

Catching apple and pear sawfly on white sticky roller tape

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Abstract

Apple sawfly *Hoplocampa testidunea* Klug (ASF) and *pear sawfly* *Hoplocampa brevis* Klug (PSF) are major pests in organic fruit growing. Adult sawflies are attracted to the white colour of the flowers. White sticky traps have been used for many years to monitor the flight. Application of white sticky roller tapes can be used to decrease the population. The white colour of the sticky tapes attract the sawflies. Here we present the results of experiments in the Netherlands, Denmark, Belgium and Switzerland. Applying the sticky roller tapes in the orchard decreases the damage of sawflies. The efficacy in apple varies from 65% till 91%, in pear even higher efficacies are seen from 74% till 100%. Density experiments did not show significant differences in sawfly catches and crop damage between treated objects, suggesting that sawflies are actively attracted to the sticky roller tapes. Experience with sticky roller tape is limited and, in some years, may be not sufficient to limit the damage. The use is an additional measure to reduce sawfly damage.

Keywords: Apple sawfly, pear sawfly, sticky tape

Introduction

Apple sawfly *Hoplocampa testidunea* Klug (ASF) is a pest in apple in the temperate regions of Europe and Eastern North America (Vincent *et al.*, 2019). Eggs are laid during bloom in the flower bottom. Larvae move to 2-3 other fruits and devastate the young fruitlets. ASF is of special importance in organic and low-input apple production, as non-chemical control options are limited (Helsen *et al.*, 2020). Pear sawfly *Hoplocampa brevis* Klug (PSF) is not as important as ASF, but can still locally cause significant damage. PSF is particularly prevalent in organic pear production. The lifecycle of apple sawfly and pear sawfly is rather similar, but there are differences. Adult ASF emerge from the soil a few days before the start of the flowering of apple (BBCH 59-60). The flight of adult PSF starts earlier, approximately from the early white bud stage (BBCH 57) in pear. Eggs are deposited shortly after emergence and eggs can be laid until the end of flowering. Eggs hatch from early flowering onwards (Trautman and Weber, 2023). Both sawflies are attracted to the white colour of the flowers. White sticky traps have been used for many years to monitor the flight. In experiments in The Netherlands different types of sticky traps were tested to catch sawflies. Disposable polypropylene plates proved to have the best efficacy (Helsen *et al.*, 2020). Since 2020 new materials are tested to catch sawflies. An innovative method is catching of sawflies using white sticky roller tapes. The catches of insects other than sawflies were observed in 2023. The preliminary results of these observations are presented in this paper.

Material and Methods

Experiments were carried out in 2021-2023 in organic orchards in the Netherlands, Denmark, Belgium and Switzerland. The trials were situated in orchards with varying apple or pear varieties. White sticky roller tapes glued on both sides (CatchIT, Andermatt NL) were

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used as sawfly traps. Tapes were installed between the horizontal wires of the trellis system of the trees well before the start of flowering, in pear in an earlier stage than in apple. The tapes were removed after flowering. The trials at all sites were carried out with control plots where no sticky tapes were attached. In the Netherlands and Denmark, trials included three or four replicates. The length of the tapes and the tape density varied. Treatments were: no tapes versus a varying tape density between 123-855 tapes per ha. The tapes had a length of 1 till 2 meter, the tape length per ha was 246-855 meter, depending on the length of a single tape. In the Netherlands and Denmark, multiple tape densities were tested within a trial. The size of the plots was different, but were at least 100 m² and had a minimum width of five rows (ca. 15 m). Observations were performed in the mid of the plots. The effect in the trials was assessed by counting the number of infected fruits by ASF or PSF in the plots. In 2023 the catches of other insects on the tapes were assessed. The main groups of predators, parasitoids and pollinators were registered in Denmark and the Netherlands. The data from the Netherlands and Denmark was analysed using ANOVA followed by Tukey as a post-hoc test, or – in case assumptions for ANOVA were not met – the non-parametric Kruskal-Wallis test.

Results

On-farm experiences apple. The efficacy of sticky tapes on the damage varied, but was higher than 65% in all experiments (Table 1).

Table 1: Experiments in several countries and apple varieties and their impact on damaged fruits. UTC=untreated control. RRR=Rewena, Reanda, Remo. Different letters within a trial indicate statistical differences.

Year	Variety	Treatment	Density	Length	Total length	Catches	Damage	Efficacy
			tapes/ha	m/tape	m/ha	sawfly/ ha	%	% i.r.t. UTC
2022	Santana	NL-UTC	0	0	0		4 b	
		NL-123	123	2	246	1318 a	1.0 a	75
		NL-246	246	2	492	1268 a	0.5 a	88
2023	Ahrista	DK1-UTC	0	0	0		35.0 b	
		DK1-150	150	1	150	650 a	9.0 a	74
		DK1-200	200	1	200	530 a	4.8 a	86
		DK1-300	300	1	300	540 a	3.1 a	91
2023	Pirouette	DK2-UTC	0	0	0		3.5 a	
		DK2-150	150	1	150	158	1.2 a	66
		DK2-200	200	1	200	92	0.9 a	74
		DK2-300	300	1	300	279	0.7 a	80
2023	RRR	CH-UTC	0	0	0		9,3	
		CH-150	150	1	150	1200	1.5	84
2022	Topaz	BE-UTC	0	0	0		4.13	
		BE-250	250	2	500	6433	0,8	80

The reducing effect of the sticky tapes on damage caused by sawflies was significant in the experiments in the Netherlands and DK1 in Denmark. In Switzerland and Belgium no statistical analyses were possible because there were no replicates. In the trials in the Netherlands and Denmark different tape densities were compared. The number of caught sawflies was not statistically different between the different densities.

On-farm experiences pear. The efficacy of sticky tapes on damage of PSF differs, but is higher than 74% in all experiments (Table 2). The reduction of damage caused by sawflies is significant in the experiments in the Netherlands and Denmark (DK1). In DK2 and DK3 no statistical analyses were possible because there were no replicates. Different tape densities were compared. The number of caught sawflies was not statistically different between the different densities. The same trend is seen in the trials in Denmark in 2023.

Table 2: Experiments in several countries and pear varieties and their impact on damaged fruits. UTC=untreated control. Different letters indicate statistical differences.

Year	Variety	Treatment	Density	Length	Total length	Catches	Damage	Efficacy
			tapes/ha	m/tape	m/ha	sawfly/ha	%	% i.r.t. UTC
2022	Xenia	NL-UTC	0	1	0		2.0 b	
		NL-214	214	1	214	4309 a	0.5 a	77
		NL-427	427	1	427	4606 a	0.5 a	74
		NL-855	855	1	855	5318 a	0.1 a	94
2023	Concorde	DK1-UTC	0	0	0		6,6	
		DK1-100	150	1	150	1277	0.5	92
		DK1-200	200	1	200	698	0.0	100
		DK1-300	300	1	300	2061	0.0	100
2021	Concorde	DK2-UTC	0	0	0		10.0	
		DK2-521	521	0,75	391		1.9	81
2021	Concorde	DK3-UTC	0	0	0		18.1	
		DK3-260	260	1,45	377		2.2	88

It is important to apply the tapes before flowering, to catch the first adults that emerge. Table 3 shows the data of applying the tapes, first catches en first bloom.

Tabel 3: Date of applying the tapes, first catches of sawflies and first flowers open. Apple and pear.

APPLE Year	Country	Variety	Tapes applied	First catch	First bloom	PEAR Year	Country	Variety	Tapes applied	First catch	First bloom
2022	NL	Santana	13.4	15.4	16.4	2022	NL	Xenia	17.3	19.3	23.3
2023	DK	Ahrista	21.4	23.4	4.5	2023	DK1	Concorde	20.4	20.4	2.5
2023	DK	Pirouette	21.4	22.4	4.5	2021	DK2	Concorde	27.4	n.a.	9.5
2023	CH	RRR	12-15.4	n.a.	n.a.	2021	DK3	Concorde	27.4	n.a.	9.5
2022	BE	Topaz	12.4	14.4	15.5	n.a.= not available					

Bycatches on the sticky tapes

In the Netherlands (on tapes) and Denmark (on plates) exploratory observations were done on the bycatches. True flies (Diptera) are attracted in high numbers and might pollute the tapes if mounted too early. Though the relative ecological importance of bycatch numbers of beneficial insects is unknown and identification of bycatches was only at genus level (instead of species level), initial observations indicate that bees, hoverflies, earwigs and lacewings are caught in neglectable numbers. While there is a bycatch of parasitic wasps, spiders and ladybirds, it was not possible to determine if the magnitude is relevant. Also, local differences are observed. Further research is necessary to conclude if the bycatches have a significant impact at population level and/or are of ecological importance (f.e. with DNA extraction to determine different insect genera). Attention is needed for a standardized protocol to perform observations on (key) beneficials.

Discussion

The results showed significant, positive effects of sticky tapes on reducing the damage of ASF and PSF. The non-significant differences of fruit damage and sawfly catches between treatments with a different tape density suggest that sawflies are actively attracted to the tapes. This implies that the tape density is of less importance, but they should be well spread over the orchard and should be well visible. The tapes should be applied before bloom, but should not be hung too early due to contamination with other insects and risk of the tapes blown away. Another aspect is the influence of the weather on the moment of emergence of adult sawflies from the soil and on the time of flowering. In some years, sawflies emerge from the soil in full bloom and there is a competition between the white color of the tapes and the white color of the flowers. The population of sawflies can differ from year to year. In orchards with an unexpected high population, white tapes are not applied in time. In these cases other measurements to control sawflies are needed. The efficacy in pear in general is higher than the efficacy in apple. Possible explanations could be the timing of appearance of adults in spring and the good visibility of the tapes as there is still little leaf development. PSW appears well before flowering and at that moment there is less competition between the white color of the tapes and the white color of the flowers. To apply the sticky tapes in the orchard time and labor are needed, In recently published Practice Abstracts (Brouwer, 2022) about sawflies the costs are calculated. For application and removal of tapes 10-14 hours per hectare is needed. The costs for the tapes depend on length and number per ha. The total costs, including labor and material, are calculated at €255-502 per ha. In an article in Denmark the costs are calculated on €371-590 per ha (Madsen *et al.*, 2023). Another point of concern could be that insects other than sawflies are caught on the tapes. In our preliminary observations we see other insect groups on the tapes, but their share in the total population in the orchard is unknown. Consequently the effect these catches may have on the total orchard ecosystem is also unknown. Further research is needed to study these effects. In order to prevent too many bycatches it is important to remove the sticky tapes as soon as possible after flowering.

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References

- Brouwer, G. 2022. Practice abstract Apple sawfly (*Hoplocampa testidunea*): Catch that fly, and Practice abstract Pear sawfly (*Hoplocampa brevis*): Catch that fly. Delphy. BIOFRUITNET.
- Helsen H., Jansonius P. J., Brouwer G. W., van der Sluis B., van Tol R., de Groot A., van Kats R., van de Maas R. (2020). Mass trapping of the apple sawfly *Hoplocampa testidinea*. Proceedings of the 19th International Conference on Organic Fruit Growing, pp. 99-102.
- Madsen R., Lindhard Pedersen H., Andersen C., . 2023. Massefangst af bladhpvpe. Gartner Tidende 2023 (10), pp. 30-31.
- Trautmann M., Weber R. W. (2023). Die Birnensägewespe. Obstbau 4-2023, pp. 212-216.
- Vincent, C., Babendreier, D., Świergiel, W., Helsen, H. and Blommers, L.H.M. (2019). A review of the apple sawfly, *Hoplocampa testudinea* (Hymenoptera Tenthredinidae). Bulletin of Insectology 72(1), pp. 35-54.