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MONITORING OF FLONICAMID (TEPPEKI) BIOLOGICAL EFFICIENCY ON CZECH AND MORAVIAN FIELD STRAINS OF DAMSON-HOP APHID (*PHORODON HUMULI* SCHRANK) IN BIOASSAYS.

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FIGURE 1:
Damson-hop aphid (*Phorodon humuli* Schrank) – winged females (migrantes alatae) and wingless asexual female aphids (apterae)

FIGURE 2:
Excreted honeydew obvious on sticky and shiny leaves serves as a medium for sooty mold fungi

FIGURE 3:
Hop cones severely damaged by damson-hop aphid with obvious sooty mold fungi, which drastically decreases value of hops

Abstract

Hop protection against damson-hop aphid (*Phorodon humuli* Schrank) in Czech Republic is based on the application of synthetic insecticides. Whereas imidacloprid and pymetrozine were frequently used in the last nearly two decades, nowadays spirotetramat (Movento) and flonicamide (Teppeki) have become the most important insecticides for the control of resistant damson hop aphid.

The data show the mortality of aphids attacking hop plants on the territory of Czech Republic after flonicamide applications on field strains sampled within Czech and Moravian hop growing regions in the beginning of June 2012. No surviving aphids were observed after application of Teppeki in 0.01, 0.005 and 0.0025% concentrations. If applied in lower tested rates the mortality dropped to approximately 98-99% (0.00125%), with the exception of Tršice strains (100%), to 94.0 – 97.6% (0.00062%) and to 87.3 – 93.2% (0.00031%), resp. **(Table 1)**.

If we take into consideration the fact that Teppeki is registered and commonly recommended in the rate of 180 g/ha in 2000 lt of water (0.009% conc.) as well as its high selectivity to beneficial insects we can see great potential of this efficient aphicide within IPM system in hops for the years to come.

Key words: damson-hop aphid, flonicamide, Teppeki, field strains, bioassays, Potter tower, biological efficiency, IPM in hops, beneficial insects.

Material and Methods

Samples of damson-hop aphids were taken from the selected hop-yards within the hop regions in Czech Republic in 2012 (Žatec region: 5 samples from Louny district and 3 samples from Rakovník district; 3 samples from Úštěk and 2 samples from Tršice regions). Aphids were collected in the first decade of June before insecticide treatments.

Field samples of *P. humuli* populations were transferred into the rearing room. Their offspring was used in laboratory tests. Aphids were placed in an air-conditioned room at a temperature of 20-22°C and 16-hours photoperiod. Relative humidity was kept at 60-70%. As a host plant hop seedlings were used. These plants were grown in a glasshouse all over the year. Hop leaves with petioles were taken from untreated or residue-free hop plants.

Decapitated leaves were placed with their back side up on the bottom of a sedimentation tower (30 cm in diameter and 96 cm high) and sprayed with 1 ml of the solution of Teppeki with the help of Potter's nozzle under the pressure of 0.2 MPa. After the sedimentation time (10 minutes) treated leaves were removed from the tower. The method (Hrdý, Kuldová, 1981), requires glass cylinders (22 mm in diameter and 15 mm high) stuck on the inside of hop leaves with the help of paraffin and bee-wax mixture that was melted to 50 °C before they were used. Glass cylinders were coated with fluon to prevent escaping aphids. Then they were placed into panels with openings for vials containing water, into which leaf stalks of the treated leaves were inserted.

Two to three hours after spraying thirty-three aphids were transferred into each cylinder by a fine, slightly moist little brush in the following sequence: non-treated (control) leaves and treated leaves in order from the lowest to the highest tested concentration. Mortality of aphids was counted 48 hours after each treatment. The knocked down aphids and the ones, which were unable to move, were considered dead. The mortality of non-treated (control) leaves must not have been higher than 20% (if so, the experiment had to be repeated). Each test was carried out three times. That means 100 aphids were tested under each concentration in a geometric row.

Hrdý, I., Kuldová, J., 1981: A standardized spray-residue method for measuring, and dip-test for monitoring resistance in aphids. In IOBC WPRS Bull. IV/3, Liblice, Czechoslovakia: 21-28.

Acknowledgement

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Table 1: Biological efficiency of flonicamide (Teppeki) in laboratory bioassays on resistant field strains of damson-hop aphid (*Phorodon humuli* Schrank) sampled within Czech and Moravian hop growing regions in 2012.

Field strain	Concentration tested (%)					
Žatec (Saaz) hop growing region, district Louny	**0.01%**	**0.005%**	**0.0025 %**	**0.00125%**	**0.00062%**	**0.00031%**
Dubčany	100	100	100	100	100	95
Markvarec	100	100	100	100	100	97
Orasice	100	100	100	99	95	89
Ročov	100	100	100	100	97	95
Stekník	100	100	100	99	96	90
Average mortality	***100%***	***100%***	***100%***	***99.6%***	***97.6%***	***93.2%***
Žatec (Saaz) hop growing region, district Rakovník	**0.008 %**	**0.004 %**	**0.002 %**	**0.001 %**	**0.0005 %**	**0.00025 %**
Kounov	100	100	100	98	94	85
Mutějovice	100	100	100	99	95	90
Nesuchyně	100	100	100	98	93	87
Average mortality	***100%***	***100%***	***100%***	***98.3%***	***94.0%***	***87.3%***
Úštěk hop growing region	**0.008 %**	**0.004 %**	**0.002 %**	**0.001 %**	**0.0005 %**	**0.00025 %**
Liběšice	100	100	100	97	92	85
Polepy	100	100	100	99	95	89
Vědomice	100	100	100	100	99	94
Average mortality	***100%***	***100%***	***100%***	***98.7%***	***95.3%***	***89.3%***
Tršice hop growing region	**0.008 %**	**0.004 %**	**0.002 %**	**0.001 %**	**0.0005 %**	**0.00025 %**
Doloplazy	100	100	100	100	98	93
Tršice	100	100	100	100	97	92
Average mortality	***100%***	***100%***	***100%***	***100%***	***97.5%***	***91.5%***

FIGURE 4:
Field samples of *P. humuli* populations are transferred into the air-conditioned rearing room

FIGURE 5:
Hop leaves placed at the bottom of the sedimentation tower are treated with Teppeki applied in a geometric row of tested concentrations

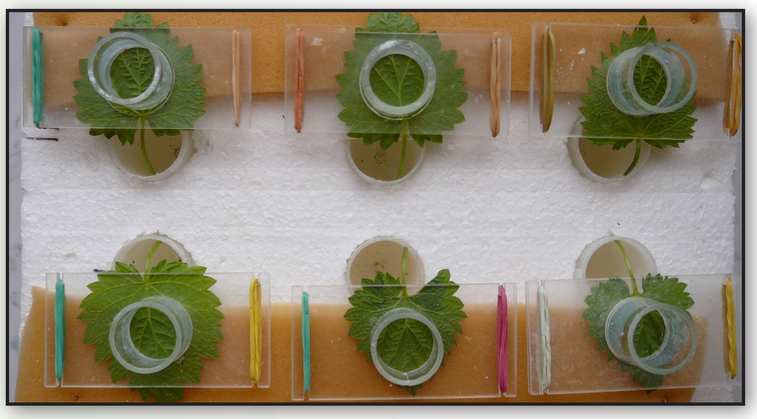

FIGURE 6:
Glass cylinders are stuck on the inside of the treated hop leaves with the help of paraffin and bee-wax. Then they are coated with fluon to prevent escaping aphids and placed into panels with openings for vials containing water, into which leaf stalks are inserted.

FIGURE 7:
High selectivity of flonicamide (Teppeki) to beneficials means a great potential of this efficient aphicide within IPM system in hops for the years to come.