

FLOWER BUD DAMAGE IN TWENTY STRAWBERRY CULTIVARS BY THE STRAWBERRY BLOSSOM WEEVIL – *Anthonomus rubi* HERBST

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A B S T R A C T

Flower bud damage in 20 strawberry cultivars by the strawberry blossom weevil (*Anthonomus rubi*) was measured from 2000 to 2002 in the Experimental Orchard in Dąbrowice near Skierniewice in central Poland. Damaged flower buds were counted when the plants were in full blossom. The percentage of damaged buds depended on cultivar and varied from year to year of the trial. There was no correlation between the level of damage and when the cultivar flowered or ripened. The lowest percentage of damaged buds was observed with the following cultivars: 'Evita', 'Karel', 'Malling Pandora', 'Marmolada' and 'Selva'. The highest percentage of damaged buds was observed with the following cultivars: 'Elkat', 'Honeoye', 'Kent', 'Polka', 'Seal', Selection 1476 and 'Tenira'. A medium level of damaged buds was observed with the following cultivars: 'Senga Sengana', 'Elsanta', 'Kaster', 'Pegasus', Selection 723, Selection 1248, 'Tarda Vicoda' and 'Vega'.

Key words: strawberry cultivars, strawberry blossom weevil, *Anthonomus rubi*, strawberry bud damage

INTRODUCTION

The strawberry blossom weevil (*Anthonomus rubi* Herbst) is one of the most destructive pests in strawberry plantations in many countries, including Poland (Łęska, 196; 1966; Łabanowska and Kobiela, 1986), Finland

(Vappula, 1965), Great Britain (Simpson et al., 1997), Austria (Lethmayer et al., 2004), and Norway (Trandem et al., 2004). It can damage up to 50% of strawberry flower buds, and can also damage raspberry buds (Łęska, 1965; Carlen et al., 2004; Łabanowska, 2004). Not all cultivars are damaged to the same degree

(Łęska, 1965; Simpson et al., 1997; Labanowska and Chlebowska, 1999).

The aim of this study was to examine the extent of damage caused by the strawberry blossom weevil to flower buds of twenty strawberry cultivars. 'Senga Sengana' was used as the standard cultivar because it is commonly grown in Poland, mainly for fruit processing.

MATERIAL AND METHODS

The experiment was carried out from 2000 to 2002 in strawberry plantations in the Experimental Orchard in Dąbrowice near Skierniewice in central Poland. Twenty strawberry cultivars were grouped as follows:

- **Early bearing:** 'Honeoye', 'Kent', 'Elsanta' and 'Vega'.
- **Mid-season bearing:** 'Marmolada', 'Kaster', 'Pegasus' and 'Polka'.
- **Late bearing:** 'Tenira', 'Senga Sengana', 'Karel', 'Elkat', 'Seal', as well as three cultivars bred at the Research Institute of Pomology and Floriculture in Skierniewice: Selection 1248, Selection 723, Selection 1476.
- **Very late bearing:** 'Malling Pandora' and 'Tarda Vicoda'.
- **Ever bearing:** 'Selva' and 'Evita'.

The experiment was carried out in the experimental orchard, where strawberries are grown every year. No fungicides or insecticides were applied to the plantation during experiment. Each cultivar was planted in a block of two 12 m long rows (24 m²), with four

replicates of 25 plants each. Once each season, when the plants were in full blossom, samples were randomly taken from each cultivar in four replicates, each consisting of 50 flower clusters and equivalent to about 300 flower buds. The percentage of flower buds damaged by the weevil was calculated. Data were subjected to analysis of variance, separately for each year. Before analysis, the percentages were transformed using the Bliss function $y = \arcsin(x)$, where x is the percentage of damaged buds. Significant differences among means were determined using Duncan's multiple range t-test at 5% level of significance.

RESULTS AND DISCUSSION

In 2000, the first year of the experiment, the number of damaged buds in most of the cultivars was similar to the standard, 'Senga Sengana' (Tab. 1). Less than 10% of the flower buds were damaged in four of the cultivars tested: 'Karel', 'Malling Pandora', 'Tarda Vicoda' and 'Evita'. In the other sixteen cultivars, between 11.8% and 23.6% of the flower buds were damaged. The percentage of damaged buds was not significantly affected by when the plants flowered and fruit ripened. There was no statistical difference between most cultivars.

In 2001, the second year of experiment, all cultivars had lower percentages of damaged buds than they did in 2000, probably because the weather did not suit the weevil. 'Kent' and 'Seal' had the highest percentages of damaged buds, 9.4% and 7.1%, respectively. The other cultivars

Flower bud damage by the strawberry blossom weevil.....

Table 1. The percentage of flower buds damaged by the strawberry blossom weevil *Anthonomus rubi* Hbst. on 20 strawberry cultivar (Dąbrowice near Skierniewice, 2000-2002)

Cultivar	Observation date		
	May 17, 2000	May 24, 2001	May 25, 2002
<u>Early bearing:</u>			
'Honeyoe'	15.0 bcd*	2.5 cd	26.0 d*
'Kent'	19.9 cd	9.4 h	22.2 cd
'Elsanta'	16.4 bcd	3.5 def	12.8 b
'Vega'	15.8 bcd	4.6 dg	20.5 cd
<u>Mid-season bearing:</u>			
'Marmolada'	17.1 bcd	1.6 bc	6.0 a
'Kaster'	18.9 cd	0.7 ab	21.8 cd
'Pegasus'	16.6 bcd	3.5 def	19.1 c
'Polka'	17.5 bcd	7.4 gh	21.6 cd
<u>Late bearing:</u>			
'Tenira'	23.6 d	3.3 def	22.3 cd
'Senga Sengana'	13.2 bcd	2.4 cd	22.7 cd
'Karel'	5.4 a	4.3 dg	18.7 c
'Elkat'	19.5 cd	4.7 dg	20.9 cd
'Seal'	18.3 cd	7.1 gh	21.2 cd
Selection 1248	11.8 bc	3.5 def	23.4 cd
Selection 723	13.2 bcd	2.6 cde	25.3 d
Selection 1476	19.1 cd	5.3 fg	25.3 d
<u>Very late bearing:</u>			
'Malling Pandora,	5.8 a	0.5 a	22.7 cd
'Tarda Vicoda'	6.0 a	4.6 dg	22.5 cd
<u>Ever bearing:</u>			
'Selva'	14.3 bcd	5.0 efg	10.5 b
'Evita'	9.5 ab	1.0 ab	no plants

Observations were made when plants were in full blossom.

*The means followed by the same letter in columns do not differ significantly, Duncan's multiple range t-test at 5% level of significance

had between 0.5% and 5.3% damaged buds, as did the standard cultivar, 'Senga Sengana', with 2.4% damaged buds. 'Kaster', 'Malling Pandora' and 'Evita' had no more than 1% damaged buds.

In 2002, the third and last year of the experiment, 'Marmolada' had the lowest percentage of damaged buds (6.0%). 'Elsanta' and 'Selva' had a medium level of damaged buds, 12.8% and 10.5%, respectively. The

other cultivars tested had a high level of damaged buds, between 18.7% and 26.0%. No data are presented for 'Evita', which had been destroyed by frost. The level of damage was not affected by when the plants blossomed and ripened. There was no significant difference between the damages to the standard cultivar, 'Senga Sengana', with 22.7% damaged buds, and all the other cultivars.

Earlier studies had shown that early-bearing strawberry cultivars are damaged by the strawberry blossom weevil more than are late-bearing cultivars (Łęska, 1965; Simpson et al., 1997). Łabanowska and Chlebowska (1999) found that the percentage of damaged buds varied from year to year, and from cultivar to cultivar, but was not correlated with when the strawberries flowered.

This study confirms that weather conditions during the year have a much stronger influence on the percentage of damaged buds than do either cultivar or flowering time. In the first year of the experiment, most of the cultivars studied had between 12% and 23% damaged buds. Only four cultivars had percentages of damaged buds which were below the economic threshold, estimated at 10% damaged buds in the first fruiting year (Terrataz et al., 1995). In the second year, all cultivars tested had less than 10% damaged buds. In the third year, the strawberry blossom weevil did even more damage than in the first year. Only 'Marmolada' had less than 10% damaged buds, that is, lower than the economic threshold. Most of the other cultivars tested had more than 20% damaged buds.

During three years of the experiment, the strawberry blossom weevil did the most damage to the following cultivars: 'Elkat', 'Honeoye', 'Kent', 'Polka', 'Seal', Selection 1476 and 'Tenira'. In earlier experiments, 'Honeoye' and 'Kent' had been in the group with medium damage, but all cultivars tested had very low percentages of damaged buds

(Łabanowska and Chlebowska, 1999). The weevil did the least damage to the following cultivars: 'Evita', 'Karel', 'Malling Pandora', 'Selva', and notably 'Marmolada', which was one of the cultivars least damaged in previous studies (Łabanowska and Chlebowska, 1999). The weevil did a medium level of damage to the standard cultivar, 'Senga Sengana', as well as to the following cultivars: 'Tarda Vicoda', 'Kaster', 'Elsanta', 'Pegasus,' Selection 723, Selection 1248 and 'Vega'. The results for 'Elsanta' and 'Senga Sengana' are similar to those from an earlier study (Łabanowska and Chlebowska, 1999).

CONCLUSIONS

1. The percentage of strawberry flower buds damaged by the strawberry blossom weevil varied from year to year, and from cultivar to cultivar.
2. The percentage of damaged buds was not affected by when the plants flowered or ripened.
3. The standard cultivar, 'Senga Sengana', as well as 'Elsanta', 'Kaster', 'Pegasus', Selection 723, Selection 1248, 'Tarda Vicoda' and 'Vega' had a medium percentage of damage buds.
4. 'Evita', 'Karel', 'Malling Pandora', 'Marmolada' and 'Selva' had the lowest percentage of damaged buds.
5. 'Elkat', 'Honeoye', 'Kent', 'Polka', 'Seal', Selection 1476 and 'Tenira' had the highest percentage of damaged buds.

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REFERENCES

- Carlen C., Mittaz C., Carron R. 2004. Importance of simulated damage to flower buds by strawberry blossom weevil on raspberries. Integrated plant Protection in fruit Crops – Soft Fruit, IOBC/WPRS BULL. 27(4): 161-165.
- Lethmayer C., Hausdorf H., Blumel S. 2004. The first field experiences with sex-aggregation pheromones of the strawberry blossom weevil, *Anthonomus rubi*, in Austria. IOBC/WPRS BULL. 27 (4) pp.133-139.
- Łabanowska B.H., 2004. Principles and possibilities of the most important pest control in Integrated Fruit Production of raspberry in Poland (Polish with English summary). PROG. PLANT PROTECTION/POST. OCHR. ROŚL. 44(2): 939-943.
- Łabanowska B.H., Chlebowska D. 1999. Strawberry blossom weevil - *Anthonomus rubi* Hbst. damage on strawberry cultivars. J. FRUIT ORNAM. PLANT RES. 7/3:147-151.
- Łabanowska B.H., Kobiela B. 1986. The efficacy of new insecticides for the control of the strawberry blossom weevil (*Anthonomus rubi* Hbst.). FRUIT SCI. REP. 13(1): 39-44.
- Łęska W. 1965. Badania nad biologią i szkodliwością kwieciaka malinowca *Anthonomus rubi* Hbst. (Col., Curculionidae). POL. PISMO ENTOMOL. B. Z. 1-2 (37-38): 81-146.
- Łęska W. 1966. Badania nad szkodliwością i metodami szacowania strat wyrządzanych przez kwieciaka malinowca (*Anthonomus rubi* Hbst.). BIUL. INST. OCHR. ROŚL. 34: 407-416.
- Simpson D. W., Easterbrook M. A., Bell J.A., Greenway C. 1997. Resistance to *Anthonomus rubi* in the cultivated strawberry. In: Proceedings of the third international strawberry symposium, Veldhoven, Netherlands, 29 April – 4 May 1996, Vol. I. ACTA HORT. 439: 211-215.
- Terrataz R., Antonin P., Carron R., Mittaz C. 1995. Economic incidence of simulated damage by the weevil on the flowers of strawberry. An approach to the determination of the tolerance threshold. REV. SUISSE VITIC. ARBOR. HORT. 27/6: 361-363.
- Trandem N., Aasen S., Hagvar E. B., Haslestad J., Salinas S. H., Sonstebj A. 2004. Strawberry blossom weevil – recent research in Norway. IOBC/WPRS BULL. 27 (4) pp.145-152.
- Vappula N.A. 1965. Pest of cultivated plants in Finland. ANN. AGRIC. FENN. 1962, Supplementum 1 (English edition), Seria Animalia Nomentia 1/5, pp. 114.

USZKODZENIE PĄKÓW KWIATOWYCH DWUDZIESTU ODMIAN TRUSKAWKI PRZEZ KWIECIAKA MALINOWCA – *Anthonomus rubi* HERBST

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S T R E S Z C Z E N I E

W latach 2000-2002 oceniano uszkodzenie pąków kwiatowych przez kwieciaka malinowca na 20 odmianach truskawki. W okresie kwitnienia określano liczbę pąków zdrowych i zniszczonych przez szkodnika. Procent uszkodzonych pąków był różny, w zależności od roku i odmiany. Najmniej uszkodzonych pąków notowano na odmianach: 'Evita', 'Karel', 'Malling Pandora', 'Marmolada' i 'Selva'. Najwyższy procent zniszczonych pąków stwierdzono na odmianach: 'Elkat', 'Honeoye', 'Kent', 'Polka', 'Seal', klon 1476 and 'Tenira'. Przyjęta za standardową 'Senga Sengana' oraz odmiany: 'Elsanta', 'Kaster', 'Pegasus', klon 723, klon 1248, 'Tarda Vicoda' a także odmiana 'Vega' uszkodzone były w średnim stopniu.

Słowa kluczowe: odmiany truskawki, kwieciak malinowiec, *Anthonomus rubi*, uszkodzenie pąków kwiatowych