for insectary reared *Trichogramma* equals the number of percentages calculated from shipments of *Trichogramma* from all companies (most often 10 insects per percent). N for endemic Trichogramma equals the number of percentages calculated from egg clusters placed in the fields (a single percentage was calculated for each plot into which 10 egg swatches were placed). Alpha=0.05.

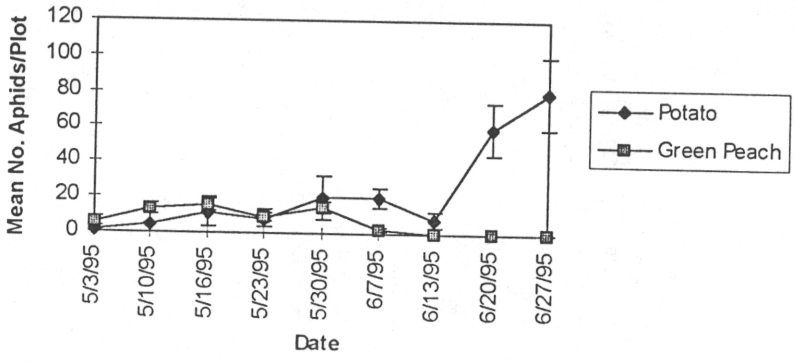


Figure 1. Mean number of green peach aphids and potato aphids on organically grown tomato plants at the Alamance County site during 1995. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

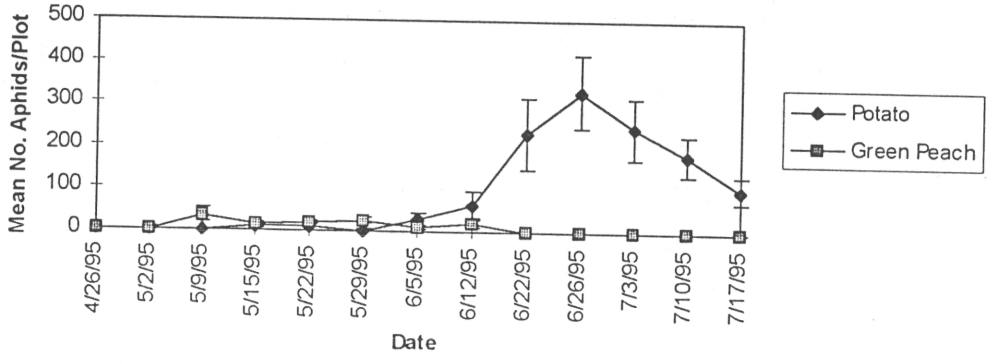


Figure 2. Mean number of green peach aphids and potato aphids on organically grown tomato plants at the Sampson County site during 1995. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

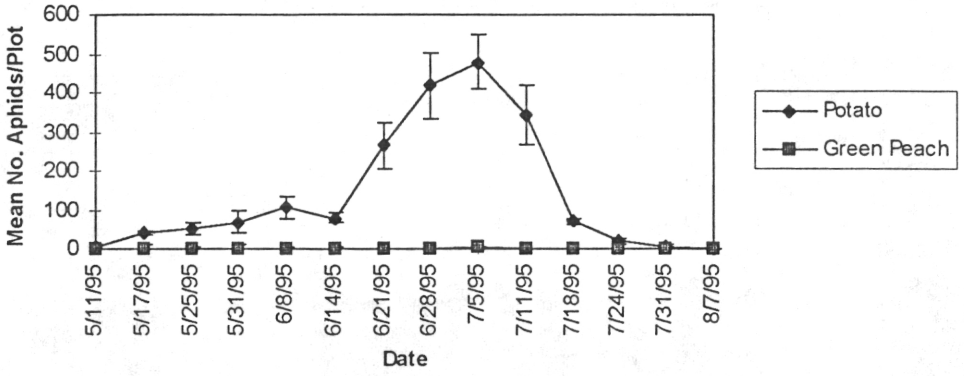


Figure 3a. Mean number of green peach aphids and potato aphids on organically grown tomato plants in the first planting at the Granville County site during 1995. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

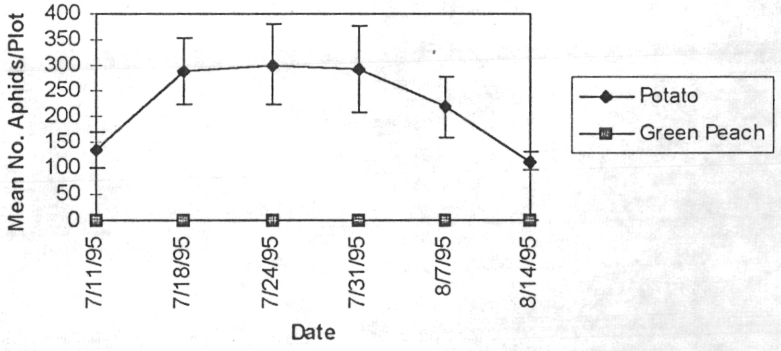


Figure 3b. Mean number of green peach aphids and potato aphids on organically grown tomato plants in the second planting at the Granville County site during 1995. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

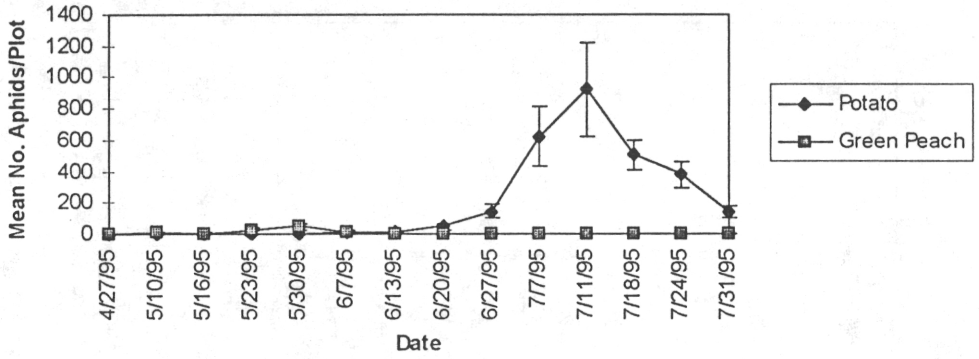


Figure 4a. Mean number of green peach aphids and potato aphids on organically grown tomato plants in the first planting at the Orange County site during 1995. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

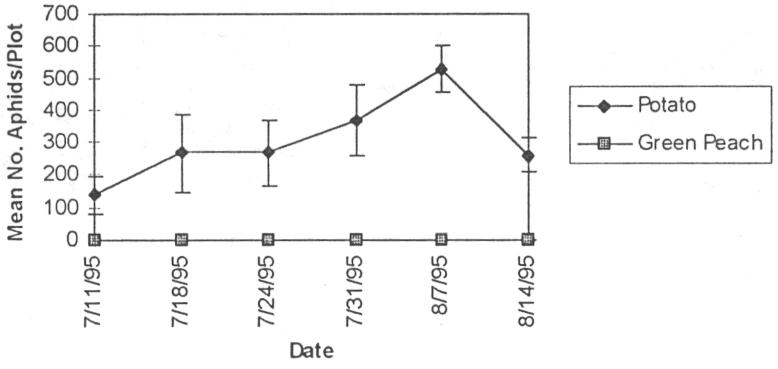


Figure 4b. Mean number of green peach aphids and potato aphids on organically grown tomato plants in the second planting at the Orange County site during 1995. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

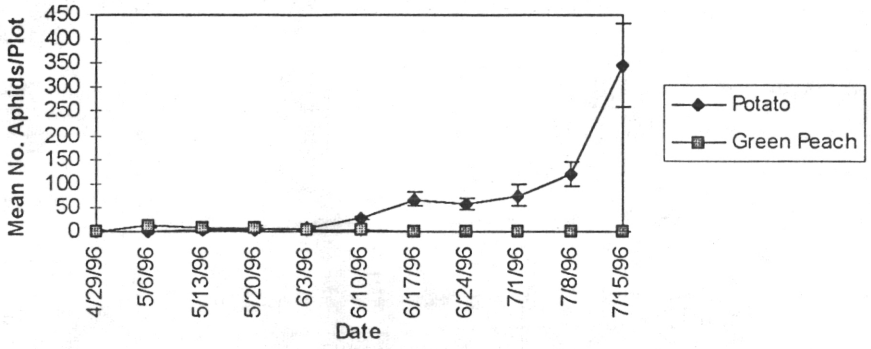


Figure 5a. Mean number of green peach aphids and potato aphids on organically grown tomato plants in the first planting at the Alamance County site during 1996. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

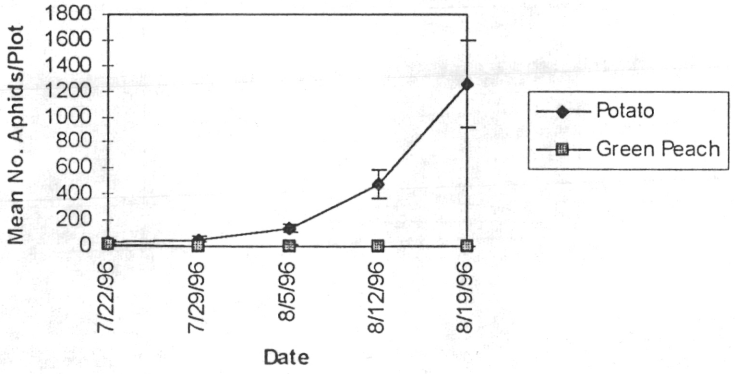


Figure 5b. Mean number of green peach aphids and potato aphids on organically grown tomato plants in the second planting at the Alamance County site during 1996. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

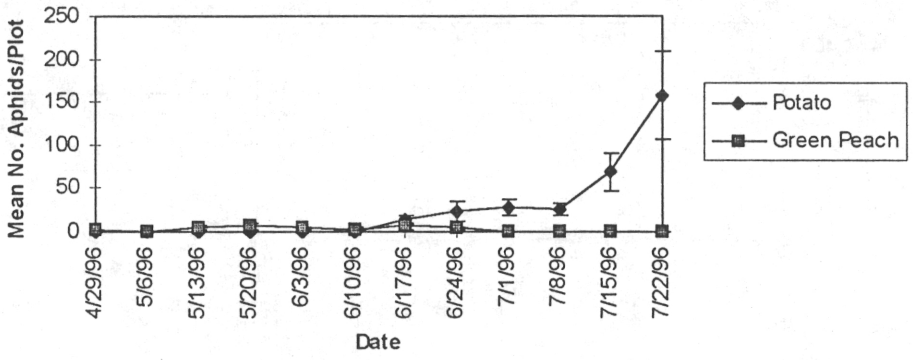


Figure 6a. Mean number of green peach aphids and potato aphids on organically grown tomato plants in the first planting at the Orange County site during 1996. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

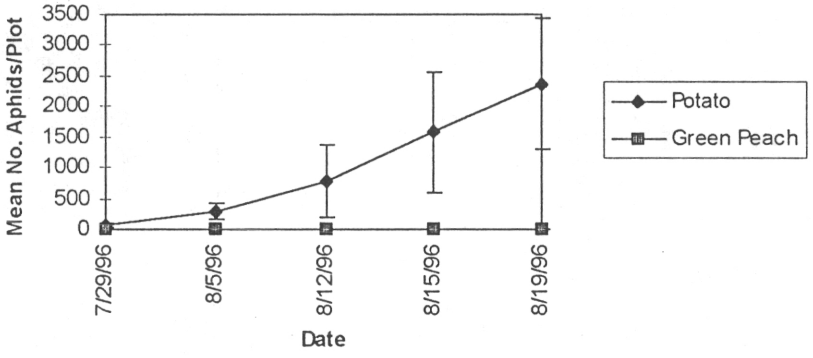


Figure 6b. Mean number of green peach aphids and potato aphids on organically grown tomato plants in the second planting at the Orange County site during 1996. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

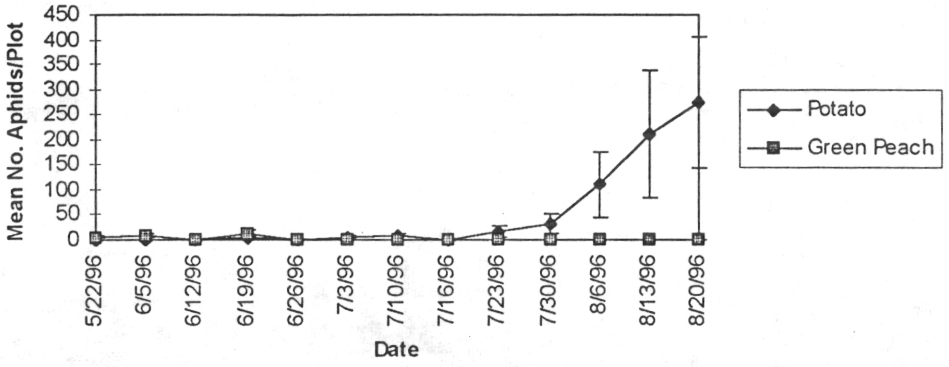


Figure 7. Mean number of green peach aphids and potato aphids on organically grown tomato plants at the Granville County site during 1996. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

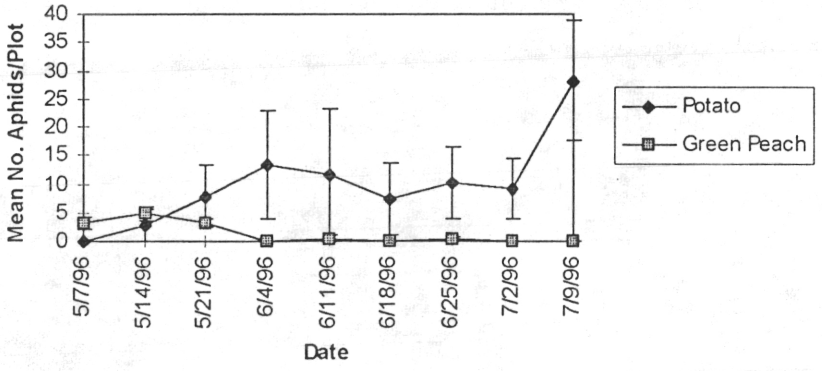


Figure 8. Mean number of green peach aphids and potato aphids on organically grown tomato plants at the Sampson County site during 1996. Values are means per plot based on samples of six apical and six basal leaves on 10 plants per plot.

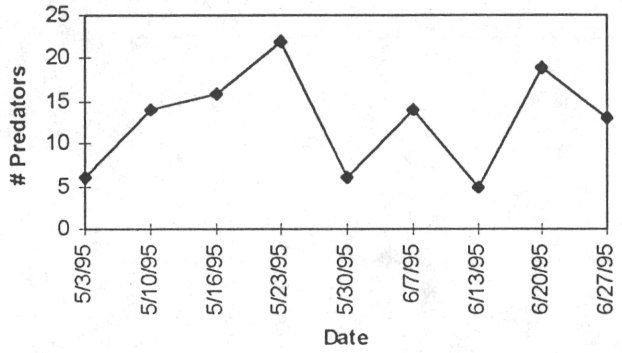


Figure 9. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants at the Alamance County site during 1995.

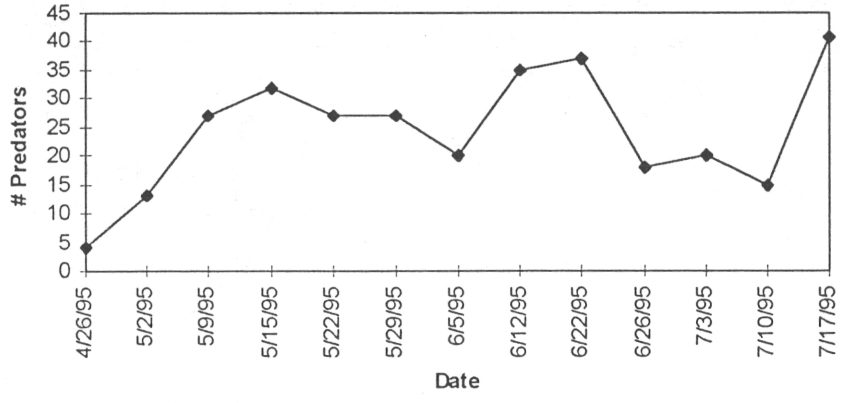


Figure 10. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants at the Sampson County site during 1995.

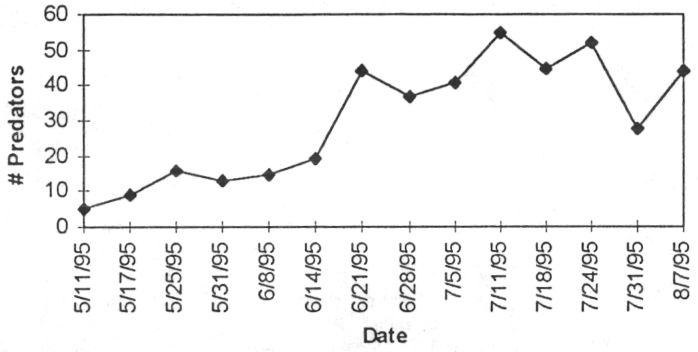


Figure 11a. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants in the first planting at the Granville County site during 1995.

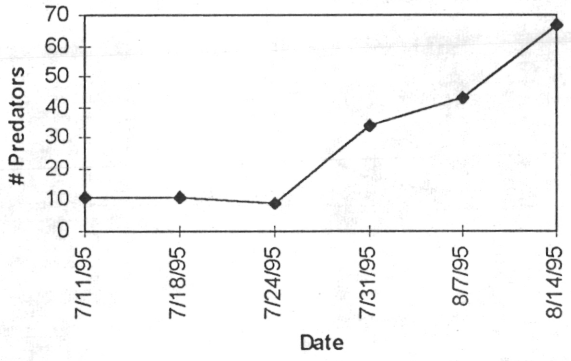


Figure 11b. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants in the second planting at the Granville County site during 1995.

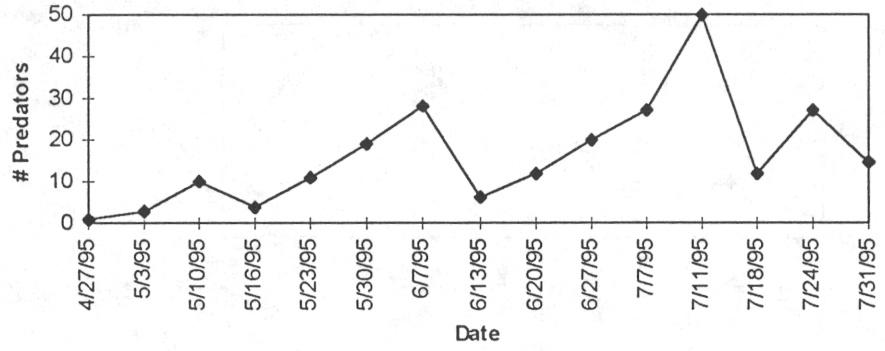


Figure 12a. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants in the first planting at the Orange County site during 1995.

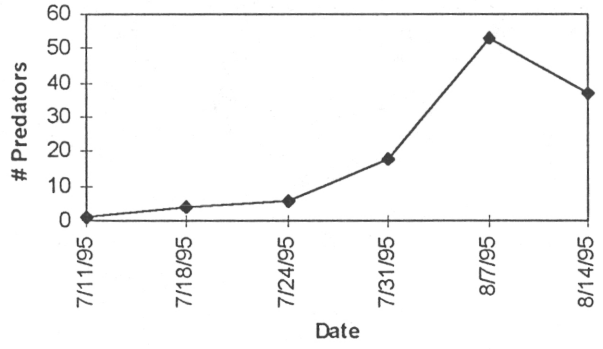


Figure 12b. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants in the second planting at the Orange County site during 1995.

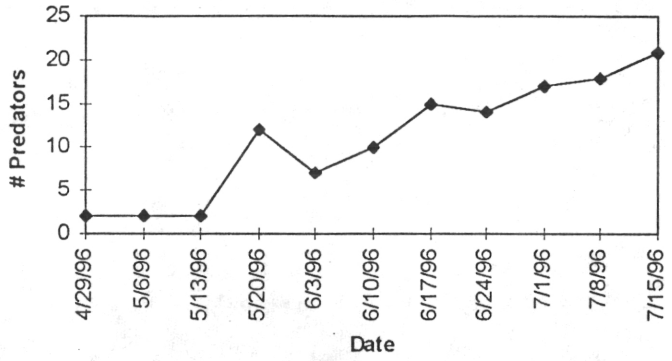


Figure 13a. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants in the first planting at the Alamance County site during 1996.

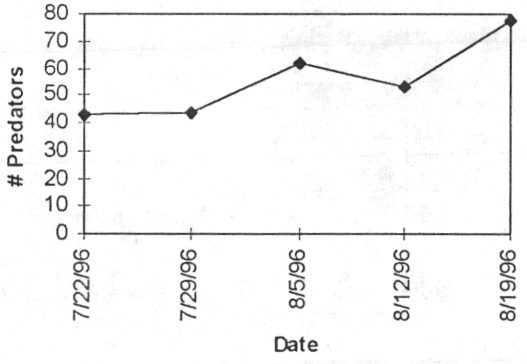


Figure 13b. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants in the second planting at the Alamance County site during 1996.

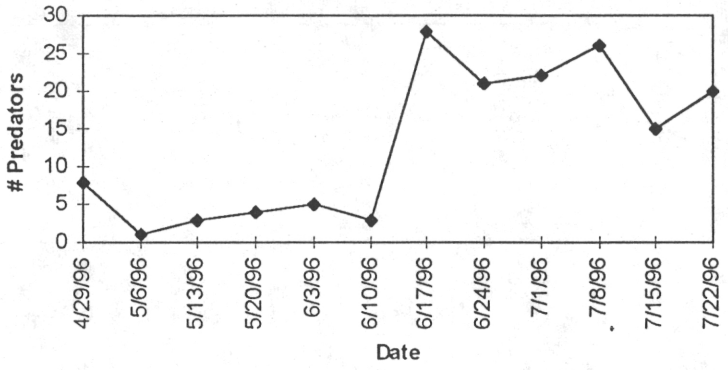


Figure 14a. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants in the first planting at the Orange County site during 1996.

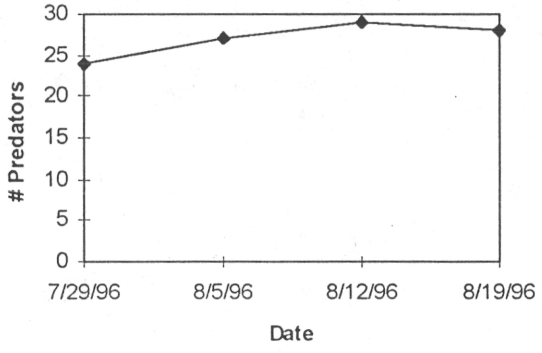


Figure 14b. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants in the second planting at the Orange County site during 1996.

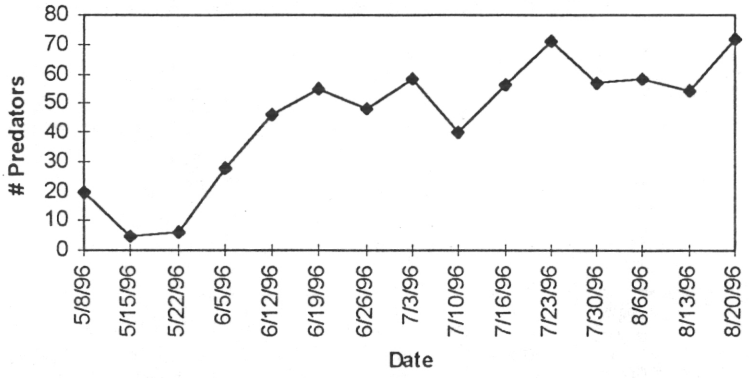


Figure 15. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants at the Granville County site during 1996.

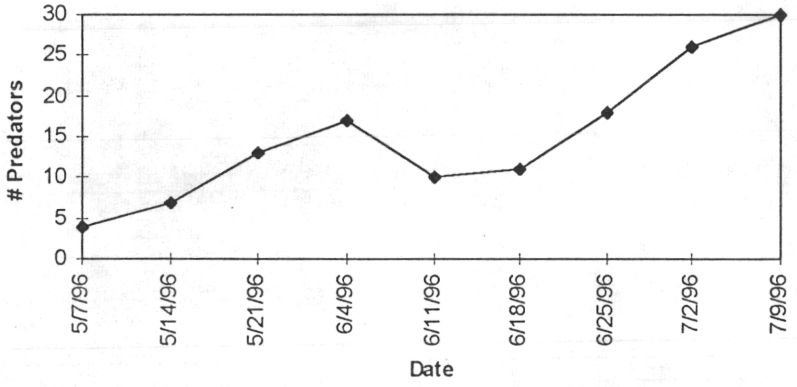


Figure 16. Total aphid predators (6 plots - 4 plants per plot) on organically grown tomato plants at the Sampson County site during 1996.

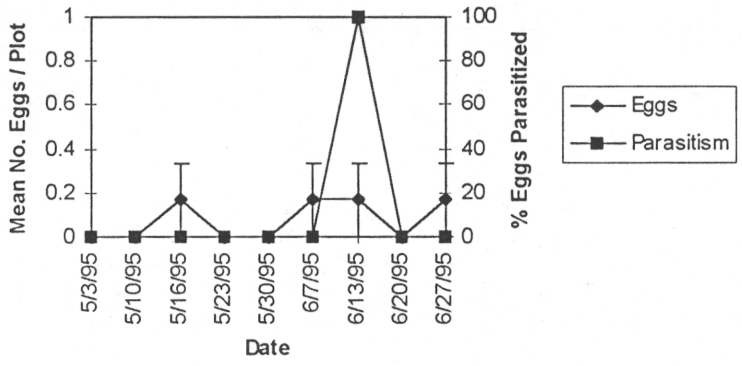


Figure 17. Abundance of hornworm eggs and the incidence of egg parasitism at the Alamance County site during 1995.

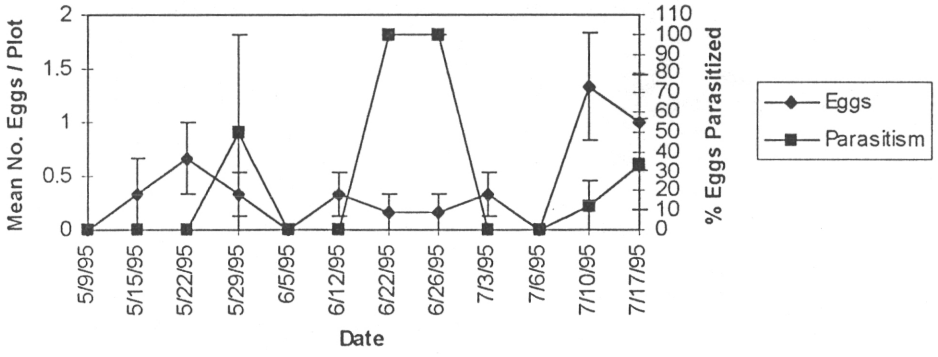


Figure 18. Abundance of hornworm eggs and the incidence of egg parasitism at the Sampson County site during 1995.

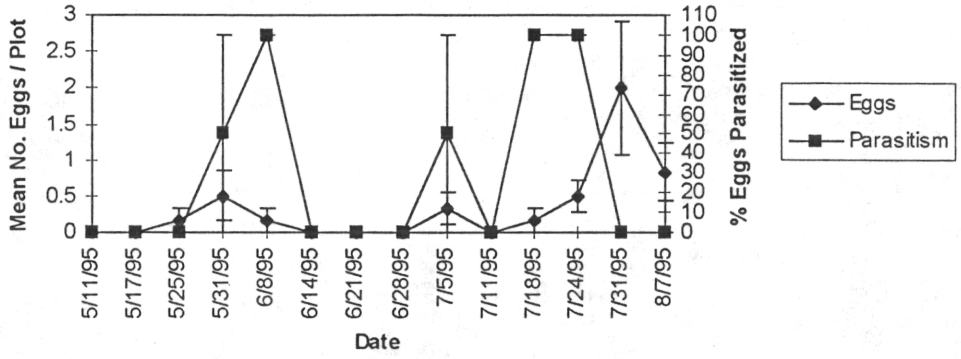


Figure 19a. Abundance of hornworm eggs and the incidence of egg parasitism in the first planting at the Granville County site during 1995.

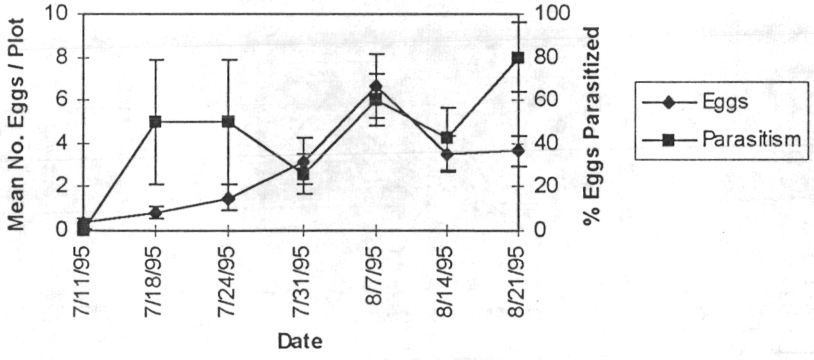


Figure 19b. Abundance of hornworm eggs and the incidence of egg parasitism in the second planting at the Granville County site during 1995.

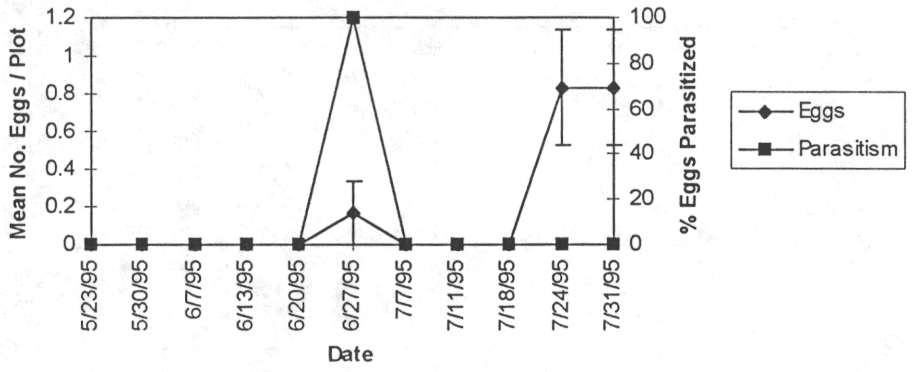


Figure 20a. Abundance of hornworm eggs and the incidence of egg parasitism in the first planting at the Orange County site during 1995.

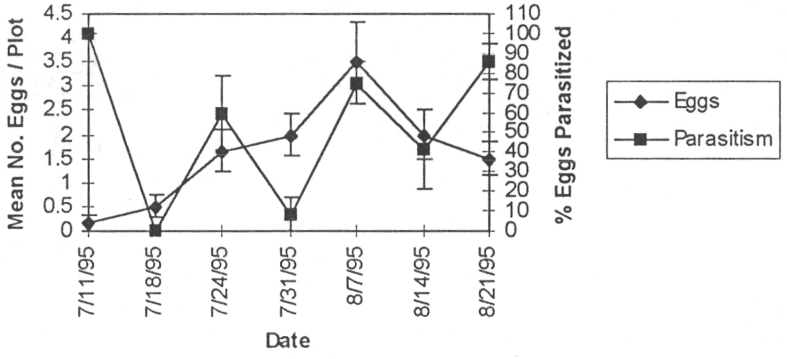


Figure 20b. Abundance of hornworm eggs and the incidence of egg parasitism in the second planting at the Orange County site during 1995.

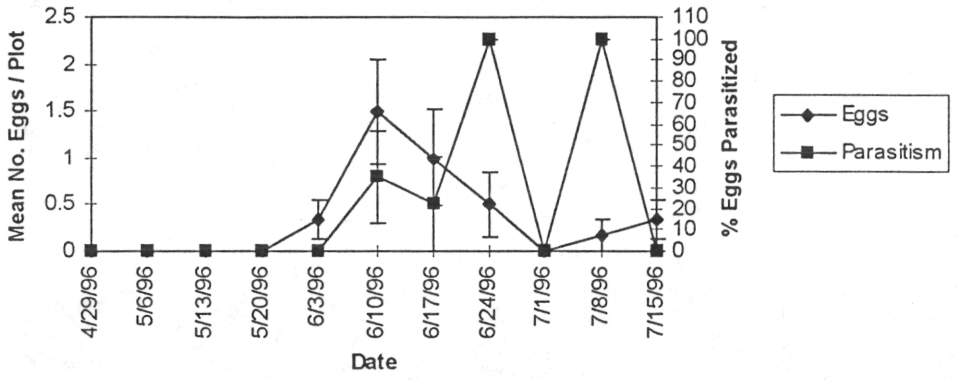


Figure 21a. Abundance of hornworm eggs and the incidence of egg parasitism in the first planting at the Alamance County site during 1996.

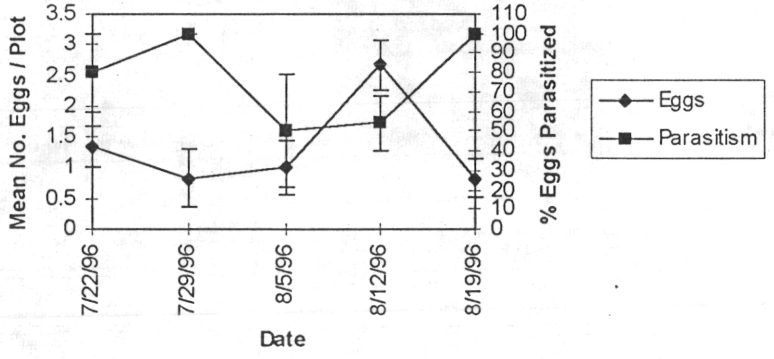


Figure 21b. Abundance of hornworm eggs and the incidence of egg parasitism in the second planting at the Alamance County site during 1996.

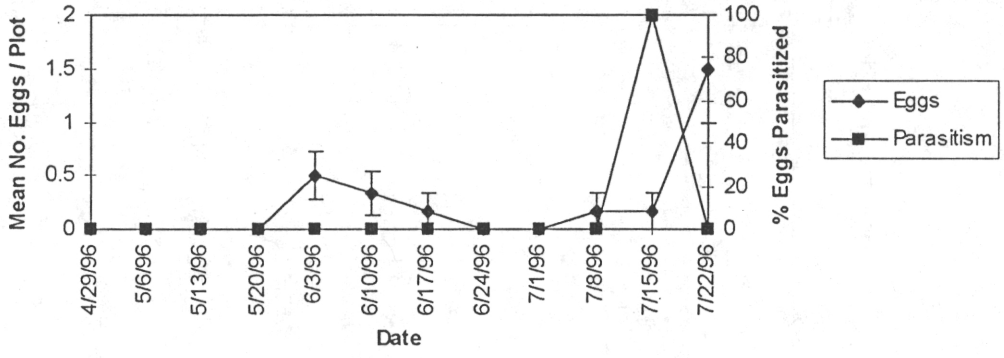


Figure 22a. Abundance of hornworm eggs and the incidence of egg parasitism in the first planting at the Orange County site during 1996.

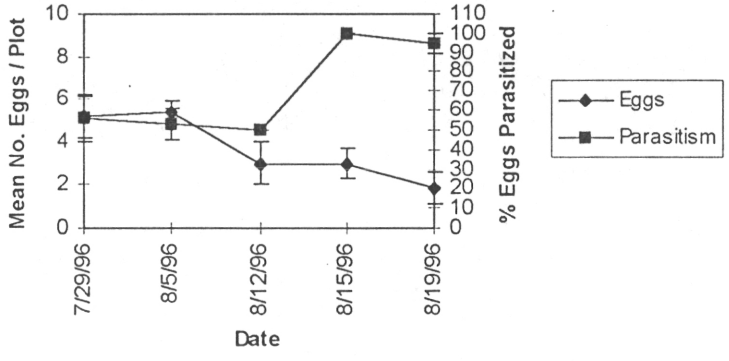


Figure 22b. Abundance of hornworm eggs and the incidence of egg parasitism in the second planting at the Orange County site during 1996.

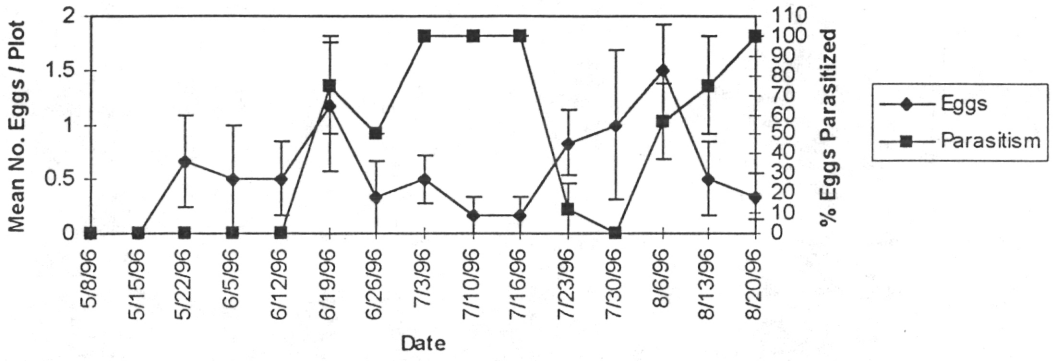


Figure 23. Abundance of hornworm eggs and the incidence of egg parasitism at the Granville County site during 1996.

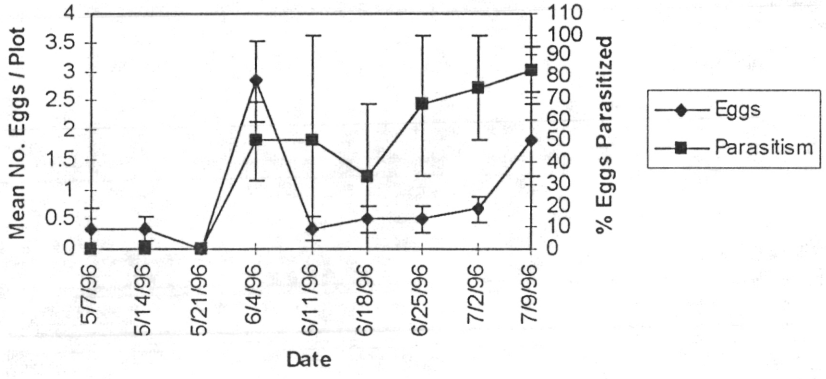


Figure 24. Abundance of hornworm eggs and the incidence of egg parasitism at the Sampson County site during 1996.

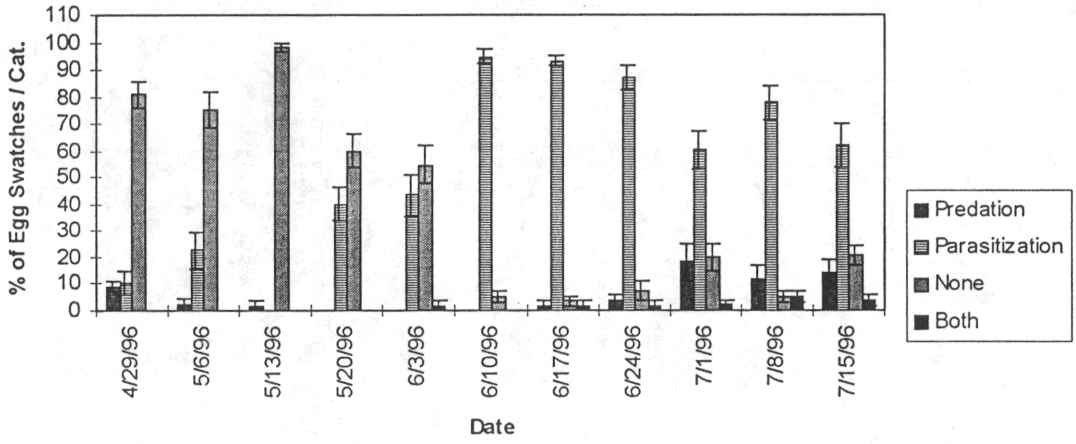


Figure 25. Incidence of egg parasitism and predation on the sentinel egg clusters in the first planting at the Alamance County site during 1996.

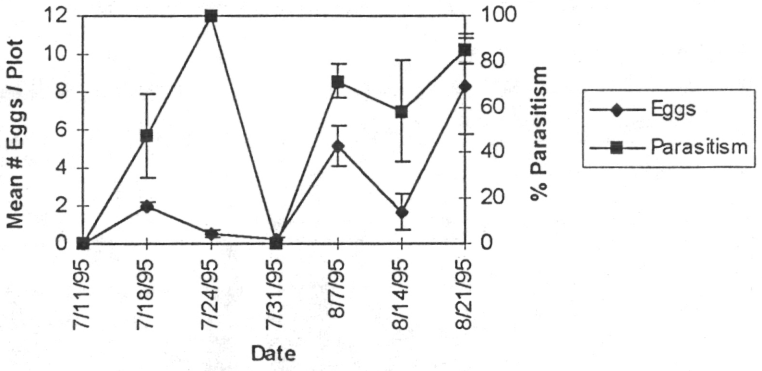


Figure 26a. Abundance of tomato fruitworm eggs and incidence of egg parasitism by *Trichogramma* in the second tomato planting at the Granville County site during 1995.

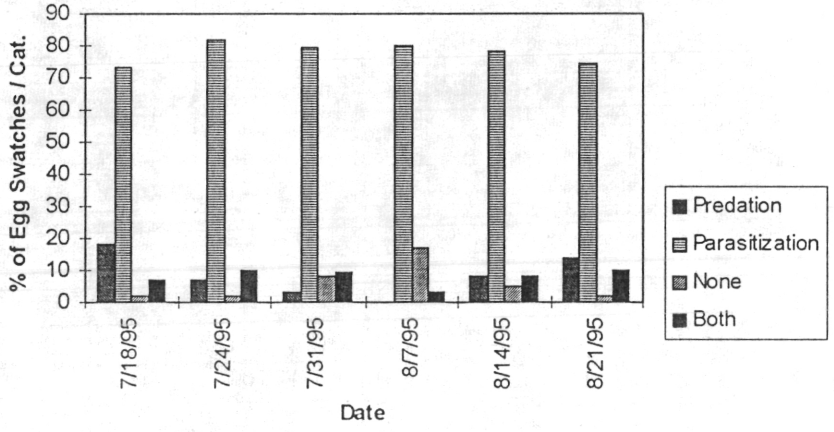


Figure 26b. Incidence of egg parasitism and predation on the sentinel egg clusters in the second planting at the Granville County site during 1995.

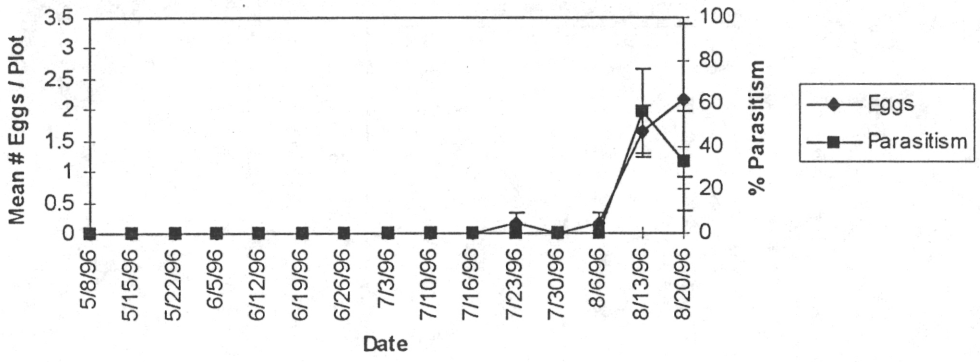


Figure 27a. Abundance of tomato fruitworm eggs and incidence of egg parasitism by *Trichogramma* in the first tomato planting at the Granville County site during 1996.

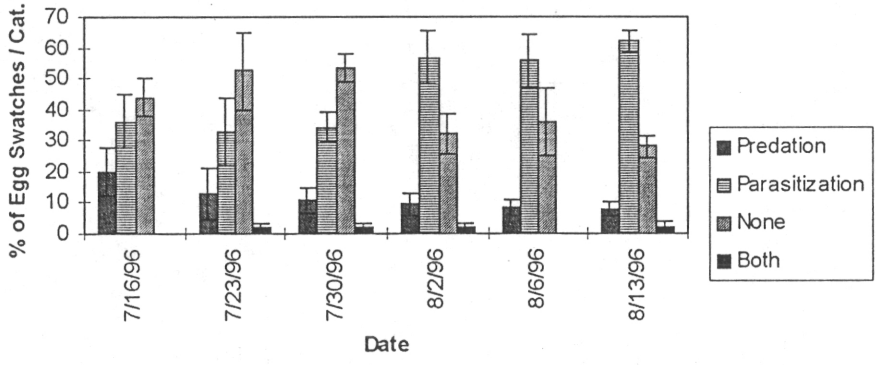


Figure 27b. Incidence of egg parasitism and predation on the sentinel egg clusters in the first planting at the Granville County site during 1996.

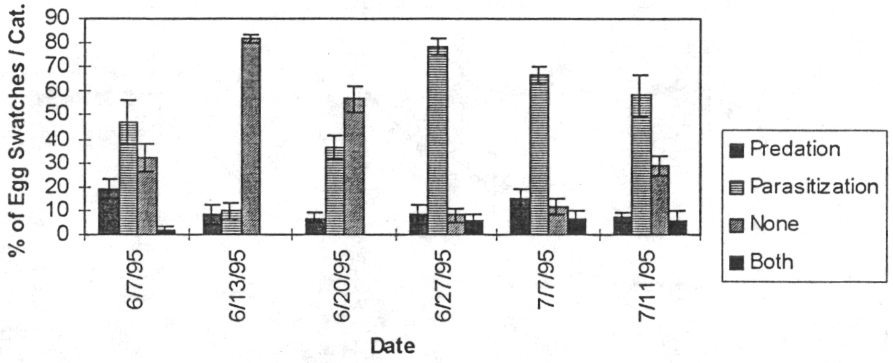


Figure 28. Incidence of egg parasitism and predation on the sentinel egg clusters in the first planting at the Orange County site during 1995.

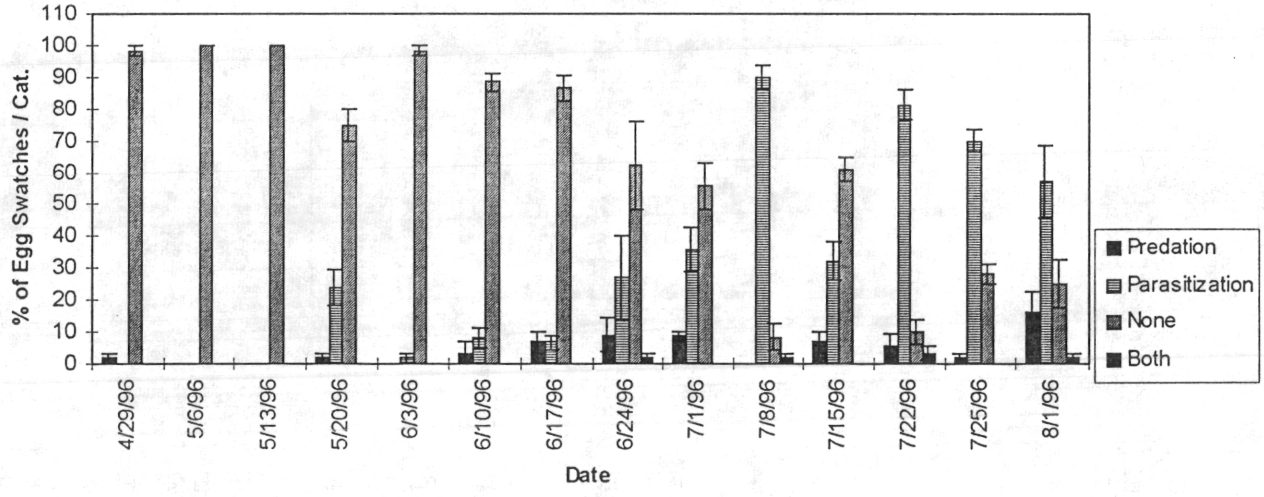


Figure 29. Incidence of egg parasitism and predation on the sentinel egg clusters in the first planting at the Orange County site during 1996.

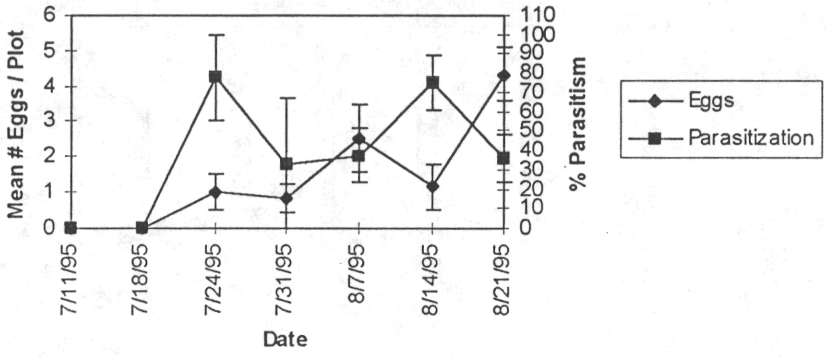


Figure 30a. Abundance of tomato fruitworm eggs and the incidence of egg parasitism by *Trichogramma* in the second tomato planting at the Orange County site during 1995.

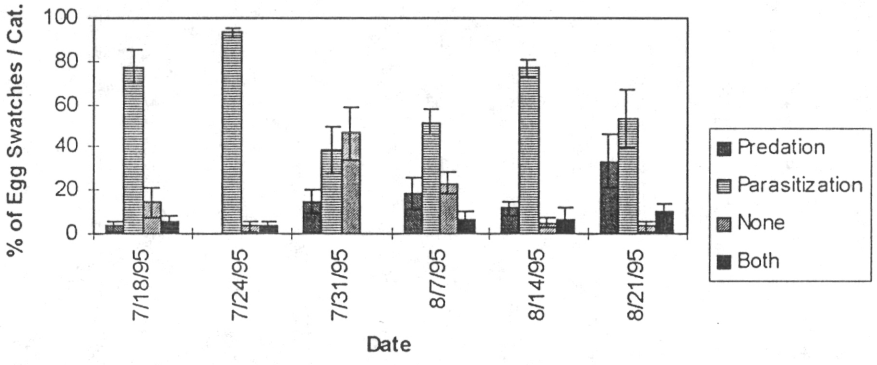


Figure 30b. Incidence of egg parasitism and predation on the sentinel egg clusters in the second tomato planting at the Orange County site during 1995.

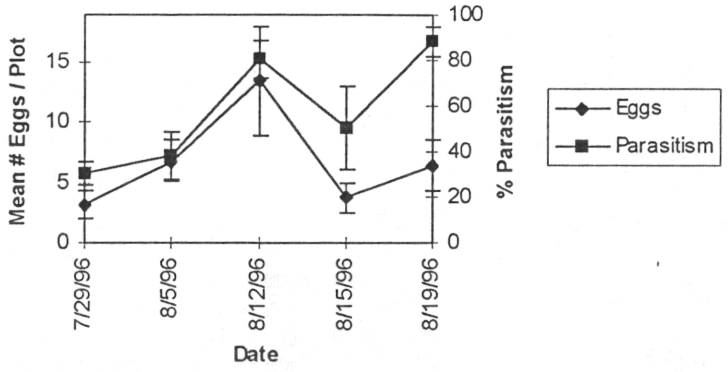


Figure 31a. Abundance of tomato fruitworm eggs and the incidence of egg parasitism by *Trichogramma* in the second tomato planting at the Orange County site during 1996.

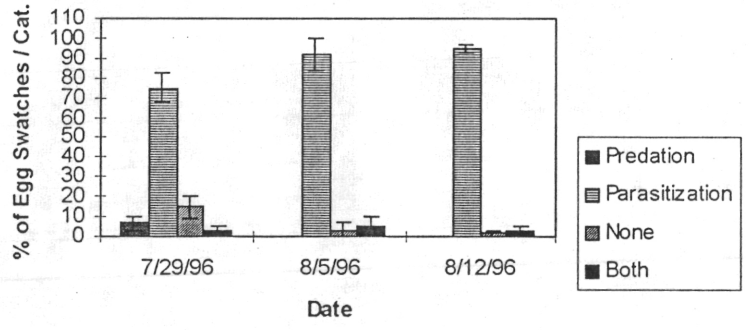


Figure 31b. Incidence of egg parasitism and predation on the sentinel egg clusters in the second tomato planting at the Orange County site during 1996.

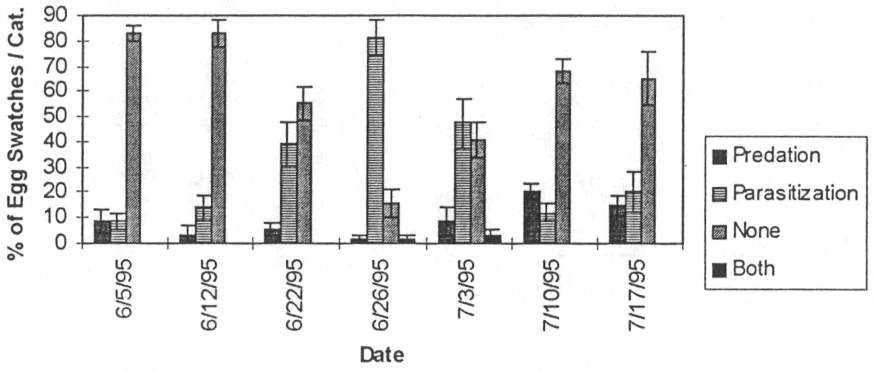


Figure 32. Incidence of egg parasitism and predation on the sentinel egg clusters at the Sampson County site during 1995.

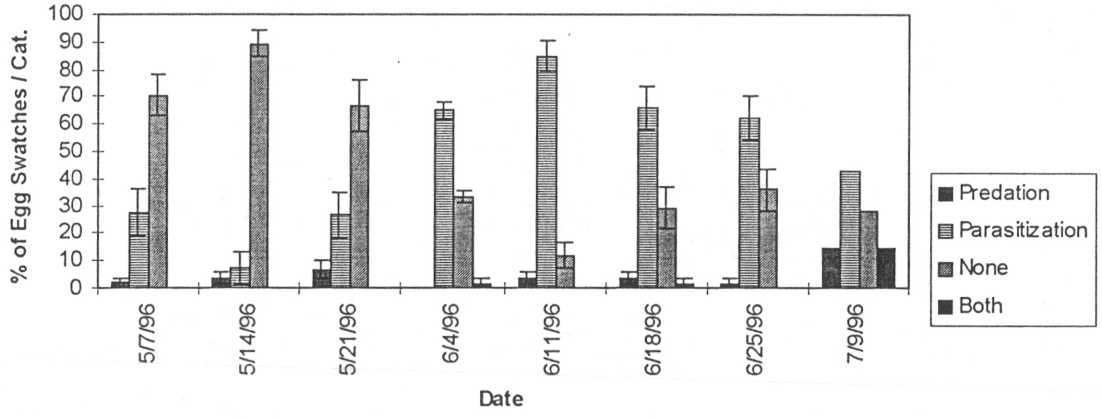
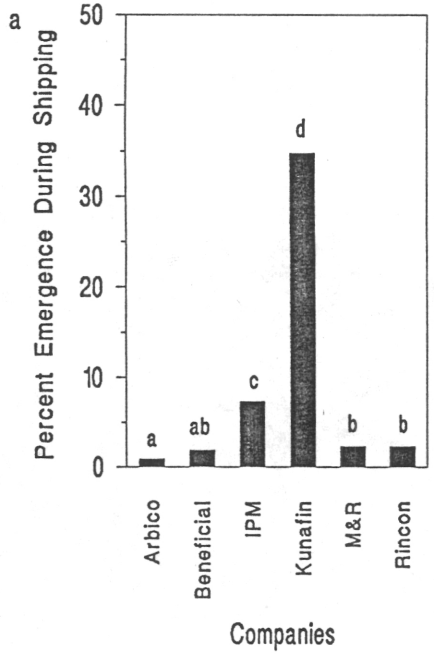
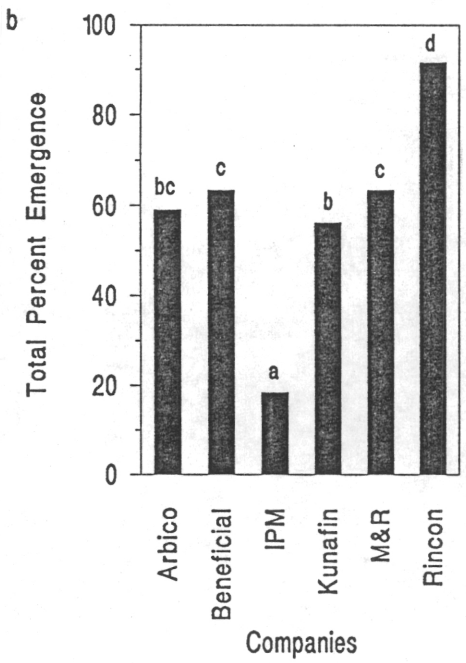


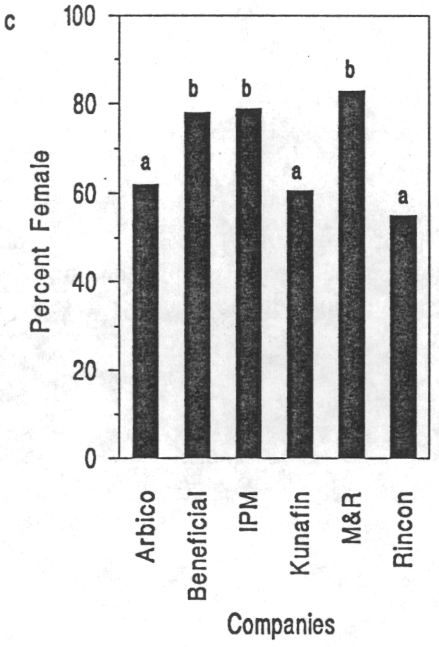
Figure 33. Incidence of egg parasitism and predation on the sentinel egg clusters at the Sampson County site during 1996.

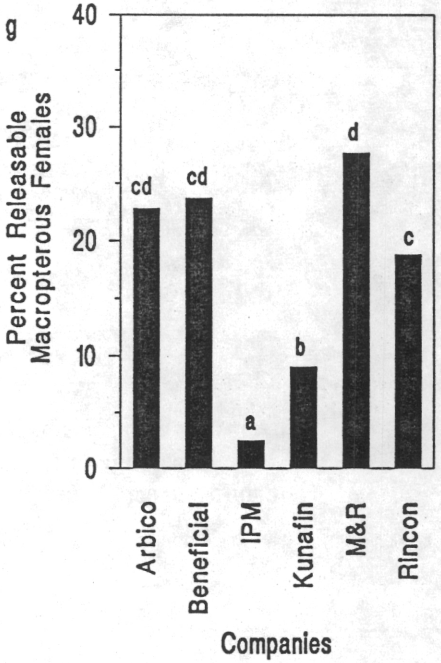
Figure 34a-g - Parameters investigated of shipments of *Trichogramma* from all companies in 1995. Mean separation by GLM; LS Means. Means within a graph of differing lower case letters are significantly different ($P \leq 0.05$, alpha=0.05). Mean separation based on untransformed data for total percent emergence, percent female, percent female brachyptery, percent male brachyptery and longevity. Mean separation based on log transformed data for percent emergence during shipping and percent releasable macropterous females.

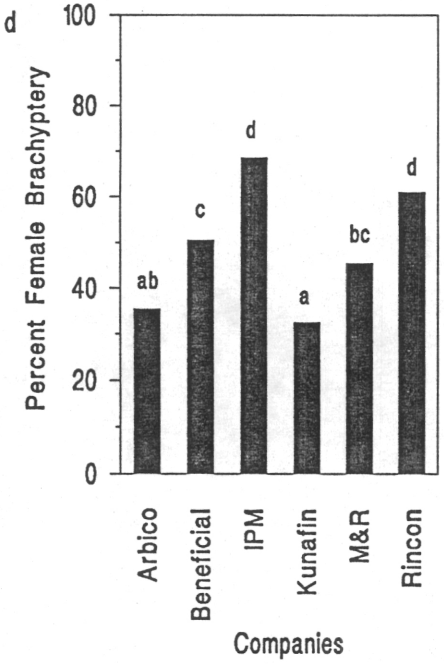
Figure 35a-g - Parameters investigated of shipments of *Trichogramma* from all companies in 1996. Mean separation by GLM; LS Means. Means within a graph of differing lower case letters are significantly different ($P \leq 0.05$, alpha=0.05). Mean separation based on untransformed data for total percent emergence, percent female, percent female brachyptery, percent male brachyptery and longevity. Mean separation based on log transformed data for percent emergence during shipping and percent releasable macropterous females.

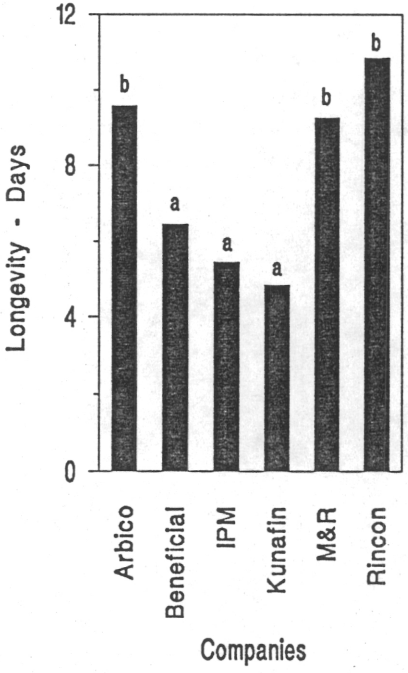

a
Percent Emergence During Shipping
50
40
30
20
10
0
a
ab
c
d
b
b
Arbico
Beneficial
IPM
Kunafin
M&R
Rincon
Companies

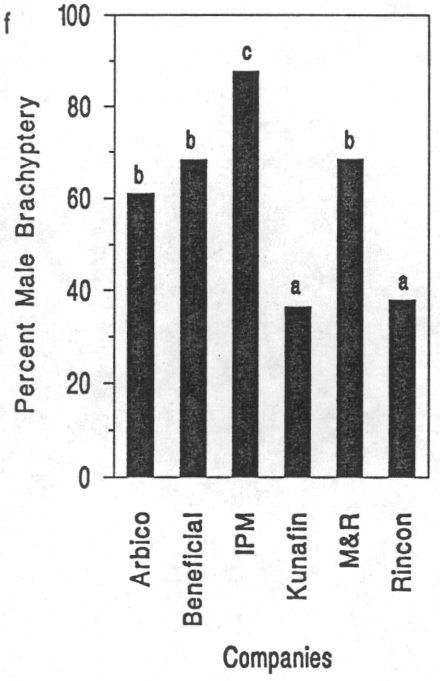

b
Total Percent Emergence
100
80
60
40
20
0
bc
c
a
b
c
d
Arbico
Beneficial
IPM
Kunafin
M&R
Rincon
Companies

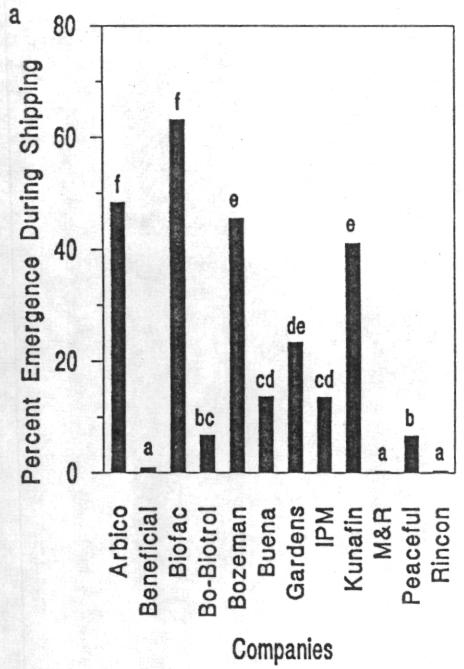

c
Percent Female
100
80
60
40
20
0
a
b
b
a
b
a
Arbico
Beneficial
IPM
Kunafin
M&R
Rincon
Companies

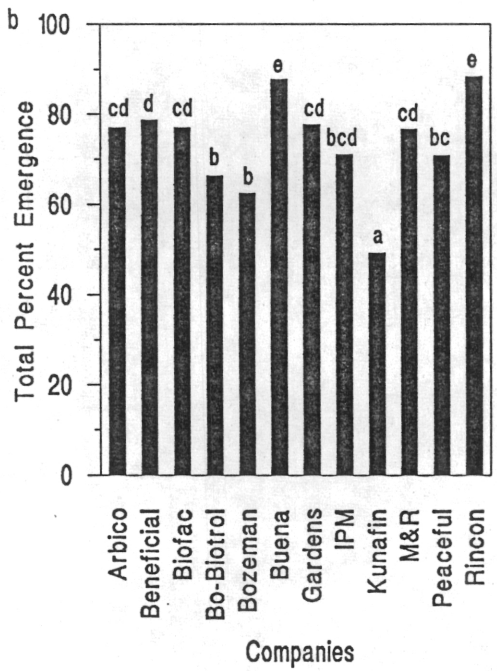

g
Percent Releasable Macropterous Females
40
30
20
10
0
cd
cd
a
b
d
c
Arbico
Beneficial
IPM
Kunafin
M&R
Rincon
Companies

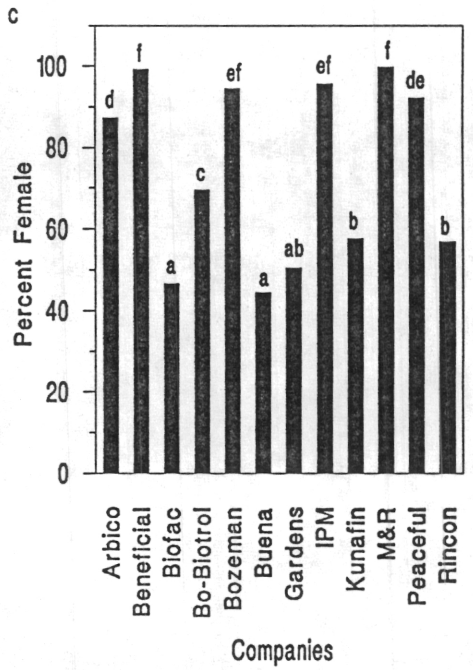

d
Percent Female Brachyptery
100
80
60
40
20
0
ab
c
d
a
bc
d
Arbico
Beneficial
IPM
Kunafin
M&R
Rincon
Companies

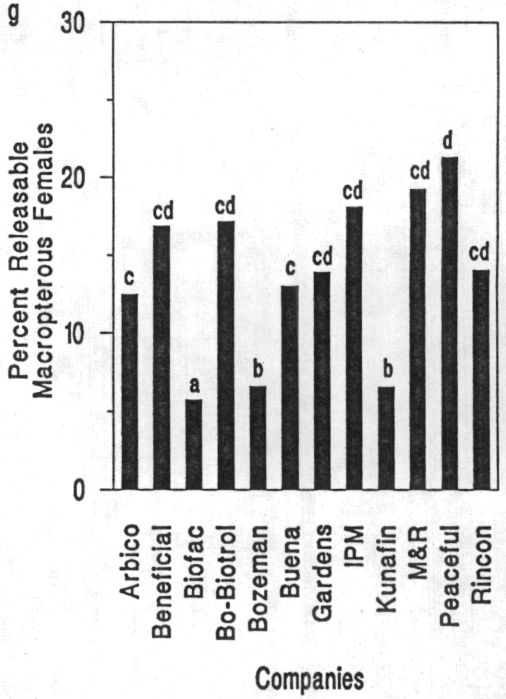

e
Longevity - Days
12
8
4
0
b
a
a
a
b
b
Arbico
Beneficial
IPM
Kunafin
M&R
Rincon
Companies

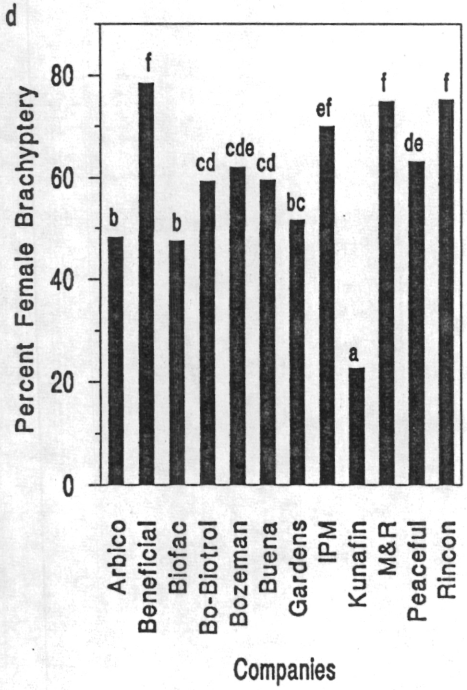

f
Percent Male Brachyptery
100
80
60
40
20
0
b
b
c
a
b
a
Arbico
Beneficial
IPM
Kunafin
M&R
Rincon
Companies

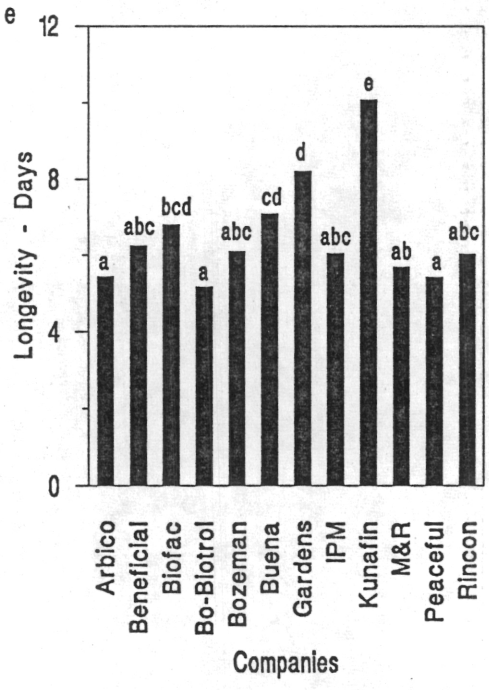

a
Percent Emergence During Shipping
0
20
40
60
80
f a f bc e cd de cd e a b a
Arbico
Beneficial
Biofac
Bo-Biotrol
Bozeman
Buena
Gardens
IPM
Kunafin
M&R
Peaceful
Rincon
Companies


b
Total Percent Emergence
0
20
40
60
80
100
cd d cd b b e cd bcd a cd bc e
Companies


c
Percent Female
0
20
40
60
80
100
d f a c ef a ab ef b f de b
Companies


g
Percent Releasable Macropterous Females
0
10
20
30
c cd a cd b c cd b cd d cd
Companies


d
Percent Female Brachyptery
0
20
40
60
80
b f b cd cde cd bc ef a f de f
Companies


e
Longevity - Days
0
4
8
12
a abc bcd a abc cd d abc e ab a abc
Companies

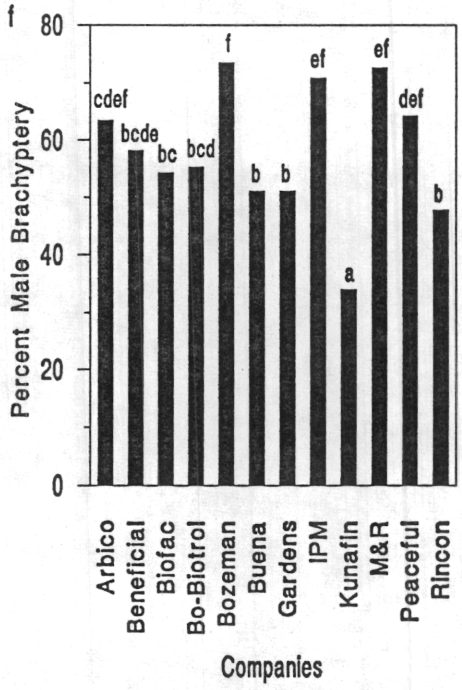
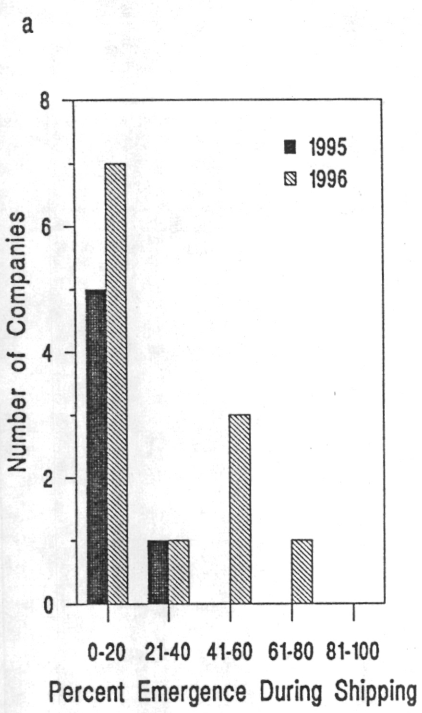
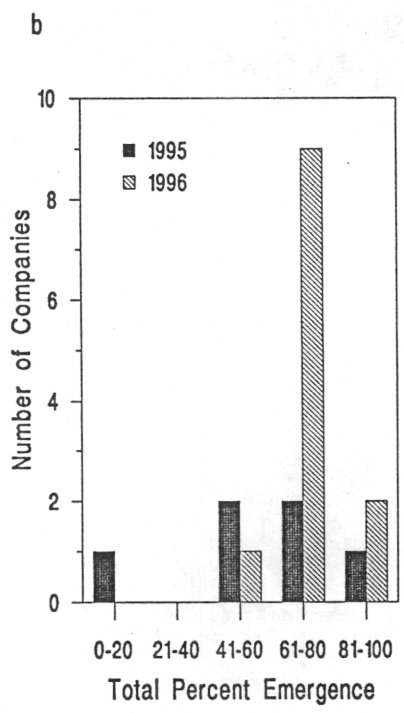
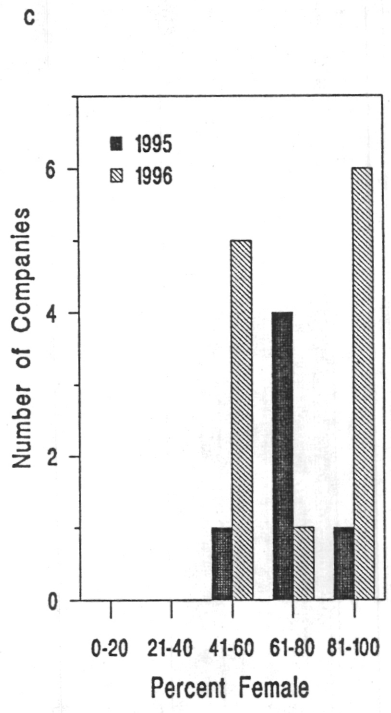
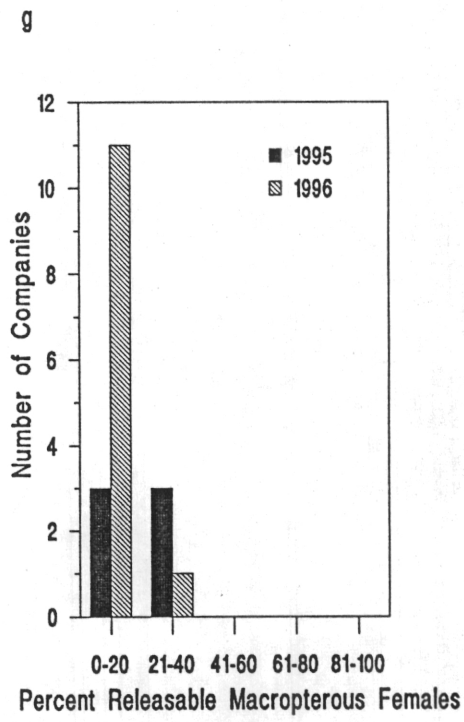

f
Percent Male Brachyptery
0
20
40
60
80
cdef bcde bc bcd f b b ef a ef def b
Companies

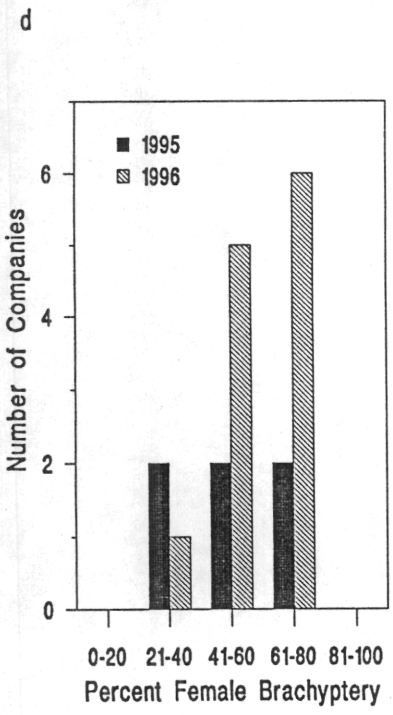
Figure 36a-g - The number of companies falling into ranges of listed parameters. A total of 6 companies were investigated in 1995 and a total of 12 companies were investigated in 1996.

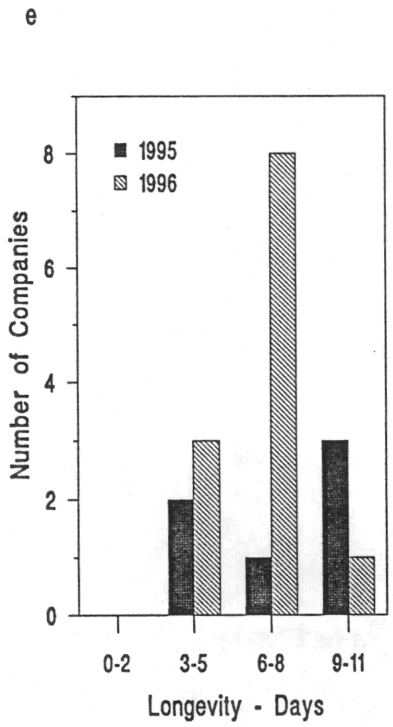

a
1995
1996
Number of Companies
0-20 21-40 41-60 61-80 81-100
Percent Emergence During Shipping

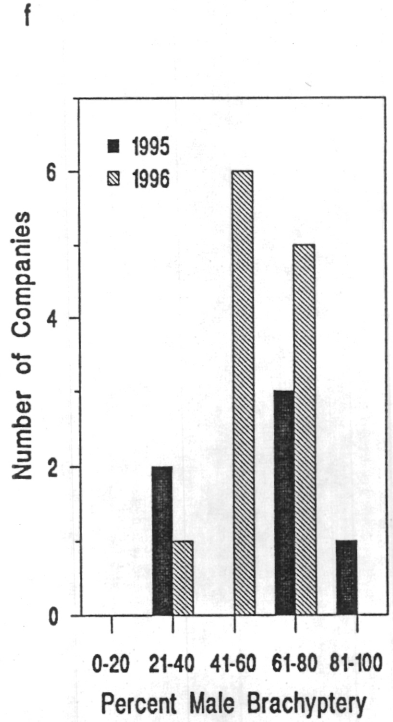

b
1995
1996
Number of Companies
0-20 21-40 41-60 61-80 81-100
Total Percent Emergence


c
1995
1996
Number of Companies
0-20 21-40 41-60 61-80 81-100
Percent Female


g
1995
1996
Number of Companies
0-20 21-40 41-60 61-80 81-100
Percent Releasable Macropterous Females


d
1995
1996
Number of Companies
0-20 21-40 41-60 61-80 81-100
Percent Female Brachyptery


e
1995
1996
Number of Companies
0-2 3-5 6-8 9-11
Longevity - Days


f
1995
1996
Number of Companies
0-20 21-40 41-60 61-80 81-100
Percent Male Brachyptery