Full Paper

Biological Control of *Drosophila suzukii* in South Tyrol (Italy) using the Exotic Parasitoid *Ganaspis kimorum*

Biologische Bekämpfung von *Drosophila suzukii* in Südtirol (Italien) unter Verwendung des exotischen Parasitoiden *Ganaspis kimorum*

Controllo biologico di *Drosophila suzukii* in Alto Adige (Italia) mediante il parassitoide esotico *Ganaspis kimorum*

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ABSTRACT

The spotted wing drosophila, *Drosophila suzukii* (Diptera: Drosophilidae), is a highly invasive fruit pest that has rapidly spread across Europe, the Americas, and parts of Africa since 2008. Its ability to oviposit in intact ripening fruits makes it particularly destructive, with infestations leading to severe economic losses in stone fruits, berries, and grapes. In Italy, the Ministry of the Ecological Transition (MiTE) authorized the release of the exotic larval parasitoid *Ganaspis kimorum* (Hymenoptera: Figitidae) in 2021 under a National Biological Control Plan. The initiative included releases in several regions and in the Autonomous Province of Bolzano/Bozen, where fruit orchards and surrounding habitats were selected as release sites based on confirmed *D. suzukii* infestations and minimal pesticide use. This study presents monitoring results from South Tyrol between 2021 and 2024, focusing on the establishment, spread, and overwintering of *G. kimorum* as well as the presence and abundance of other parasitoid species that emerged from the sampled fruits.

KEYWORDS

spotted wing fly, exotic natural enemies, Alpine agroecosystems, Leptopilina japonica, plant host interactions, parasitoid community

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INTRODUCTION

Invasive insect pests threaten global food security, ecosystem stability, and agricultural sustainability. Among them, the spotted wing drosophila, *Drosophila suzukii* (Diptera: Drosophilidae), has become a model example of how rapidly an exotic species can disrupt fruit production systems once introduced into new environments. Unlike other drosophilids that feed on decaying fruits, *D. suzukii* uses its serrated ovipositor to lay eggs inside healthy, ripening fruits [1]. This behaviour exposes commercial fruit crops to unprecedented levels of pre-harvest damage.

The pest invasion has been facilitated by its broad host range, short generation time, and lack of specialized natural enemies in invaded regions. In Europe and North America, *D. suzukii* has adapted to diverse agroecosystems, including high-value crops such as cherries, raspberries, blueberries, strawberries, peaches, plums, and grapes. Yield losses in heavily infested orchards and berry farms can reach catastrophic levels, severely impacting growers' incomes and regional fruit economies [2]. Furthermore, the host plant range of *D. suzukii* includes several wild soft berry species, which serve as pest reservoirs in unmanaged habitats. Because eggs and larvae develop inside intact fruit, they are largely protected from insecticide applications. Chemical treatments are further constrained by strict residue limits close to harvest, leading to narrow treatment windows and frequent reinvasion from surrounding unmanaged habitats [3]. These challenges are particularly acute in organic farming systems. The limitations of chemical control have prompted a shift toward integrated pest management strategies that incorporate biological control as a sustainable alternative.

Surveys in the pest's native range of East Asia identified a community of larval parasitoids capable of attacking *D. suzukii* [1] [4]. Among them, *Ganaspis kimorum* (Hymenoptera: Figitidae) demonstrated exceptional host specificity, with a strong preference for *D. suzukii* larvae and negligible risk to non-target drosophilids. Such attributes make it an ideal candidate for classical biological control programme [5]. *G. kimorum* is a larval endoparasitoid that primarily targets freshly hatched (early instar) *D. suzukii* larvae within infested fruits [1].

In Italy, a nationwide initiative coordinated by the Regional Phytosanitary Services and research institutions was launched to develop biological control of *D. suzukii* through the deliberate introduction of *G. kimorum*. Following a comprehensive

Fig. 1: Diversity of habitats included in the study, ranging from valley-floor vineyards and cultivated orchards to mid-altitude and mountain sites with spontaneous vegetation and experimental plots protected by nets.

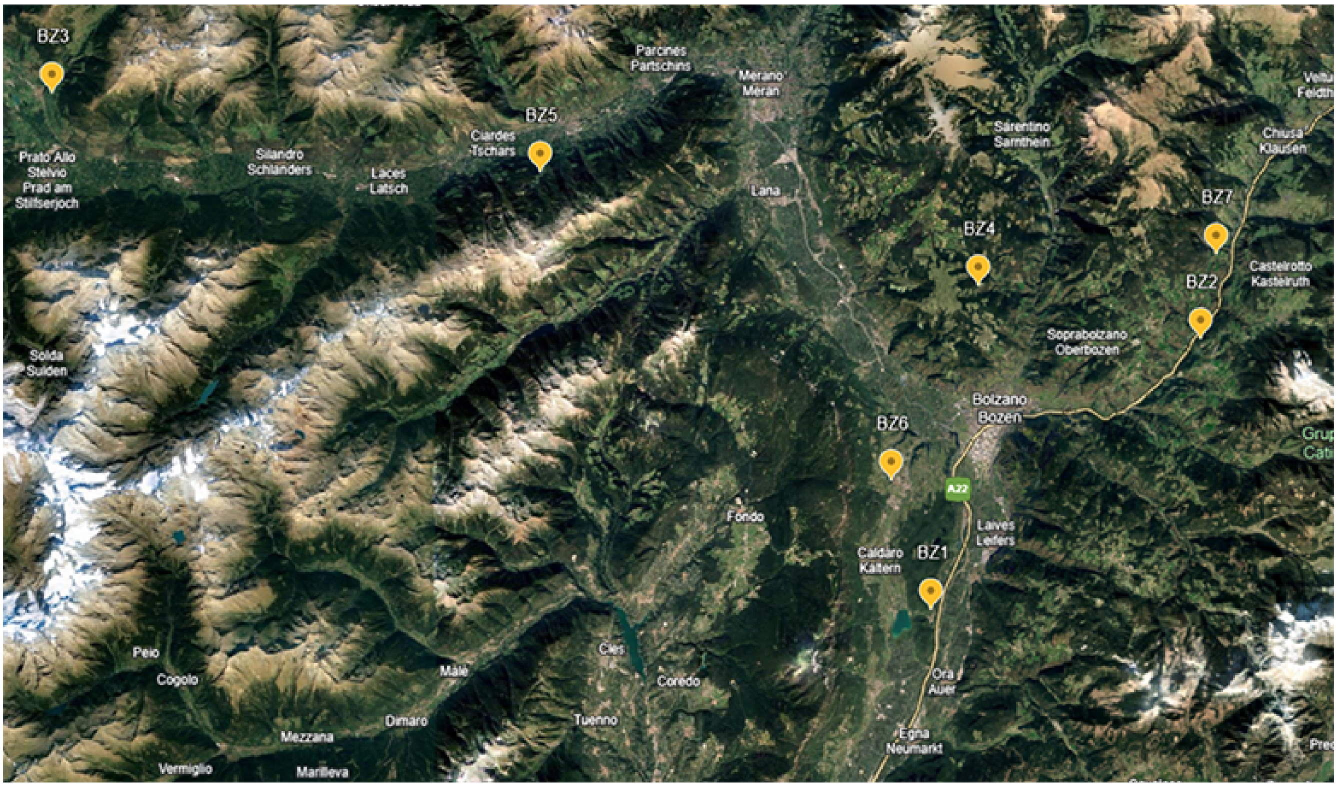

Fig. 2: Release and monitoring sites in South Tyrol. (Source: https://www.google.com/maps/).

risk assessment, the Ministry of the Environment and Energy (MiTE, resolution no. 139/2021) authorized the release of *G. kimorum* in 2021 and subsequent years (2022-2024) across multiple regions: Emilia-Romagna, Veneto, Lombardia, Piemonte, Campania, Puglia, Sicilia, Toscana, Valle d'Aosta, and the Autonomous Provinces of Trento and Bolzano [6] [5]. The Laimburg Research Centre in the Autonomous Province of Bolzano (South Tyrol) implemented an intensive monitoring and release programme to evaluate the establishment and spread of *G. kimorum* across local cropping systems and assessed its contribution to *D. suzukii* parasitism.

Notably, the larval parasitoid *Leptopilina japonica* (Hymenoptera: Figitidae), also native to East Asia, has established widespread populations in Europe and North America following accidental introduction [1] [7]. In several regions - including northern Italy, Switzerland, and parts of the Pacific Northwest, *L. japonica* has become the most common parasitoid associated with *D. suzukii*, suggesting strong ecological adaptation and potential for

Tab. 1: Overview of monitoring and release sites in the Province of Bolzano.

Sitecode	Locality	Altitude(m a.s.l.)	Host plants	Topography
BZ1	Laimburg-Schloßleiten	~ 300	Vine grape *Vitis vinifera*, wild cherry *Prunus avium*, wild strawberry *Fragaria vesca*	Valley floor
BZ2	Novale di Fiè /Völser Ried	~ 620	Raspberry *Rubus idaeus*, strawberry *Fragaria ananassa*, elderberry *Sambucus nigra*, wild blackberry *Rubus ulmifolius*	Mid-altitude valley
BZ3	Sluderno /Schluderns	~ 1150	Cherry *P. avium*, strawberry *F. ananassa*, elderberry *S. nigra*, blackberry *Rubus fruticosus*	Mountain
BZ4	San Genesio /Jenesien	~ 1200	Cherry *P. avium*, strawberry *F. ananassa*, raspberry *R. idaeus*, elderberry *S. nigra*	Mountain
BZ5	Tablà /Tabland	~ 780	Strawberry *F. ananassa*, apricot *Prunus armeniaca*, elderberry *S. nigra*	Mid-altitude valley
BZ6	Appiano /Eppan	~ 450	vine grape *V. vinifera*, wild cherry *P. avium*, wild strawberry *F. vesca*	Valley floor
BZ7	Rotwand	~ 750	Cherry *P. avium*, elderberry *S. nigra*, raspberry *R. idaeus*	Mid-altitude valley

Fig. 3: Field release of *Ganaspis kimorum*.

natural regulation of the pest population [8] [9]. Its co-occurrence with *G. kimorum* in field conditions offers a valuable opportunity to assess interactions between these two parasitoid species in newly invaded ecosystems.

This study presents the results of *G. kimorum* parasitoids release and monitoring activities carried out in South Tyrol between 2021 and 2024, documenting population trends of *D. suzukii*, the establishment of *G. kimorum*, and the presence of other larval parasitoids.

METHODS

MONITORING AND RELEASE LOCATIONS

Seven release and monitoring sites were selected along an altitudinal gradient ranging from approximately 300-1200 m a.s.l., encompassing valley floors, hilly areas, and mountain locations. This elevational design ensured coverage of contrasting climatic conditions and host plant phenologies across the main fruit producing areas of South Tyrol (Fig. 1, Fig. 2). Sites included lowland vineyards, mid-altitude berry plantations, high-altitude berry and stone fruit plantations located in proximity to semi-natural habitats and forest borders. Each site was assigned a unique code (BZ1-BZ7) reflecting its location, altitude, and cropping system, with selection criteria targeting the representative ecological and agricultural conditions of the region (Tab. 1).

Tab. 2: Number of *Ganaspis kimorum* individuals emergencing before (pre) and after release (post).

Site	Year of first release	2021	2022		2023		2024	
		Post	Pre	Post	Pre	Post	Pre	Post
BZ1	2021	2	2	0	0	1	2	0
BZ2	2021	0	0	0	0	0	0	0
BZ3	2021	0	0	0	0	1	0	0
BZ4	2022	0	0	1	0	0	0	0
BZ5	2022	0	0	0	0	0	0	0
BZ6	2022	0	0	2	0	0	0	0
BZ7	2022	0	0	0	0	3	0	0

INSECT REARING

Ganaspis kimorum was reared at the laboratory of the Laimburg Research Centre under controlled conditions: 22 ± 1 ℃, 65% relative humidity (RH), and a 16:8 h (L:D) photoperiod. Parasitoids were reared on *D. suzukii*-infested blueberries as hosts [10].

A laboratory colony of *D. suzukii* was established from naturally infested fruits collected in South Tyrol and maintained in insect cages (BugDorm - 4M4590; MegaView Science Co., Ltd, Taichung, Taiwan) under the same controlled conditions as *G. kimorum*. Flies were reared on a cornmeal diet [11] supplemented with live dry baker's yeast (RUF Lebensmittelwerk KG, Quakenbrück, Germany) sprinkled on the surface, and were provided with a 5% sugar solution on cotton pads as an additional energy source.

RELEASE PROTOCOL

Between June and September of each year (2021-2024), three standardized releases of *G. kimorum* were conducted per site, each involving 100 males and 100 females (Fig. 3), following a protocol agreed at national level. Releases were repeated annually at the same sites between late May and early October and were timed according to the phenology of *D. suzukii* host plants at each site, with a minimum interval of two weeks between release events.

MONITORING PROTOCOL

Fruit samples from wild or untreated cultivated host plants were collected from both the canopy and the ground, within a maximum distance of 200 m from the *G. kimorum* release point [12]. Sampling was carried out at different frequencies among sites, depending on the availability of host plants and fruit suitable for sampling. Each site was sampled at least twice during the season, including a minimum of one pre-release sampling and one post-release sampling conducted after the second or third parasitoid release. The amount of fruit collected per fruit sample was a minimum of 50 g. The fruit was incubated at 20-23 ℃ and 60-65% RH for at least 35 days. Up to 50% of *D. suzukii* pupae, developing within the first 14 days after fruit collection in the fruit sample, were carefully extracted and transferred into 4 ml volume glass vials (maximum 10 pupae per vial) to monitor the emergence of *D. suzukii* or parasitoids. *Drosophila* pupae were identified following Abram et al. 2022 [13]. Glass vials were closed with cotton and maintained at 22 ℃ ± 1 ℃, 65% RH, and 16:8 h (L:D) photoperiod for 40 days. Fruit residues containing remaining pupae were simultaneously placed in a climatic chamber under identical conditions. Parasitoid emergence from fruit residues was assessed weekly.

IDENTIFICATION OF PARASITOIDS AND DROSOPHILIDS

Emerging parasitoids and *Drosophila* adults were collected weekly and preserved in 90% ethanol until identification. Non-emerged pupae were considered dead. Morphological identification of parasitoids was performed under a stereomicroscope using dichotomous keys specific to the Figitidae family [14] [15] [16] [1] [13]. Diagnostic features including wing venation, antennal morphology, and ovipositor structure were used to distinguish *G. kimorum*, *L. japonica*, and other associated species. Identification was further supported by the dichotomous key for Eastern North American Figitidae which provided complementary diagnostic characters for confirming species boundaries within the genus *Ganaspis*. *Drosophila* adults were identified to species level using standard morphological keys [17].

Tab. 3: Number of *Drosophila suzukii* pupae collected and preserved in glass vials: parasitism rates, and parasitoid species composition emerged within 40 days.

Year	*D. suzukii* pupae collected	Parasitized pupae (%)	*L. japonica*	*L. boulardi*	*L. heterotoma*	*G. kimorum*	*Asobara sp.*
2022	9090	222 (2.5%)	217	1	2	1	1
2023	1366	289 (21.1%)	279	6	4	0	0
2024	2125	296 (13.9%)	269	21	6	0	0

HOST PLANT SPECIES SUITABILITY INDEX

Host suitability for parasitoid development was quantified for *L. japonica* using a Host Suitability Index (HSI) based on the mean number of parasitoids emerged per gram of fruit across three monitoring years (2022-2024). Emergence data were log-transformed [$log(x + 1)$] to account for right-skewness and zero values. To ensure comparability among years, log-transformed values were standardized within each year using z-score normalization. The HSI for each host plant species was calculated as the mean of its standardized values across years and subsequently rescaled to a 0-1 range using min–max normalization, with higher values indicating greater host suitability. All analyses were conducted in Python (v.3.12) using Pandas and NumPy.

RESULTS

RECOVERY OF *G. KIMORUM*

Between 2021 and 2024, a total of 12 individuals of *G. kimorum* were recovered from fruit samples across the seven monitored sites (Tab. 2). Recovery was sporadic and limited, with ten individuals detected in post-release periods and four in pre-release or post-overwintering phases. The parasitoid was never recovered from sites BZ2 and BZ5 despite annual releases. In 2021, releases were initiated late in the season (August) at three sites (BZ1, BZ2, BZ3). Two male *G. kimorum* emerged from grape samples collected at site BZ1 on 12 October 2021, two weeks after the final release. These individuals either represented recently released parasitoids or provided early evidence of establishment.

In 2022, releases were expanded to all seven sites. Monitoring detected *G. kimorum* at two additional sites: one individual emerged from cherries at site BZ4 (collected 1 July, within 0-25 m of release point) and two individuals from ground-collected grapes at site BZ6 (collected 20 September). Notably, pre-release monitoring in March 2022 at site BZ1 recovered two *G. kimorum* individuals that had overwintered from the previous year's releases, indicating winter survival in valley-bottom conditions.

In 2023, *G. kimorum* was recovered at three sites, all from post-release fruit samples. Site BZ1 yielded one female from ground-collected grapes; site BZ3 produced one male from blackberry fruit residues collected 50-100 m from the release point at 1200 m altitude, representing the first confirmed reproduction at a high-altitude site; site BZ7 yielded three individuals from elderberry samples at 0-25 m and 25-50 m from release points. All six individuals recovered in 2023 were detected in fruit residue samples rather than in separated pupae, indicating likely emergence from parasitized *D. suzukii* pupae.

In 2024, *G. kimorum* was recovered only as two overwintered adults from ground-collected grapes at site BZ1 during post-overwintering monitoring in March, following the same overwintering pattern observed in March 2022. No *G. kimorum* individuals were detected in standard post-release monitoring across any of the seven sites during the 2024 growing season; however, it should be noted that during 2024 monitoring activities were limited to the assessment of pupae collected and separated in glass vials, which may have reduced the probability of detecting the species. Recoveries of *G. kimorum* originated mainly directly from fruit residual samples rather than from collected pupae incubated in vials.

G. kimorum represented only a minor fraction of the introduced parasitoid species. Across all years, *G. kimorum* accounted for 3.5% of parasitoids recovered from *D. suzukii* infested fruit samples.

DROSOPHILA SUZUKII INFESTATION ON FRUIT SAMPLES AND PARASITOID COMMUNITY EMERGED

Monitoring in 2021, at three sites, revealed consistently high levels of *D. suzukii* infestation, with the species dominating drosophilid communities in fruits collected from plants (ranging 85-100% of emergences) and being present but less dominant in ground-collected fruit (40-87% depending on site). In

Tab. 4: Number and species composition of parasitoids emerged directly from fruit samples.

Year	Nr. of fruit Samples collected	Total quantity of fruits in g	Nr. of Parasitoids emerged	*L. japonica*	*L. boulardi*	*L. heterotoma*	*G. kimorum*	*Asobara* sp.	*P. vindemmiae*	*Spalangia* sp.	*T. drosophilae*
2022	134	9905	131	65	21	11	4	4	27	1	0
2023	174	20 744	2236	1984	187	43	5	7	9	0	1

2022 *D. suzukii* remained highly dominant in plant-collected fruit (94% mean, 91-100% at most sites) and was less prevalent in ground-collected fruit (47%). Also, in 2023 *D. suzukii* remained dominant in fruits collected from plants (92% at most sites) and showed reduced prevalence in fruits collected from the ground (51%), suggesting differential pressure on fruit microhabitats. In 2024 *D. suzukii* infestation patterns showed high prevalence in plant-collected fruit and slightly lower prevalence in ground-collected fruit.

For 2022-2024 years, a total of 19 692 *D. suzukii* pupae were collected from fruit samples across the seven study sites (Tab. 3).

In 2022, 9090 pupae of *D. suzukii* were collected. 2351 *D. suzukii* emerged from the collected pupae and 221 pupae (2.4%) were found to be parasitized. In addition, 2732 individuals emerged directly from the fruit within the first 10-14 days. From 3785 pupae neither *Drosophila* nor parasitoids emerged and therefore the pupae were considered dead. The reasons for the mortality of the collected pupae could be due to their handling. In 2023, 1366 pupae were collected from seven sites, yielding fewer total emergences than in 2022 but representing a shift in parasitism patterns. Of these pupae, 731 (53.3%) emerged as *D. suzukii* and 289 (21.1%) were parasitized.

In 2024, 2125 pupae were collected, with 1421 (66.9%) emerging as *D. suzukii* and 296 (13.9%) parasitized. The parasitism rate remained elevated relative to 2022 levels.

Parasitoids collected directly from fruit residual samples are shown in table 4. Across all years, seven parasitoid taxa were recorded: the exotic larval parasitoids *G. kimorum* and *L. japonica*; native larval parasitoids *Leptopilina boulardi*, *Leptopilina heterotoma*, and *Asobara* sp.; and pupal parasitoids *Pachycrepoideus vindemiae*, *Trichopria drosophilae* and *Spalangia* sp.

L. japonica dominated the parasitoid assemblage throughout the study period, representing 96% of all parasitoids recovered from *D. suzukii* pupae across the four years (Tab. 3). In 2022, *L. japonica* emerged from 217 out of 221 parasitized pupae (98.1%), and its prevalence remained consistent in subsequent years: 279 out of 289 parasitoids in 2023 (96.5%) and 269 out of 296 in 2024 (90.8%).

Pupal parasitoids (*P. vindemiae* and *T. drosophilae*) were encountered in field samples but at low frequencies and were not a major component of the parasitoid complex in any year.

However, sampling protocols were primarily designed to detect larval parasitoids, and only in some cases did the collected fruit already contain *Drosophila* pupae, which may have limited the recovery of pupal parasitoids.

ESTABLISHMENT, SPREAD AND HOST PLANTS OF *LEPTOPILINA JAPONICA*

The exotic larval parasitoid *L. japonica* was present from the first year of monitoring in 2021, when it was detected in all three monitored sites. This early presence, prior to the *G. kimorum* release programme, indicates that *L. japonica* had already established in South Tyrol before the introduction of *G. kimorum*.

In 2021, a total of 197 *L. japonica* individuals were recovered from the three sites, emerging primarily from *D. suzukii* pupae but also occasionally from other drosophilid species. Its activity was concentrated in plant-collected fruits, where it demonstrated a preference for hosts in situ.

By 2022, *L. japonica* was recovered in all seven monitored sites, including sites at higher altitudes. Early-season emergence was recorded in ground fruit residuals sampled in March at lowland vineyards (site BZ1), indicating winter survival. Across the growing season, *L. japonica* emerged from most parasitized pupae, confirming its rapid ecological dominance in the parasitoid community. Fruit sample data from 2022 (9905 g fresh weight) yielded *L. japonica* emergence across all site types and both plant-collected and ground-collected fruits, demonstrating ecological flexibility.

In 2023, *L. japonica*'s dominance was further consolidated. Early-season emergence was recorded as early as May at lowland sites in wild strawberry fruit samples (site BZ1). Across the seven sites, *L. japonica* emerged from most parasitized pupae. Parasitism rates increased substantially compared to 2022: the total parasitism rate of *D. suzukii* pupae reached 20.4 % in 2023, compared to 2.4% in 2022. Fruit sample weight was higher in 2023 (20 744 g), reflecting more intensive sampling, and *L. japonica* was consistently present across lowland, hilly, and high-altitude sites (ranging from 300 to 1200 m a.s.l.).

Tab. 5: Mean number of *Leptopilina japonica* individuals emerged per gram of fruit across host plant species. "n.a." indicates that no data were available for that year.

Host plant species	2022	2023	2024
Rubus idaeus	0.099	0.148	0.021
Rubus fruticosus	0.025	0.258	n.a.
Rubus ulmifolius	0.003	0.113	0.050
Sambucus nigra	0.033	0.063	0.473
Prunus avium	0.001	0.022	0.035
Prunus domesticus	n.a.	0.013	0.000
Fragaria ananassa	0.001	0.015	0.006
Fragaria vesca	0.000	0.063	0.000
Vitis vinifera	0.050	0.004	0.000

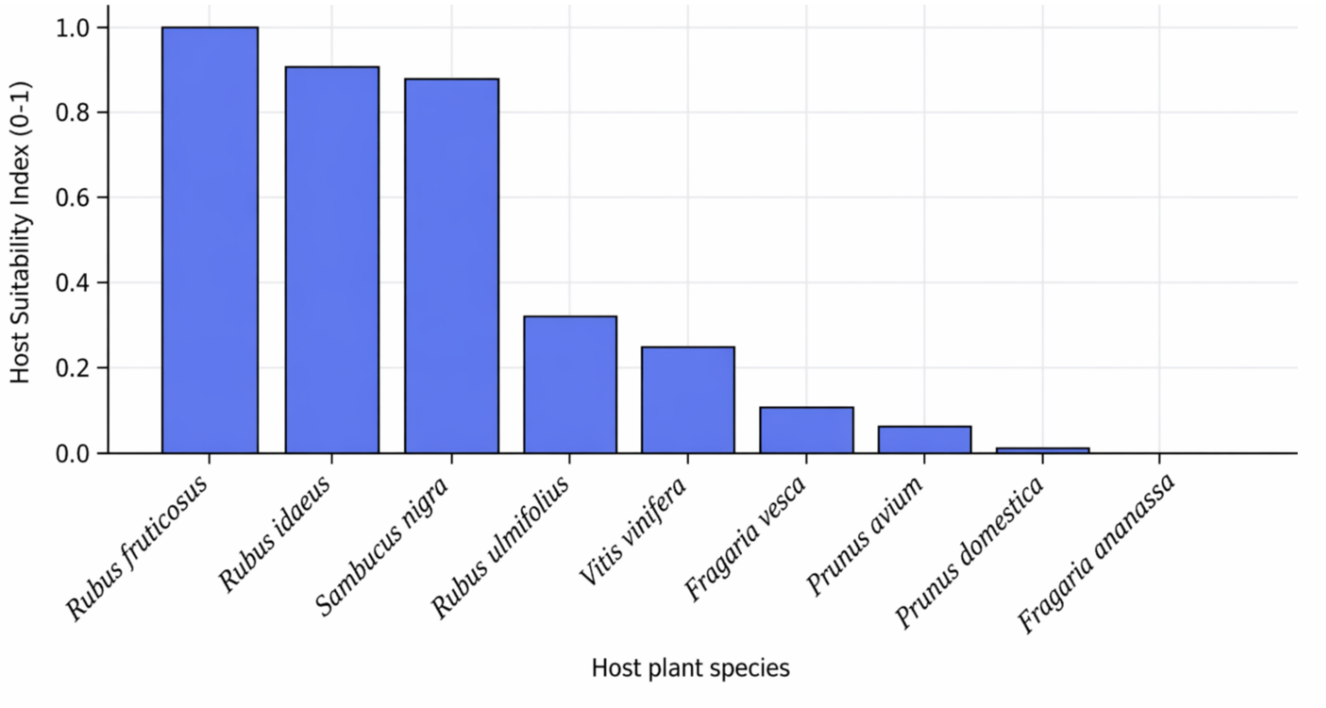

Fig. 4: Ranking of host plant suitability based on a host suitability index (HSI) calculated from *L. japonica* emergence data.

In 2024, *L. japonica* remained the dominant parasitoid species. Its parasitism rate of *D. suzukii* pupae was approximately 13% across all sites and it was detected throughout the season from June to September, emerging from fruits collected both on plants and on the ground, confirming sustained ecological establishment and flexibility in exploiting different microhabitats and fruit types.

L. japonica demonstrated a clear pattern of spatial establishment across the altitudinal gradient from 2022 to 2024. In 2022, the species was recovered predominantly from sites at lower altitudes (226-620 m a.s.l.), particularly from Adige Valley and Isarco Valley. By 2023, *L. japonica* had established at all monitored sites, including higher locations (1200 m a.s.l. in San Genesio and 1150 m in Venosta Valley), indicating successful upslope colonization.

To assess the relative suitability of each host plant species parasitoid productivity was quantified as the mean number of emerged *L. japonica* per gram of fruit for each host species across all years with available data (Tab. 5).

The host suitability index revealed clear differences among the host plant species in their capacity to support *L. japonica* development (Fig. 4). *Rubus fruticosus*, *Rubus idaeus*, and *Sambucus nigra* exhibited the highest host suitability index, indicating superior suitability for parasitoid development, whereas cultivated hosts such as *Fragaria ananassa*, *Prunus domesticus*, and *Vitis vinifera* showed consistently low suitability. It should be noted that *F. ananassa* fruits showing a lower suitability index in this dataset originate from crops that were partially treated with fungicides and insecticides.

The dominance of *Rubus* and *Sambucus* species reflected their availability across the study sites and their suitability as hosts for *D. suzukii*. The concentration of *L. japonica* on these wild and semi-cultivated plants underscores the species' ability to exploit both cultivated agroecosystems and adjacent semi-natural habitats.

DISCUSSION AND CONCLUSIONS

The results obtained between 2021 and 2024 suggest that *G. kimorum* is capable of establishing under field conditions in South Tyrol, albeit with notable limitations related to altitude and climate [18]. Consistent recoveries at BZ1 (Laimburg, ∼300 m) demonstrate that valley-floor environments with favorable microclimates and abundant hosts can sustain recurrent parasitism and even overwintering survival. Conversely, detection at higher elevations (BZ3, Sluderno, ∼ 1200 m; BZ4, San Genesio, ∼ 1000 m) was sporadic and suggests that cooler mountain sites remain challenging for stable establishment [18].

Nevertheless, the monitoring also revealed that *L. japonica* is already far more widespread and abundant across altitudes in South Tyrol. Its higher prevalence indicates that this parasitoid currently plays a stronger role in the natural enemy community of *D. suzukii*. For this reason, future research should prioritize the study of *L. japonica* - its ecological niches, interaction with host plants, seasonal dynamics, and potential synergy or competition with *G. kimorum*.

Future perspectives for managing *D. suzukii* in South Tyrol should build on the insights gained from 2021-2024. Additional releases of *G. ki-*

morum are recommended, particularly in valley-floor hotspots where its establishment has already been confirmed, to enhance its local impact. At the same time, dedicated studies on *L. japonica* are essential, as this parasitoid demonstrates higher prevalence and apparent adaptability across a wide range of elevations, including alpine agroecosystems. Long-term monitoring across altitudinal gradients remains critical to evaluate the persistence, dispersal, and host range of both parasitoids. The role of these exotic parasitoids should be incorporated into integrated pest management strategies, combining biological control with cultural practices, sanitation measures, and protective nets. Overall, the evidence indicates that while *G. kimorum* shows potential for localized establishment, *L. japonica* currently represents the dominant and most widespread natural enemy of *D. suzukii* in South Tyrol. A deeper understanding of its ecology and effective integration into control strategies will be key to developing sustainable, long-term solutions for fruit production in alpine regions.

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ZUSAMMENFASSUNG

Die Kirschessigfliege *Drosophila suzukii* (Diptera: Drosophilidae) ist ein invasiver Schädling an Früchten, der sich seit 2008 rasch in Europa, Amerika und Teilen Afrikas ausgebreitet hat. Ihre Fähigkeit, Eier in noch intakte, reifende Früchte abzulegen, macht sie besonders zerstörerisch. Ein Befall kann zu erheblichen wirtschaftlichen Verlusten in Steinobst, Beerenkulturen und Weintrauben führen. In Italien genehmigte das Ministerium für den Ökologischen Übergang (MiTE) im Jahr 2021 die Freisetzung des exotischen Larvalparasitoiden *Ganaspis kimorum* (Hymenoptera: Figitidae) im Rahmen eines nationalen Programms zur biologischen Schädlingsbekämpfung. Die Initiative umfasste Freisetzungen in mehreren Regionen sowie in der Autonomen Provinz Bozen, wo natürliche Lebensräume angrenzend an Obstbaugebiete als Freisetzungsstandorte ausgewählt wurden. Die Standortauswahl basierte auf bestätigtem *D. suzukii*-Befall sowie einem geringen Einsatz von Pflanzenschutzmitteln. Diese Studie präsentiert Monitoring-Ergebnisse aus Südtirol zwischen 2021 und 2024 und konzentriert sich auf die Etablierung, Ausbreitung und Überwinterung von *G. kimorum* sowie auf das Vorkommen und die Häufigkeit weiterer Parasitoidarten, die aus den beprobten Früchten nachgewiesen wurden.

RIASSUNTO

Il moscerino dei piccoli frutti *Drosophila suzukii* (Diptera: Drosophilidae) è un fitofago altamente invasivo che, dal 2008, si è rapidamente diffuso in Europa, nelle Americhe e in alcune parti dell'Africa. La sua capacità di ovideporre in frutti integri e in fase di maturazione lo rende particolarmente dannoso; le infestazioni possono causare gravi perdite economiche nelle drupacee, nei piccoli frutti e in varietà suscettibili di uva. In Italia, il Ministero della Transizione Ecologica (MiTE) ha autorizzato nel 2021 il rilascio del parassitoide larvale esotico *Ganaspis kimorum* (Hymenoptera: Figitidae) nell'ambito di un Piano Nazionale di Lotta Biologica. L'iniziativa ha incluso rilasci in diverse regioni e nella Provincia Autonoma di Bolzano. I siti di rilascio sono stati selezionati in habitat con presenza di piante ospiti di *D. suzukii* adiacenti a frutteti e vigneti suscettibili sulla base di infestazioni confermate di *D. suzukii* e di un utilizzo minimo di pesticidi. Questo studio presenta i risultati del monitoraggio in Alto Adige tra il 2021 e il 2024, concentrandosi sull'insediamento, la diffusione e lo svernamento di *G. kimorum*, nonché sulla presenza e abbondanza di altre specie di parassitoidi emerse dai frutti campionati.

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