



**PEST ASSESSMENT: Swede midge, *Contarinia nasturtii* (Kieffer),
(Diptera:Cecidomyiidae)**

USDA-APHIS-PPQ-CPHST-PERAL/ NCSU

Section A: Species Information



Scientific name: *Contarinia nasturtii*

Order: Diptera

Family: Cecidomyiidae

Common Name: Swede midge, cabbage
gall midge, cabbage crown gall fly

Source: Fact sheet Ontario Ministry
Agriculture and Food

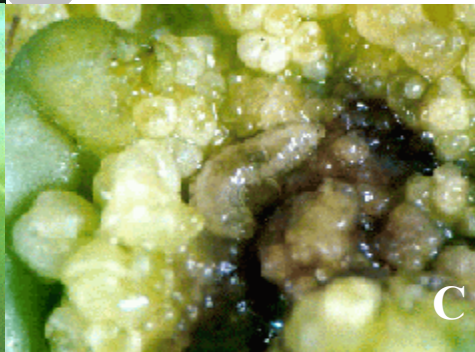
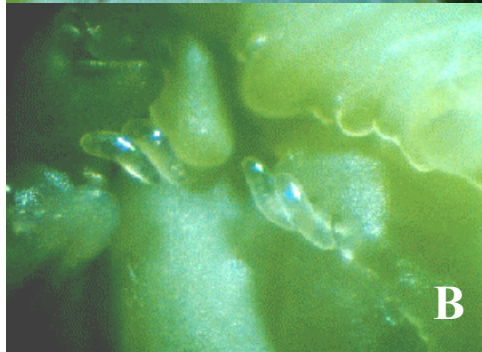


Figure 1. *Contarinia nasturtii*, adult (A), eggs (B) and larvae (C). (Picture A and C from Kikkert et al 2002. Picture B from Klaus Schrammeyer, ALLB, Heilbronn)

Description: (Summarized from Callow and Fraser, 2003)

Eggs: Very small (0.3 mm), transparent in color when initially laid then turn creamy white as they approach maturity

Larvae: Small maggots initially 0.3 mm in size before reaching final size of 3-4 mm. Larvae are initially translucent following eclosion and coloration becomes increasingly yellow with development until lemon-yellow at maturity.

Pupae: non descript diptera pupae

Adult: A small (1.5-2 mm) non-distinct light brown midge.

Life History: (Following information unless noted summarized from Ontario Factsheet)

First generation adults emerge from overwintering pupae in the soil. Adults mate shortly after emergence and begin to lay eggs on suitable host plants in clusters of 2-50 with a total of approximately 100 eggs laid per female. Adult flies have a short life span (1-5 d). Eggs are typically deposited near the apical meristem, the active growing point of the plant and larvae feed gregariously there post eclosion. Larvae may enter a dormant period during drought conditions as moist environments are required for survival. At maturity the larvae drop or “jump” to the soil surface, tunnel and form cocoons typically within the top 5 cm of soil. Oval shaped cocoons are formed for pupation and spherical-shaped cocoons for dormancy or drought (Readshaw 1966)

The main crops of economic interest affected by *C. nasturtii* are cruciferous crops: broccoli, cabbage, cauliflower, Brussels sprouts, kale, collards, rutabagas and radish.

Prediction Model:

A generic insect degree day model was used to predict the potential of Swede midge (*C. nasturtii*) infestation in the United States with temperature accumulations above the low developmental threshold as the main weather factor controlling the pest insects' biology. The developmental requirements for the individual stages of *C. nasturtii* were calculated from values presented in Readshaw 1965. The base developmental threshold for *C. nasturtii* has been listed as 7.2 C (Noll 1959). Temperatures above 32.5 C resulted in 100% pupal mortality (Readshaw 1966).

Results. The risk probability maps generated for *C. nasturtii* (Figure 2) are for a specified time period, June 1-7, which was selected arbitrarily, but adequately represents a period when many of the crops of interest are actively growing. The model parameters for each selected generation (overwintering, first, second or third) were examined by individual year in a 30 year historical national weather database. The data is interpreted as the number of times the model parameters (accumulated degree days (DD) between temperature thresholds) occur within the selected

timeframe (i.e. if the designated DD accumulations for a specific location occur 10 years out of 30 than there is a 30% probability of occurrence or 3 out of 10 years). The crop maps were generated from county data for acres grown (1997 Census of Agriculture). Several generations of *C. nasturtii* would be expected in most areas of the US, as the dipteran has a relatively short life cycle. *Contarinia nasturtii* is currently a pest in Canada on cruciferous crops and has the ability to pass through multiple generations in the Ontario Lake region (Figure 2B)

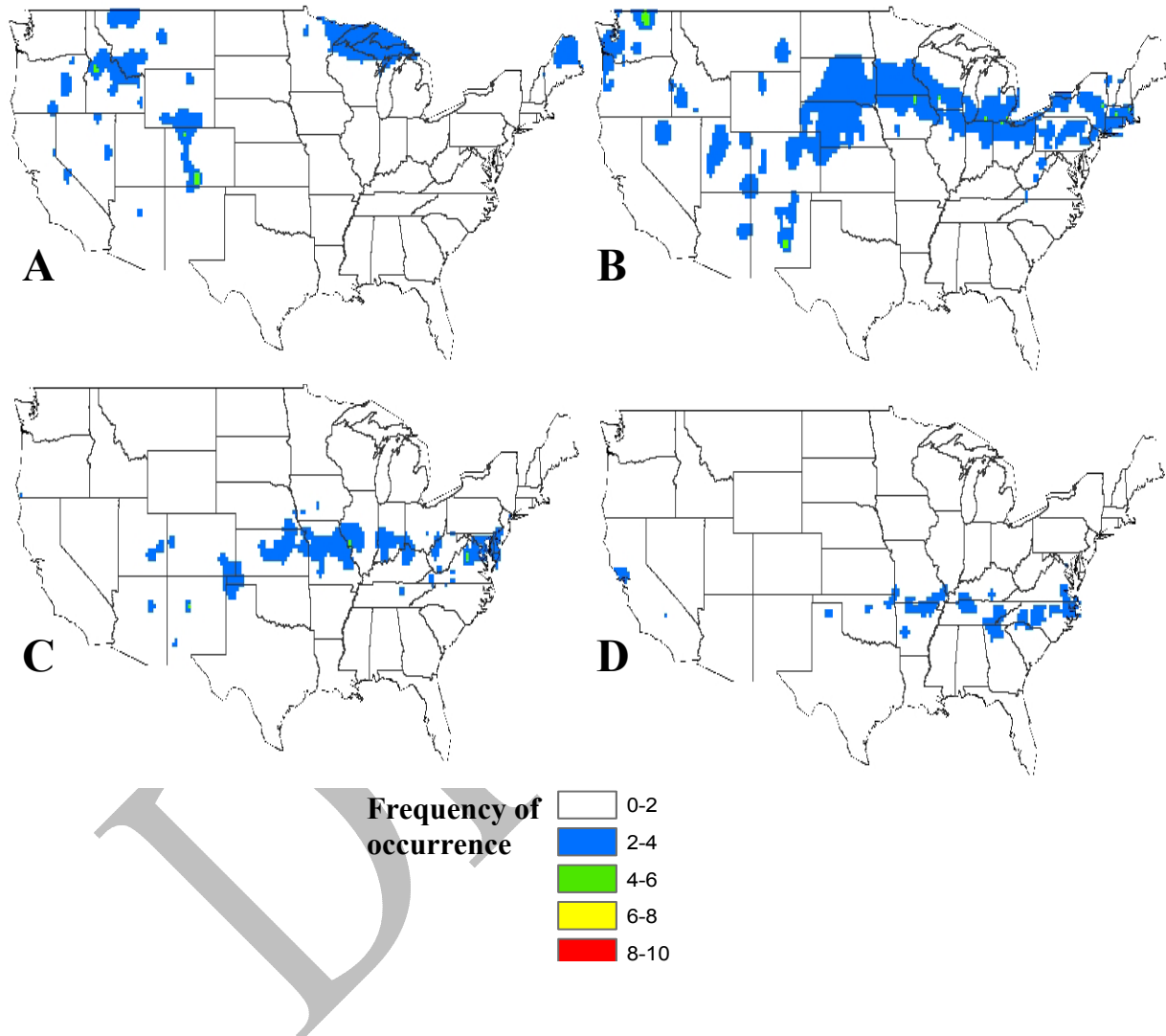


Figure 2. Probability maps of adult *C. nasturtii* emergence during the period of June 1-7 for overwintering, first, second and third generations (A-D), respectively, represented by frequency of occurrence out of 10 years. Maps generated from 30-year climactic data.

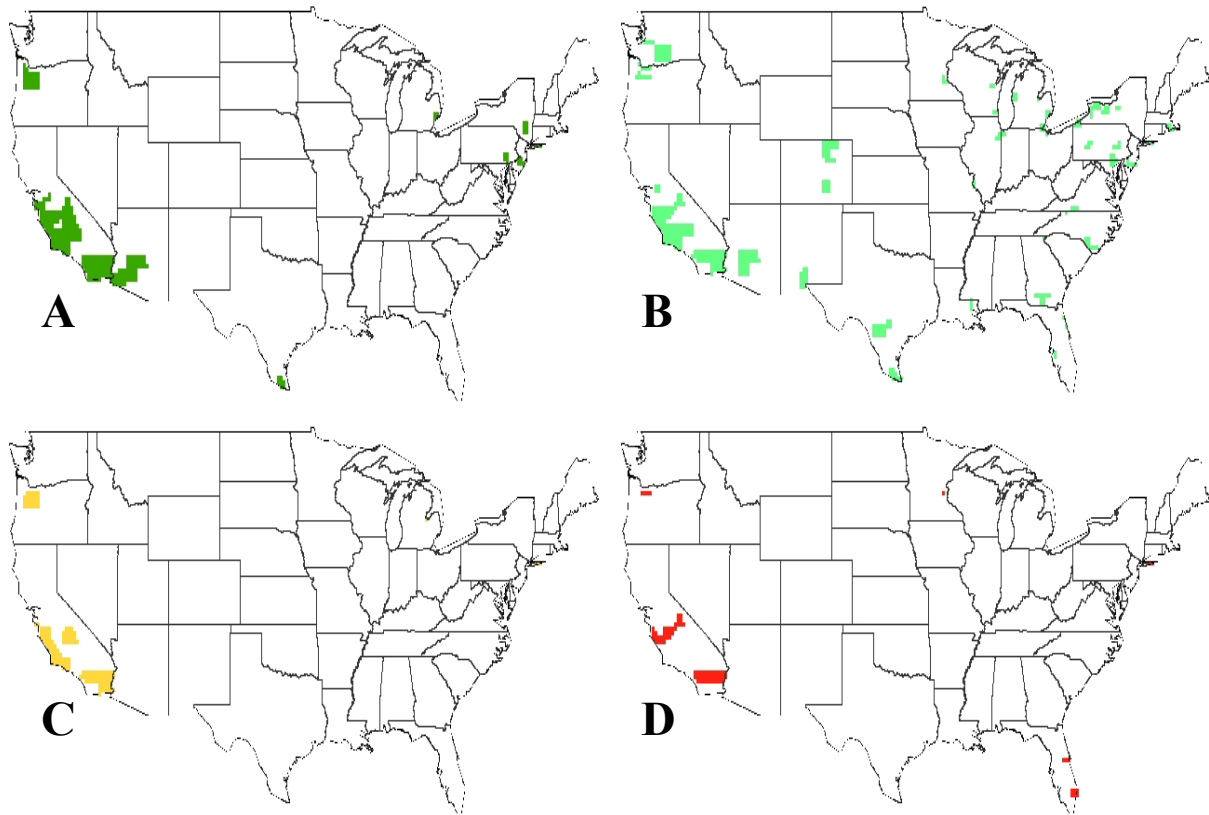


Figure 3. Counties in United States where greater than 50 acres of broccoli (A) cabbage (B) cauliflower (C) or radish (D) are grown (1997 Census of Agriculture).

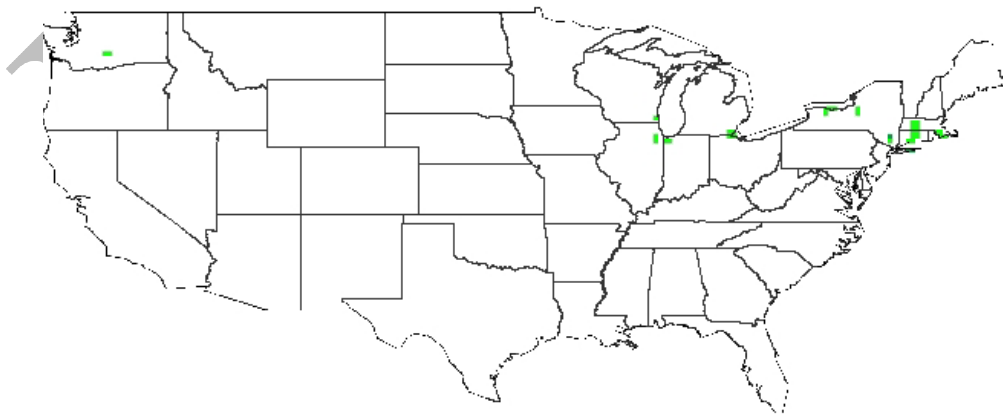


Figure 4. Regions of crops depicted in Figure 3 and greater than 3 years out of 10 occurrence of first generation *C.nasturtii* adult from June 1-7. Maps generated from 30-years of climactic data.

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Section D:

References Cited:

- Callow, K. and H. Fraser. 2003. The swede midge- a new pest in crucifer crops in Ontario. Ontario Ministry of Agriculture and Food. Fact sheet.
<http://www.gov.on.ca/omafra/english/crops/facts/03-035.htm>
- Kikkert, J.R., C.A. Hoepting and A. M. Shelton. 2002. Vegetable Crops: Insects of crucifers Swede Midge Fact Sheet 751.3
- Noll, J. Über den einfluss von temperature und bodenfeuchtigkeit auf die larven und puppen der kohldrehherzmücke *Contarinia nasturtii* (Kieffer) als grundlage für die vorausberechnung des ersten schlupftermins im frühjahr. Archiv für Gartenbau. 7. S. 362-415.
- Readshaw, J.L. 1966. The ecology of the swede midge, *Contarinia nasturtii* (Kieffer) (Diptera: Cecidomyiidae). 1. Life history and influences of temperature on development. Bull. Ent Res. 56(4), S. 685-700.

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Table 1. Biological Parameters used for modeling phenology of Swede midge (*C. nasturtii*)

Swede midge		7.2	32.5	
Generations	Stage	DD in stage	First entry	second entry
Overwintering	Pup	128	0	128
	adult	10	129	139
	oviposition	30	140	170
1	Larvae	61	171	232
	Pup	128	233	361
	adult	10	362	372
2	oviposition	30	373	403
	Larvae	61	404	465
	Pup	128	466	594
3	adult	10	595	605
	oviposition	30	606	636
	Larvae	61	637	698
4	Pup	128	699	827
	adult	10	828	838
	oviposition	30	839	869
5	Larvae	61	870	931
	Pup	128	932	1060
	adult	10	1061	1071
6	oviposition	30	1072	1102
	Larvae	61	1103	1164
	Pup	128	1165	1293
7	adult	10	1294	1304
	oviposition	30	1305	1335
	Larvae	61	1336	1397
8	Pup	128	1398	1526
	adult	10	1527	1537
	oviposition	30	1538	1568
9	Larvae	61	1569	1630
	Pup	128	1631	1759
	adult	10	1760	1770
10	oviposition	30	1771	1801
	Larvae	61	1802	1863
	Pup	128	1864	1992
11	adult	10	1993	2003
	oviposition	30	2004	2034
	Larvae	61	2035	2096