

Orange wheat blossom midge, *Sitodiplosis mosellana* (Géhin) (Dipt., Cecidomyidae), on wheat in Finland

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Abstract: *Sitodiplosis mosellana* has been found for the first time infesting wheat in Finland. In the wheat field studied, the egg laying period was in mid July, and the larvae left the ears in mid August. On an average ca. 20 % of the ears were infested. It was estimated, that 1.7 % of the grains were sucked by the larvae. The level of infestation was found to differ between wheat varieties.

Introduction

The orange wheat blossom midge, *Sitodiplosis mosellana* (Géhin) (Diptera, Cecidomyidae), occurs as an occasional pest of wheat throughout the wheat-producing countries in the Northern Hemisphere (e.g. BARNES 1956), including the northernmost wheat area in Scandinavia.

Recently, *S. mosellana* was reported to be a more serious pest than the related species *Contarinia tritici* Kirby in the Netherlands and Poland (NIJVELDT & BOKHORST 1973, GOLEBIOWSKA 1980). It was estimated, that 3 or more larvae per grain makes the crop unacceptable for human consumption (NIJVELDT & BOKHORST 1973).

In Sweden, the life history, economic importance and methods of control of *S. mo-*

sellana, together with those of *C. tritici*, were studied in the 1930s. *S. mosellana* was found in smaller numbers and was considered to be less important than *C. tritici* (LINDBLOM & MÜHLOW 1932, MÜHLOW 1935, 1936, MÜHLOW & SJÖBERG 1937, SWÄRDSON 1940). Until recently, the damage to wheat in that country was caused by the latter species. In 1979, however, sudden, severe damage was caused by *S. mosellana* in Skåne county, the losses averaging 500 kg per ha (ANDERSSON & NILSSON 1980). In 1981 also there was heavier infestation by *S. mosellana* than by *C. tritici* in Sweden (ÅHRÉN 1982).

In Finland, only the lemon wheat blossom midge, *C. tritici* was found earlier in wheat (see VAPPULA 1962), *S. mosellana* being reported from rye (e.g. HUKKINEN & VAPPULA

1936). Neither of the midges was considered a serious pest.

In 1983, marked damage to spring wheat was noted in some localities in Southeastern Finland and was suspected to be caused by the wheat midge. The purpose of the present study was to find out whether wheat midges were in fact responsible for the damage.

Material and methods

In summer 1984 the infestation of spring wheat var. Hankkija's Taava by midges was estimated in a 1.6 ha farm field in Anjalankoski, Southeastern Finland. The study field was situated 10 km SW of Kymenlaakso Research Station. The soil type was silty clay (humous), pH 6.3. The wheat was sown on 17 May.

This field was chosen because it was one of the most seriously damaged in 1983. The wheat yield in that year was only 1 500 kg per ha, and of poor quality.

From 29 June to 31 Aug. 60 wheat ears were sampled at random every 3rd or 4th day along a south-east transect. The ears were inspected for midge eggs or larvae, and the level of infestation was examined on 135 ears collected in the later part of larval development, but before the larvae started to leave the ears (31 July to 7 August).

Falling traps were used in the period when the larvae were leaving the ears and falling to the ground. Three pairs of traps were placed at equal intervals along the transect: Ten

wheat ears were bent over a 12-cm-diameter funnel and covered with clear plastic so, that every larva leaving an ear was forced into the funnel. The larvae were collected in a changeable tube at the end of the funnel. The frame holding the funnel allowed vertical adjustment to the growth of the wheat. The trapping period lasted from 20 July to 31 Aug. The tubes were emptied on the same occasions when the ears were sampled.

At Kymenlaakso Research Station, samples were taken from 25 spring wheat varieties. On 16 and 17 Aug., 30 ears were taken per variety and replicate. There were two replicates. The ears were inspected for midge larvae.

According to measurements at Utti weather station 18 km NE of Kymenlaakso Research Station, the weather during the study period in 1984 was fairly near to normal. The spring was warmer and drier, and the rainfall in June and July was heavier than usual. The weather in the study year was similar to that in 1983 (Table 1).

Adult midges were collected from wheat stands on 22 July at Hankkija Plant Breeding Station, Anttila, 35 km N of Helsinki, and on 28 July at Helsinki University Experiment Farm, Helsinki.

Results

Only *S. mosellana* was found. There was no evidence of *C. tritici*.

The first *S. mosellana* eggs were found in

Table 1. Deviations of temperature (°C) and rainfall (mm) in April—August 1983 and 1984 from the means of the period 1931—1960 (normal) at Utti Weather Station.

	Daily mean temperature			Rainfall		
	Deviation		Normal	Deviation		Normal
	1983	1984		1984		
April	+3.0	+2.1	2.2	-12.0	-24.4	36
May	+2.8	+4.3	9.2	-11.3	-11.6	42
June	-1.0	-0.8	14.7	+37.6	+17.1	53
July	+0.4	-2.2	17.6	-52.0	+38.3	80
August	-0.6	-1.3	15.7	-19.0	-28.1	74

the florets on 3 July, at the end of ear emergence. The last eggs were found in the ears on 20 July (Table 2). The development of these ears was delayed compared with the average for the stand.

The first larvae of *S. mosellana* were also found on 3 July, and some were still present in the ears at the end of the sampling period, on 31 Aug. (Table 2). In 921 ears the mean size of a larvae group was 1.58 larvae (per grain):

1 larva	per grain	64 %	of the infested grains
2 larvae	» »	24 %	» » » »
3 »	» »	8 %	» » » »
4 »	» »	2 %	» » » »
5—6 »	» »	2 %	» » » »

On an average, 21 % of the ears were infested, the mean being 0.9 larvae per ear. The mean ear size was 33 grains, so the proportion of infested grains was ca. 1.7 %. There were no clear differences in the level of infestation between different parts of the field.

Table 2. Distribution of finds of *S. mosellana* eggs and larvae on wheat ears during the sampling period.

Sampling date	Eggs % (total 151)	Larvae % (total 620)
June 29.	—	—
July 3.	5.3	0.3
6.	—	—
10.	1.3	—
13.	4.6	9.4
17.	33.8	7.4
20.	55.0	4.7
24.	—	0.3
27.	—	7.1
31.	—	3.7
August 3.	—	9.2
7.	—	6.8
10.	—	12.6
14.	—	1.8
17.	—	5.8
21.	—	5.8
24.	—	9.8
28.	—	14.0
31.	—	1.3
	100 %	100 %

From 10 Aug. onwards, the larvae tended to crawl out of the sampled heads on to the insides of the plastic sample bags during the 2—3 days' delay before inspection. The ears monitored with the falling traps yielded altogether 54 larvae from 7 Aug. to 21 Aug., at about the yellow ripening stage of the stand. A nine-ear sample of late, still green tillers was taken on 24 Aug., when the rest of the stand was already at the yellow ripening stage. All these late tillers were infested, the mean being 10 larvae per ear.

The crop was harvested on 7 September. The yield was normal, 3 770 kg per ha, and the quality was good. The grain weight was 80.2 kg per hectolitre.

At Kymenlaakso Research Station, some differences in infestation levels were found between the varieties and lines ($F(24,24) = 4.93^{***}$). The highest level of infestation, in Jo 8187, was 4.1 larvae per ear, which was 20

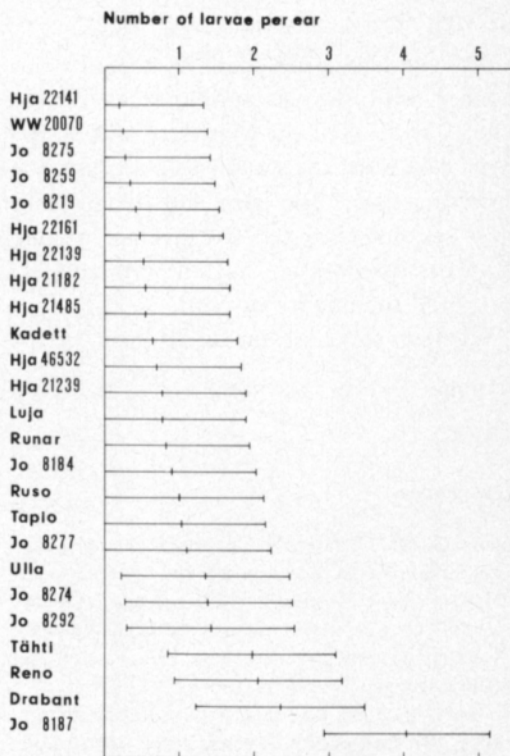


Fig. 1. 95 % comparison intervals obtained by the T-method for the means of infestation by *S. mosellana* larvae of ears of 25 spring wheat varieties.

times as high as the lowest level, 0.2 larvae per ear in Hja 22141 (Fig. 1). There was no difference in the timing or length of the heading process between Jo 8187 and the less heavily infested varieties.

Six midge specimens from Hankkija Plant Breeding Station and seven from Helsinki University Experiment Farm were determined. They were all found to be *Sitodiplosis mosellana* (♀ ♀).

Discussion

For the first time in Finland, *Sitodiplosis mosellana* has been reported infesting wheat. The midge was abundant not only in the study field, but also in the other locations inspected by chance. As *S. mosellana* was easily found in large numbers, it is likely that it occurs in other wheat-growing areas in Finland as well. It is interesting that the first damage by *S. mosellana* in decades was recently reported from the neighbouring wheat-growing area in Sweden.

The egg-laying period showed poor coincidence with the susceptible stage of the wheat, as most of the eggs were laid on delayed ears when the stand was already at the flowering stage. The latest individuals were most seriously infested. An average of one larva per ear does not have any notable effect upon the quality of crop.

Whether some of the differences in in-

festation between the varieties could be explained by genetic properties remains to be found out.

Most of the larvae occurred singly. The larvae leave the heads gradually during and after the yellow ripening stage. The use of a plastic cover in the falling traps may have raised the relative humidity, which is known to encourage the descent of larvae (BARNES 1956). This may explain the completion of descent from the monitored ears by as early as 21 Aug.

Evidently, the wheat midges contributed to the damage in 1983. The losses were not repeated in the study year. The poor coincidence of egg laying with the susceptible stage may partly explain the low infestation. There was some evidence on high parasite activity, especially that of Platygasteridae, which are important egg and larval parasites of wheat midges (e.g. BASEDOW & GILLICH 1982). These preliminary results motivate further studies.

In future work priority should be given to studying the distribution and abundance of *S. mosellana* in Finland, in order to assess the need for control.

Acknowledgements: We are grateful to Mr. W. Nijveldt, Wageningen, the Netherlands, for determining the midges. We should like to thank Ass. Prof., Dr. Anna-Liisa Varis for valuable advice, and Kalevi Virri, the Head of Kymenlaakso Research Station, for help in organizing the work. The English text was revised by Mrs. Anna Damström.

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Ms received December 12, 1984

SELOSTUS

Tähkäsääsken *Sitodiplosis mosellana* (Géhin) (Dipt., Cecidomyidae) esiintyminen vehnässä

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Tähkäsääsken esiintymistä seurattiin tähkänäyttein ja pyydyksin kevätevehnäviljelmältä (lajike Hankkijan Taava) Anjalankoskella kasvukauden 1984 ajan. Muninta-aika oli heinäkuun puolivälissä. Täysikasvuiset toukat pudottautuivat tähkiltä elokuun puolivälistä alkaen. Keskimäärin toukkia oli 0,9 kpl tähkää kohden, mutta vain noin 20 % tähkistä oli saastuneita. Toukkaryhmän keskikoko oli 1,58 toukkaa. Noin 1,7 % jyvistä oli saastuneita. Sadon määrä viljelmältä oli normaali ja laatu hyvä.

Kymenlaakson tutkimusasemalla otettiin 16. ja 17. 8. tähkänäytteet kevätevehnän lajikekokeesta 25 lajikkeesta

tai linjasta. Saastuneisuus vaihteli merkitsevästi 4,1 toukasta (Jo 8187) 0,2 toukkaan (Hja 22141) tähkää kohden. Tähkimisajankohta ei selittänyt eroja.

Aikuisia tähkäsääskinaaraita tavattiin lentelemässä vehnäkasvustoissa paitsi Anjalankoskella, myös Helsingissä (Viikin koetilalla) ja Tuusulassa (Anttilan koetilalla), eli kaikilla satunnaisesti tarkastetuilla paikoilla. Vaikka tähkäsääski nyt Suomessa raportoidaan ensimmäisen kerran vehnästä, on syytä epäillä, että laji on vehnänviljelyalueella laajalle levinnyt.

Torjunnan tarpeen arvioimiseksi tulisi tähkäsääsken levinneisyys ja runsaus selvittää.