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Comparison between different trap types for *Drosophila suzukii* in cherry orchards

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Abstract: In 2013 an experiment was carried out to compare six types of similar size traps baited with the same food attractant ("DroskiDrink"), differing for their shape and the number of entry holes. Four of the traps are already/will be soon available on the market, two of them being marketed specifically for SWD ("Drosotrap new®" and "Drosotrap®" by BIOBEST), and two being marketed for other pests ("Taptrap®" and "Vasotrap®" by Roberto Carello). The other two traps were specifically designed and hand-made on purpose (Kartell red and Bot). The trial was performed in a cherry orchard in Vignola (Modena Province, Northern Italy), area of IGP cherries; traps were placed according to a completely randomized block design and their position was changed weekly. The number of captured *Drosophila suzukii* (SWD) and that of other insect taxa was recorded weekly.

After the first year, results show that the traps with the best performance in terms of early season captures and total number of SWD catches were "Drosotrap new" and "Bot". However, the low selectivity towards other insect types and the uneasiness of use suggest the need of further research to improve the efficacy of these traps.

Key words: *Drosophila suzukii*, monitoring, trapping, traps, cherry orchard

Introduction

The interest towards the spotted wing *Drosophila* (SWD) (*Drosophila suzukii* Matsumura 1931), an invasive alien pest that attacks ripening fruits of small and stone fruit crops, is growing worldwide because of its recent fast spread in the United States, Canada, Mexico and Europe. In Italy, SWD is becoming a serious pest of soft fruits in the Trentino Alto Adige Region and a dangerous pest, especially for cherry orchards, in the Emilia Romagna Region (Cini *et al.*, 2012).

A monitoring program activated since 2011 in Emilia Romagna using hand-made food traps, showed an increasing presence of SWD in the main fruit orchards and grapevine producing areas of the region (Boselli *et al.*, 2012). It also highlighted some limitations related to the types of the used traps, such as no or very low captures in the early season, decreased attractiveness overtime of the food lures, low selectivity of the traps.

To solve these critical aspects that would greatly benefit planning of SWD management strategies, in 2013 an experiment was performed to compare six types of similar size traps baited with the same food attractant ("DroskiDrink"), differing for their shape and number of entry holes.

Material and methods

Six traps models (shown in Table 1) were compared during the period 30 April to 17 July 2013, in a multivarietal cherry crop of about 1 ha located in proximity of Vignola (Mo).

All traps were baited with the same attractive bait (200 ml per trap), called DroskiDrink, a mixture of apple cider vinegar, red wine and brown sugarcane, with the addition of a drop of surfactant (Triton X100), that was replaced weekly.

Table 1. Trap description.

Trap name	Acronym	Color	Hole size/ hole n°	Hole position
New Droso Trap model (Commercial, Bio Best)	DRNEW	red	5 mm/21	On the side along the circumference in three groups of 7 holes
Bottle (milk bottle) (Self made, 1l volume)	BOT	transparent	6 mm/7	Grouped in one side of the bottle
Tap Trap* (Commercial, Az. Roberto Carello)	TAP	red	20 mm/1	Top opening with a mesh screen 3 mm diameter
Vaso Trap* (Commercial, Az. Roberto Carello)	VASO	red	18 mm/1	Top opening with a mesh screen 3 mm diameter
Bottle (Kartell) (Self made, 1l volume)	KART	red	5 mm/6	On the side along the circumference
Old Droso Trap model* (Commercial, Bio Best)	DROSO	red	10 mm/3	On the side along the circumference with a mesh screen 3 mm diameter

The comparison was replicated three times. Blocks were positioned at 50 m distance and set up in one cherry variety, or in multiple cherry varieties with similar ripening times and similar microclimatic condition. Traps in each block were randomly rotated every week. Each trap was spaced about 4 m from the others and positioned on the plants at about 1.50 m height, in a shady position.

Every week all the content of the traps was checked in laboratory and the number of SWD (male, female and total), other Drosophilids, Coleoptera and other bigger size insects (> 0.4 mm), that were mostly Diptera and Lepidoptera, were counted.

Data on weekly captures of adult *D. suzukii* in each trap type were transformed (ln + 1) to meet the assumption of homogeneous variances. As trends were similar for both sexes, the total number of SWD was used for the analyses. Data were compared using ANOVA followed by LSD post hoc test to separate the means.

Results and discussion

Total catches and trap sensitivity

DRNEW and BOT captured significantly more SWD than all other traps along all the testing period, catching respectively 80 (± 11.85) and 69 (± 10.60) adults (Figure 1); the catches of KART (4 ± 1) and DROSO (2.33 ± 0.88) were sigificantly lower from the other traps. TAP

and VASO have a intermediate position, catching respectively 23.67 (± 1.76) and 15.33 (± 4.63) adults and are statistically different from the best and the worse traps.

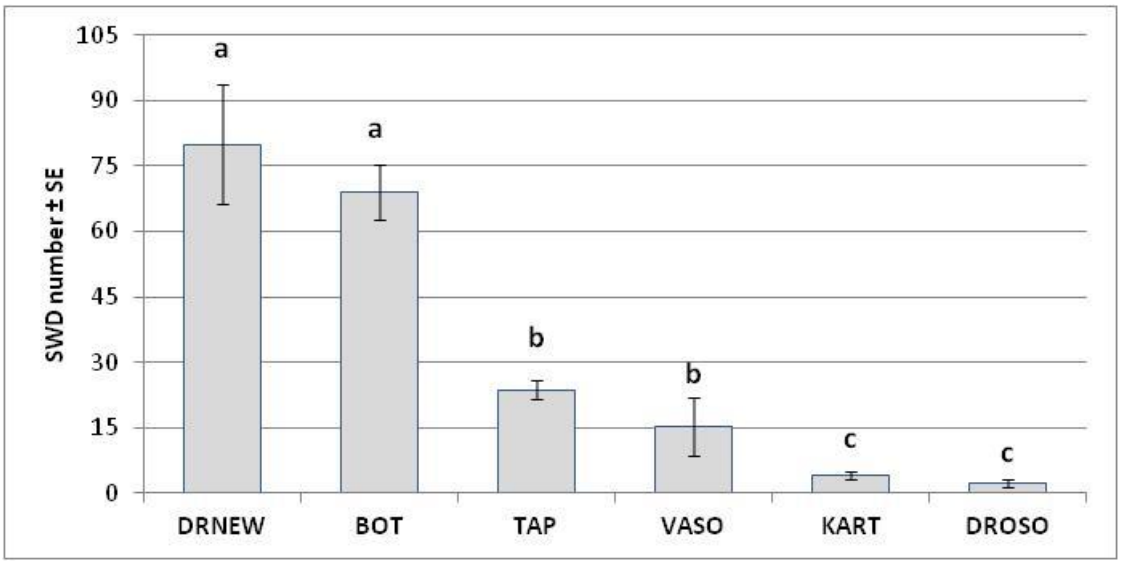

Figure 1. Cumulative SWD captures per trap type (mean ± SE) along the whole test period. Different letters denote significant difference after LSD test on log-transformed data.

As shown in Table 2 DRNEW and BOT are the only traps that caught at least one SWD adult among the three repetitions in each of the 11 weeks. However, no statistically significant differences were detected among the traps during the first six weeks except for the week number 3 in which DRNEW differed from all the other traps capturing approximately ten times more SWD than the other traps. DRNEW had the best score of captures in seven of the 11 weeks and BOT had the best score in 4; significant differences between these two traps were detected only in week 3 and in week 11.

Table 2. Weekly captures of *D. suzukii* in traps (mean ± SE). For each week column, different letters denote significant difference after LSD test on log-transformed data.

Trap	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11
DRNEW	0,7± 0,3	1,0± 0,6	3,00± 1,15 **a**	1,0± 0,6	0,5± 0,5	3,3± 2,0	2,00± 1 **ab**	7,67± 2,96 **a**	25,33± 3,71 **a**	13,0± 4,04 **a**	22,33± 4,18 **b**
BOT	0,3± 0,3	0,7± 0,3	0,33± 0,33 **b**	2,7± 1,5	2,7± 1,7	1	3,33± 0,67 **a**	5,00± 1,53 **a**	6,33± 1,20 **b**	11,0± 2,31 **a**	35,67± 10,09 **a**
TAP	0,3± 0,3	0	0 **b**	0,7± 0,7	0	0	0,67± 0,33 **bc**	3,33± 0,88 **a**	6,33± 0,33 **b**	4,33± 0,88 **b**	8,00± 1 **b**
VASO	0	0	0 **b**	0	0,7± 0,7	1,0± 0,6	0 **c**	2,67± 1,45 **ab**	1,67± 1,20 **c**	3,33± 0,88 **b**	6,00± 2,65 **c**
KART	0,3± 0,3	0	0,33± 0,33 **b**	0	0,7± 0,3	0,3± 0,3	0,33± 0,33 **bc**	0,33± 0,33 **b**	0,33± 0,33 **c**	0,33± 0,33 **c**	1,00± 0,58 **c**
DROSO	0	0	0,33± 0,33 **b**	0,3± 0,3	0	0	0 **c**	0,33± 0,33 **b**	0,33± 0,33 **c**	0 **c**	1,00± 0,58 **c**

Selectivity

As reported in other studies (Lee *et al*., 2012) traps that caught flies earlier also caught more flies during the rest of the season. In fact, DRNEW and BOT caught also significantly more other non-target insects compared to the other tested traps (Table 3). None of the traps was

selective, as, on average, the proportion of *D. suzukii* caught among all the insects ranged from 0.2% to 0.7%, a percentage which is lower than those described in other studies (Basoalto *et al*., 2013; Lee *et al*., 2012).

Table 3. Cumulative captures of non target insects in the traps (mean ± SE). For each column, different letters denote significant difference after LSD test.

	Drosophilids	Coleoptera	Big size insect
DRNEW	1846,3±488,2 **a**	247,3±45,0 **a**	105,7±3,2 **a**
BOT	1943,7±163,4 **a**	313,3±33,5 **a**	121,0±33,6 **a**
TAP	194,3 ±17,1 **b**	29,7 ±7,4 **b**	1,0 ±1,0 **b**
VASO	387,3 ±91,4 **b**	46,0 ±5,5 **b**	11,3 ±3,8 **b**
KART	288,7 ±26,2 **b**	82,7 ±15,4 **b**	3,7 ±0,9 **b**
DROSO	343,3 ±7,7 **b**	86,3 ±4,7 **b**	3,3 ±1,7 **b**

Conclusions

After the first year, results show that the traps with the best performance in terms of early season captures and total number of SWD catches were "Drosotrap new" and "Bot". However, the low selectivity towards non target insects and the uneasiness of use suggest the need of further research to improve the efficacy of these traps.

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