

Occurrence of Raspberry Gall Midge *Lasioptera rubi* Schrank (Diptera, Cecidomyiidae) in Some Raspberry Cultivars

Snežana Tanasković
Faculty of Agronomy Čačak, Serbia

S. Milenković
Megatrend University Belgrade, Faculty of Biofarming Bačka Topola, Serbia

Abstract: The raspberry gall midge, *Lasioptera rubi* Schrank (Diptera, Cecidomyiidae), is an economically important pest, especially in the raspberry plantings where canes are not removed after harvest. The objective of this study was to determine the harmfulness of *L. rubi* in an untreated raspberry cultivar planting at the Fruit Research Institute, Serbia.

Cane samples were collected in July 2008 from five raspberry genotypes, including cvs. Willamette, Meeker, Latham, Tullameen and the hybrid K 81-6, to assess raspberry gall midge infestation. The samples were sent to the laboratory to be measured for cane diameter and gall length, width and diameter and checked for the number of galls per cane and larvae per gall.

Galls did not occur in cv. Meeker, but they were found on the primocanes of the other cultivars at a height not exceeding 70 cm. The largest average number of infested canes (10) was recorded in the K 81-6 hybrid. The detected galls differed in shape, the largest being observed in Tullameen, somewhat smaller in K 81-6 and those of similar size in Latham and Willamette. The highest larval pressure per gall (40) was recorded in cv. Tullameen. The presence of young and old larvae as well as eggs was observed in the globules in cvs. Tullameen and K 81-6. The calculated values for 2008 show that the highest larval/gall pressure was found in Tullameen (24.5) and lowest in Latham (5.28).

The most vigorous canes were observed in Willamette, followed by Latham, K 81-6 and Tullameen.

Key words: *Lasioptera rubi*, larva, intensity of attack, gall number, cultivar.

Introduction

Raspberries cannot be grown profitably unless pests and causal agents of diseases are effectively controlled. However, pesticide applications made close to harvest induce an increase in residue levels in fruits that are 50 % above maximum residue levels (Cross and Berrie 2006). In practical terms, high-quality raspberry production can be made feasible through a number of approaches including an increase in the pre-harvest interval, cultivation of resistant cultivars, use of non-pesticide control methods, development of biological control methods, permanent crop visual monitoring and disease and pest risk forecasting.

Under Serbian raspberry growing conditions (Gordon *et al.* 2003, Milenković 2005), the small raspberry aphid (*Aphis idaei*) is a widespread pest, the large raspberry aphid (*Amphorophora idaei*) occurs sporadically and the raspberry beetle (*Byturus tomentosus*) is commonly found at higher altitudes. The raspberry blossom weevil (*Athonomus rubi*) is a serious economic pest in the major raspberry growing region of Arilje. The incidence of both the raspberry cane midge *Resseliella theobaldi* Barnes (Milenković *et al.* 2006, Milenković and Tanasković 2007b) and the raspberry gall midge *Lasioptera rubi* Schrank. (Heeger.) (Milenković and Ranković 2001, Gordon *et al.* 2003, Milenković 2005, Milenković and Tanasković 2007a, Milenković and Tanasković 2008; Tanasković *et al.* 2008) has been on the rise over the past years. *L. rubi* gall infestation of about 30% of raspberry plants was detected in raspberry plantings in the vicinity of Čačak, Western Serbia, after the hail damage in 1999. The harmfulness of this pest in Serbia was first recorded in the 1970s by Dobrivojević (1968) and Simova-Tošić (1970).

During 2002, Cecidomyiidae induced midge blight was detected in plantings in the vicinity of Čačak and Arilje (Koprivica *et al.* 2002). The causal agent of the disease is the raspberry cane midge *Resseliella theobaldi* (Barnes). The primary damage is due to larvae feeding on tissue just beneath the epidermis and the secondary damage is caused by fungal infection (*Fusarium spp.*, *Altrernaria spp.*, *Phoma spp.* and, *Leptosphaeria coniothyrium*) at the larval feeding sites.

R. theobaldi and *L. rubi* of the *Cecidomyiidae* (Diptera) family are extremely serious economic pests spread in raspberry plantings throughout Europe. The OEPP/EPPO (1993) certification schemes for *Rubus* and its hybrids, PM 4/10(1), classify the two pests into damaging organisms which require preventive monitoring measures (compulsory visual inspection) aimed at their elimination from the fields for all categories of reproductive planting material used for the propagation of certified planting material. Furthermore, it must be ensured that all the compulsory chemical control measures laid down in the code of good agricultural practice (GAP 2/26 (1)) of the OEPP/EPPO (2002) schemes are implemented.

Material and Methods

Raspberry cane samples were collected on 15 July 2008 from five raspberry genotypes, including cvs. Willamette, Tullameen, Latham, Meeker and the hybrid K 81-6, in a raspberry planting of the Fruit Research Institute in Čačak.

The trial was set up at the 'Zdravljak' site, the coordinates thereof being N 43°50'19.2" and E 020°18'32.0", the altitude 649 m, the orientation Southern. The planting was established in 2002. It included five genotypes planted randomly in 10 north-south facing rows in four replications per genotype, using 50 plants per replication and the intra-row and inter-row spacings of 0.33 m and 2.5 m, respectively. During the 2008 growing period, six years after planting, six to eight floricanes per linear meter of row were recorded on average.

Rows and row sections were designated for sampling in a randomized design. The samples were collected from four genotypes at a two-meter length of row in four replications during 2008. The canes that displayed gall-like morphological changes were sampled from the designated row sections.

The cane samples were sent to the laboratory to be measured for cane diameter, gall length, width and diameter and checked for the number of galls per cane and larvae per gall. The measurements were made using a ± 0.05 mm precision Inox caliper.

Results and Discussion

During the 2008 period of observation, galls made by the raspberry gall midge were found on the lower parts of the canes below the height of the first wire in cvs. Latham, Willamette, Tullameen and hybrid K81-6. The most vigorous canes were produced by cv. Willamette (0.86 cm).

Previous studies conducted in 2006 and 2007 showed that galls were detected in cv. Latham during both growing seasons whereas in cvs. Tullameen, Willamette and hybrid K81-6 they were found only in 2006 (Milenković and Tanasković 2007a, 2008, Tanasković *et al.* 2007, 2008). Furthermore, galls covered the entire length of the primocanes and were sporadically found on fruiting canes and petioles in 2006, whereas in the 2007 growing season they were formed only on primocanes at a height not exceeding 70 cm (Tanasković *et al.* 2008). The most vigorous canes were produced by the hybrid K81-6 (Milenković and Tanasković 2008, Tanasković *et al.* 2008).



Figure 1. Galls on raspberry canes

The average number of infested canes during the study period was highest in the hybrid K 81-6 (10), followed by Willamette (9), Laitham (4) and Tullameen (4). In 2008, the highest larval/gall number was recorded in Tullameen (40), but the presence of eggs was also observed in Tullameen and K 81-6.

As for Meeker, another cultivar grown in the planting, no signs of galling damage were detected during the period of observation, nor in the two previous growing seasons (Milenkovic and Tanaskovic 2008, Tanaskovic *et al.* 2007, 2008).

In order to monitor the pest pressure among the tested cultivars, average values were calculated for each cultivar during the growing season (Table 1).

Tab. 1. Average values measured for all cultivars during 2008

Cultivar	Average gall number	Average cane diameter - cm	Gall, average values expressed in cm			Average number/gall	
			length	width	diameter	L	eggs
Tullameen	1	0.73	2.225	1.125	1.60	24.5	2.5
Latham	1.75	0.80	1.87	1.12	1.21	5.28	0
Willamette	1.22	0.86	1.75	0.86	1.23	6.18	0
Hibrid K 81,6	1.4	0.77	1.97	1.18	1.40	11.57	0.28

The calculated values for the 2008 growing season suggest that the highest average number of larvae per gall was observed in Tullameen (24.5), which implied that this cultivar was the most favoured host of the raspberry gall midge under the trial conditions. The number decreased to 11.57 in hybrid K 81-6, 6.18 in Willamette and as low as 5.28 in Latham. The average number of galls per cane declined from 1.75 in Latham to 1.4 in K 81-6, 1.22 in Willamette and 1 in Tullameen. As for cane thickness, the highest values were exhibited by Willamette, followed by Latham, K 81-6 and Tullameen.

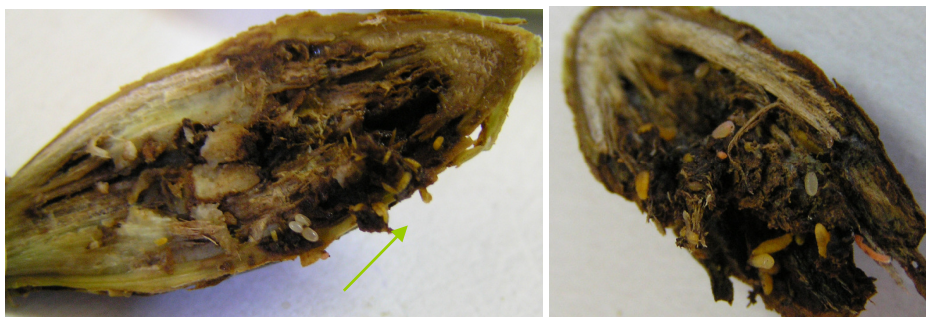


Fig. 2. Diameter of gall cabin with eggs (arrow) and larvae (translucent, orange yellow to red larvae)

The detected galls were longest in cv. Tullameen, then in K 81-6, Willamette and Latham. As regards gall width and gall diameter, the measured values were highest in Tullameen, followed in decreasing order by K 81-6, Latham and Willamette. The results revealed that the galls were largest in

Tullameen, somewhat smaller in K 81-6 and similar in size in Latham and Willamette, as also suggested by previous studies (Tanasković *et al.* 2008).

Conclusion

The presence of the raspberry gall midge *Lasioptera rubi* Schrank (Diptera, Cecidomyiidae) was detected in cvs. Tullameen, Latham, Willamette, Meeker and the hybrid K 81-6. The pest pressure ranged from 1.75 in Latham to 1 gall in Tullameen. The largest galls and the highest average number of larvae (24.5) were found in Tullameen. The collected samples of Tullameen and K 81-6 also showed the presence of eggs. Cvs. Willamette and Latham produced the most vigorous canes and the lowest larval number was recorded in galled Latham canes. Note that raspberry growing practices should aim at reducing mechanical damage inflicted to canes in order to contribute significantly to reduced gall midge incidence.

Given the difference in raspberry gall midge pressure, accompanied by the non-uniform and prolonged time of onset of pest developmental stages, as reported by the 2008 and previous results (obtained in 2006 and 2007), further studies should involve multilocation trials covering a large number of cultivars focused on determining the generation number, the period of occurrence in raspberry plantings and the degree of raspberry tolerance to this damaging pest.

References

- Cross J., Berrie A. (2006): The challenges of developing IPM Programmes for soft fruit crops that eliminate reportable pesticide residues. *J. Fruit Ornament. Plant Res.*, **14** (Suppl. 3): 49-50.
- Dobrivojević K (1968): Ekonomski značajne štetočine maline u proizvodnim područjima Valjeva i Čačka. *Zaštita bilja*, **100-101**: 253-271.
- Gordon S. C., Milenković S., Cross J. V. Stanisavljević M. (2003): Raspberry pests in Serbia. *Bulletin OILB/SROP*, **26**, **2**: 23-27.
- Ivanović M., Petanović R., S. Milenković (1999): Aktuelni problemi u zaštiti maline i kupine. *Četvrto jugoslovensko savetovanje o zaštiti bilja, Zlatibor 6-10.12.1999*, 32 - 33.
- Koprivica M., Milenković S., Milijašević S., Gavrilović V. (2002): Nove bolesti maline i manje poznate interakcije štetočina i patogena maline. *XII Simpozijum o zaštiti bilja i savetovanje o primeni pesticida, Zlatibor*, 25-29.
- Milenković S. (2005): Raspberry pests and diseases in Serbia. *COST: WG3 First Meeting. Report*, Wageningen 7/9 July 2005. *Meeting code*: COST-863-070705-01479.
- Milenković S., Tanasković Snezana (2007): Harmfulness of raspberry gall midge, *Lasioptera rubi* Schrank (Diptera, Cecidomyiidae), to some raspberry cultivars. International Organisation for Biological and Integrated Control of Noxious Animals and Plants (IOBC). *Workshop on Integrated Soft Fruit Production. 6th Meeting at East Malling Research, Kent, UK, 24th – 27th September 2007. Book of Abstracts*. pp. 43;
- Milenković S., Tanasković S. (2008): Harmfulness of raspberry gall midge, *Lasioptera rubi* Schrank (Diptera, Cecidomyiidae), to some raspberry cultivars. *IOBC/wprs Bulletin*, **39**: 71-75.

- OEPP/EPPO (1993): Recommendations made by EPPO Council in 1992: scheme for the production of classified vegetatively propagated ornamental plants to satisfy health standards. *Bulletin OEPP/EPPO Bulletin*, **23**: 735-736.
- OEPP/EPPO (2002): Good plant protection practice *Ribes* and *Rubus* crops. *Bulletin OEPP/EPPO Bulletin*, **32**: 367-369.
- Simova Tošić Duška (1970): Malo poznate štetočine maline iz familije *Cecidomyidae* (Diptera), *Jugoslovensko voćarstvo*, 193-197.
- Tanasković Snežana, Milenković S., Sretenović Dušica (2007): Intenzitet napada *Lasioptera rubi* Schrank (Diptera, Cecidomyiidae) na nekim genotipovima maline. *Simpozijum entomologa Srbije sa međunarodnim učešćem*, Užice, 26-30.
- Tanasković Snežana, Milenković S., Sretenović Dušica (2008): Intensity of attack of raspberry gall midge (*Lasioptera rubi* Schrank (Diptera, Cecidomyiidae), on some raspberry genotypes. *Acta Entomologica Serbica*, **13** (1/2): 43-50.

**PRISUSTVO MALININE MUŠICE GALICE *Lasioptera rubi*
Schrank (Diptera, Cecidomyiidae) NA NEKIM SORTAMA MALINE**

- originalni naučni rad -

Snežana Tanasković

Agronomski fakultet Čačak, Srbija

S. Milenković

Megatrend Univerzitet Beograd, Fakultet za biofarming Bačka Topola, Srbija

Rezime

Malinina mušica galica *Lasioptera rubi* Schrank (Diptera, Cecidomyiidae) predstavlja ekonomski značajnu štetočinu, posebno u malinogorjima gde izostaje skidanje izdanaka po završenoj berbi. Cilj rada bio je da se u netretiranom kolekcionom zasadu maline utvrdi intenzitet napada *L. rubi*.

Izdanci za pregled na prisustvo malinine mušice galice prikupljeni su tokom jula 2008. godine. Uzorkovanje je izvršeno na sortama Willamette, Meeker, Latham, Tullameen i hibridu K 81-6. Prikupljeni izdanci doneti su u laboratoriju gde je izvršeno merenje prečnika izdanaka, dužine, širine i prečnika gale, prebrojavanje gala na izdancima i larvi u galama.

Prisustvo gala nije registrovano na sorti Meeker, a na ostale četiri sorte prisutne su na jednogodišnjim izdancima na visini < 70 cm. Najviši prosečan broj (10) infestiranih izdanaka je na hibridu K 81-6. Gale su se razlikovale po obliku, a najkrupnije su kod Tullameen, nešto sitnije kod K 81-6, a približne veličine kod kod Latham i Willamette. Najveći broj larvi u jednoj gali (40) registrovan je na cv Tullameen. Pored larvi na Tullameen i K 81-6 registrovano je i prisustvo jaja. Najveći prosečan broj larvi/gali je na Tullameen (24,5), a najmanji kod Latham (5,28).

Najbujniji izdanci registrovani su kod Willamette, pa prečnik opada kod Latham, K 81-6 i Tullameen.