The secret in their spines: could the prickly pear cactus (*Opuntia sulphurea*) serve as host for fruit pest *Drosophila suzukii*?

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Abstract

Biological invasions increasingly threaten ecosystems and agriculture. The spotted-wing drosophila, *Drosophila suzukii*, has been recognized as a highly polyphagous invasive pest. Despite being collected in habitats where cacti are present, its capacity to develop on cactus hosts has not been experimentally evaluated. Here we evaluate the prickly pear *O. sulphurea* as a potential alternative host by conducting no-choice oviposition assays and rearing larvae on a semi-natural cactus diet. We measured viability, developmental time, morphological traits, and fatty acid profiles with two laboratory diets. Females laid eggs on cactus tissue, and larvae successfully completed development with fitness parameters comparable to the standard diet. Fatty acid profiles of adults reared in the cactus diet overlapped with those from natural hosts. These findings indicate that *O. sulphurea* can support *D. suzukii* development, suggesting that it may serve as an alternative host during periods in which cultivated fruits become unavailable. These results may have implications for pest management programs and ecological dynamics.

1. Introduction

Biological invasions are a hallmark of the anthropocene (Lewis & Maslin, 2015). In particular, insects are among the most prominent invasive classes, with thousands of invasive species described worldwide (Roy et al., 2023). Once in the new environments, invasive insects benefit from biotic factors such as lack of predators, absence of competition and association with native hosts (Deconninck et al., 2026; Poyet et al., 2015), that enable establishment, proliferation and expansion.The species *Drosophila suzukii* (Matsumura 1931), also known as the “spotted-wing *Drosophila*” (SWD) is considered an invasive insect species and pest that produces significant economic losses. Over the last 18 years, this species expanded its distribution from its native range in South East Asia to every continent except Australia and Antarctica (Nair & Peterson, 2023). It has been reported in North America (Hauser, 2011), South America (Lavagnino et al., 2018), Hawai’i (Koch et al., 2020), Europe (Cini et al., 2012; Nissinen et al., 2023) and Sub-Saharan Africa (Kwadha et al., 2021). It is considered a pest in several countries (Andreazza et al., 2017; Asplen et al., 2015) where its presence is associated with heavy economic losses (Bolda et al., 2016; Buonocore Biancheri, Kirschbaum, et al., 2024). The SWD owes much of its invasive capabilities to its host generalism. It is considered an extremely polyphagous species, as it can thrive in a wide diversity of plant species (Bühlmann & Gossner, 2022; Jiménez-Padilla et al., 2020; Olazcuaga et al., 2023). Along with berries, its emergence has been recorded in over 60 plant species of 18 different families, including several cultivar, ornamental and native plants (Kenis et al., 2016; Poyet et al., 2015). *D. suzuki* has even been shown to thrive in species with toxic allelochemistry, including alkaloids such as solanine in *Solanum nigrum* (Kenis et al., 2016) or atropine in *Atropa bella-donna* (Bühlmann & Gossner, 2022). Moreover, when infected with parasitoids such as *Asobara japonica* or *Trichopria. cf. drosophilae*, *D. suzukii* prefers to lay eggs in atropine-rich medium as a way to increase fertility and reduce parasitism load (Poyet et al., 2017). In this vein, there is evidence that suggests that *D. suzukii* could make use of cactus, whose chlorenchyma is enriched in toxic alkaloids and terpenes, as an alternative host. For instance, a single fly has been reported emerging from the fruit of the ornamental cactus *Opuntia*

streptacantha in California, USA (Wang et al., 2019). Moreover, adult flies were captured in proximity to decomposing cacti (*Cereus uruguayanus*) in Isla Martín García (Argentina), an island with no crops located 3.5 km from the coastline (Bennardo et al., 2021) and near *Opuntia ficus-indica* plants in a semi-desert (BSh) location in northwestern Argentina (Gandini et al., 2023).

It has been suggested that native plant species could serve as alternative hosts for the SWD in seasons when crops are not available, thus, sustaining annual populations persistence (Buonocore Biancheri, Kirschbaum, et al., 2024; Buonocore Biancheri, Suárez, et al., 2024). However, as of yet, cactus species have not been tested as potential hosts. The prickly pear cactus, *Opuntia sulphurea*, is a widespread perennial species native to southern South America (Oakley et al., 2024). It is the most widespread species of all *Opuntia* species thriving in Argentina (Pigue, 2013) and it has also been introduced to Australia (Osunkoya et al., 2025). In South America, its distribution overlaps with findings of *D. suzukii* in northwestern Argentina (see Fig. S1). Compared to other cactus species, *O. sulphurea* has a higher concentration of free disaccharides and lipids, as well as a high caloric content, resulting in a relatively low toxicity (Carreira et al., 2014).

The aim of this study is to assess if the prickly pear cactus could be a potential alternative host for the polyphagous invasive pest *D. suzukii*. To address this issue, first, we test *Opuntia sulphurea* as a potential oviposition substrate for *D. suzukii*. Second, we evaluated the development success of *D. suzukii* in *Opuntia sulphurea* by rearing first instar larvae in a semi-natural diet based on the cactus and compared to larvae reared in standard cornmeal diet and a suboptimal potato-based diet. We studied the effect of development in these media on fitness by determining life history traits, such as viability and developmental time, and several fitness-related traits such as ovariole number and wing length in emerging adults. Finally, we measured the fatty acid composition of adult flies and compared with previous studies that characterized fatty acid profiles of adults reared in recognized hosts (Wiman et al., 2020). As *D. suzukii* has a generalist, canalized metabolism regardless of host (Olazcuaga et al., 2023), fatty acid profiles could serve as an indicator of host suitability. Our hypothesis is that the SWD can be successfully reared in cactus hosts.

2. Methods

2.1 Insect collection

Flies used in this study were collected in the vicinity of Luján (34°34'13"S, 59°06'18"W, Buenos Aires Province, Argentina) during January 2022, as described in Gandini et al. (2023). Shortly, flies were caught by net sweeping on fermented banana baits. Species identification was accomplished by the inspection of spotted wings in males and serrated ovipositor in females. Prior to the experiments, flies' stocks were maintained under controlled photoperiod (12:12) and temperature (~ 25°C) and fed with standard cornmeal-based *Drosophila* medium (see Table 1). Cactus samples were collected from San Agustín del Valle Fértil (30° 31' S, 67° 31' W; San Juan, Argentina) and stored in a freezer at -20°C. Pieces of cactus

were ground in a blender, weighted and mixed with baker's yeast in a 99:1 proportion. About 8g of media were poured into each vial, which were sterilized in an autoclave.2.2 Host acceptance

We ran a "no choice" host acceptance assay (Soto et al., 2011): 50 pairs of sexually mature flies from stock were placed inside a chamber with three plates containing either agar or *O. sulphurea* at 25°C. Cactus cladodes were cut first longitudinally and then in circular pieces (~ 3g) using a punch. Cactus pieces were fit in the plates, exposing cuticles and spines. After 24 hours, plates were removed and inspected under a microscope for egg count. Finally, 24 hours later, larvae were counted and hatchability was calculated as the ratio between numbers of larvae and eggs in each plate.

2.3 Insect rearing, viability and developmental time

Adult flies were allowed to mate and lay eggs on Petri dishes containing agar, yeast was added to stimulate ovipositing. Batches of 40 first-instar larvae were transferred to culture vials containing cactus, cornmeal or potato-based diet (rehydrated instant mashed potato medium). The latter has been reported to reduce larval fitness (Flaibani et al., 2023). Nutritional composition of diets can be found in Table 1. Lastly, vials were placed in an incubator at 25°C, which is within the optimum temperature range for egg-to-adult developmental success (Winkler et al., 2020). Viability was calculated as the percentage of adults emerged in each vial relative to the 40 initial larvae. Developmental time was measured as the number of days elapsed from first instar larvae to adult emergence. The assay finished when all adults emerged or after two weeks without emergence.

Table 1
Nutritional composition of experimental diets. a: Carreira et al. (2014). b: Flaibani et al. (2023).

Diet (each 100 g)	Water (g)	Carbohydrates (g)	Protein (g)	P:C	Lipids (g)	Kcal
O. sulphurea [a]	89.90	3.22	0.74	1:4	0.50	35.05
Potato [b]	~ 90	7.33	0.78	1:9	0.04	32.86
Cornmeal [b]	89,93	10,19	1,76	1:6	0,16	23,78

2.4 Wing length and ovarioles number

Immediately upon emergence, immature flies have small ovaries and folded wings. Thus, newly emerged adults were separated by sex and transferred to vials with fresh cornmeal diet and placed at ~ 25°C for seven days, allowing flies to mature, i.e., unfold wings and females reach ovarian maturation (Peluso et al., 2016). Body size is generally considered an important indicator of fitness in insects (Beukeboom, 2018), and wing length as a proxy of body size, particularly in *Drosophila* (Cortese et al., 2002; Loeschcke et al., 2000). Ovariole number correlates with total reproductive output, particularly in Drosophilidae (Church et al., 2020). Wing length was measured as described in Kreiman et al. (2025). Shortly, wings were removed and mounted, then digital images were obtained using a Leica M205 A stereo microscope

equipped with a digital camera. Wing length was measured using Leica Application Suite (LAS) software V4.13. Ovarioles dissection was performed following the protocol described in Peluso et al. (2016). Briefly, ovaries were pulled away from the abdomen in the posterior direction using forceps and dyed with methylene blue. Then ovarioles were stained and separated for counting.

2.5 Fatty acid profiling

Upon emergence individuals were snap-frozen in liquid nitrogen. Samples were stored at − 80°C until further processing. Based on pilot studies, 20 individuals per replicate and 3–4 replicates per experimental group were assigned. The pool of 20 individuals was weighed before analysis. A homogenate of 20–45 mg per sample was prepared from these individuals. Fatty acid methyl esters (FAMEs) of total lipids were prepared by reaction with 4% HCl in CH_3OH at 70°C for 2 h. After cooling, a drop of water was added, and the FAMEs were extracted with 0.5 mL of dichloromethane three times. The organic phase containing FAMEs were analyzed by gas chromatography (CG-FID) on a Focus GC (Thermo Finnigan Corporation), equipped with an Innowax capillary column (Agilent, 100% polyethylene glycol, 30 m length, 0.25 mm i.d., 0.5 µm film thickness), as described in Gomez Ribot et al., 2023. Quantification was performed by comparing the peak area percentages on the chromatogram with the internal standard of known weight (methyl nonadecanoate, Sigma-Aldrich Co.). Along with these individuals, fatty acid compositions of the experimental diets were also analyzed.

2.6 Statistical analyses

All analyses were performed employing R version 4.3.0 (R Core Team, 2024) and RStudio (“Cherry Blossom”, v2023.3). Data visualization was done via ggplot2 (Wickham, 2016). Univariate analyses were implemented using generalized linear mixed models (GLMMs) using diet as the explanatory variable. Models were constructed with the glmmTMB package (Brooks et al., 2017) and validated with DHARMa (Hartig, 2024). Average developmental time was calculated for each vial and then fitted to a lognormal distribution. Viability was analyzed using a binomial model, including an observation-level random effect (OLRE) to account for overdispersion (Brooks et al., 2017; Zuur et al., 2009). Due to overdispersion, ovariole number was fitted to a Conway-Maxwell-Poisson distribution, rather than a simple Poisson distribution (Zuur et al., 2009). The wing length model also included sex as a principal effect and the individual as a random effect, as both left and right wings were measured. Egg number was fitted to a negative binomial distribution (Brooks et al., 2017; Hardin & Hilbe, 2007) and the chamber was included as a random effect. Hatchability was fitted to a binomial distribution. Larval count was fitted to a Poisson distribution. Finally, Wald’s χ^2 test was performed via the Anova() function of the car package (Fox et al., 2024), and then the emmeans package (Lenth, 2025) was used for a for *post hoc* multiple mean comparisons across groups. The factoextra package (Kassambara & Mundt, 2020) was used to conduct a Principal Component Analysis (PCA) on a data matrix containing all 11 fatty acid values, applying a singular value decomposition (SVD) approach.

3. Results

3.1 Host acceptance

Table 2
Host acceptance assay. Average egg number, larvae number and hatchability by plate content. Mean ± standard deviation. Superscript letters indicate significant differences in *post hoc* tests.

Plate content	Egg number	Hatchability (%)	Larvae number
O. sulphurea	27.8 ± 34.7 [a]	17.4 ± 17.0 [a]	5.8 ± 9.5 [a]
Agar	9.6 ± 18.6 [b]	46.4 ± 36.0 [b]	3.4 ± 5.5 [a]

Average egg number in cactus plates tripled that of agar plates (χ^2 = 7.57, p = 0.006, Table 2). Hatchability, however, was lower in the cactus plates than in agar (χ^2 = 14.67, p = 0.0001, Table 2). As a result, average larvae number did not differ (χ^2 = 0.64, p = 0.43) between cactus and agar plates; resulting in ~ 5 larvae per plate. Notably, flies rarely lay eggs on the cuticle of cacti, rather they lay eggs in exposed chlorenchyma (Fig. 2), as they either crawled beneath from the sides of the plate or searched for lacerations or perforations in the cuticle (Fig. S2D). When offered similar cactus plates sealed on the sides with silicone, egg number was virtually zero (< 1 egg per plate) and hatchability was null (data not shown).

3.2 Viability and developmental time

D. suzukii completed development from larvae to adult in the cactus diet, with a mean viability of 41.8% (Fig. 2). Among diets, cactus vials showed the highest variance, ranging from 0 to 82.5% (Fig. 2), three times the standard deviation observed in cornmeal and potato diets (Fig. 2). Non-significant differences were found between viability in the cactus diet and the other diets (Fig. 2). Developmental time of individuals reared in the cactus diet was not different from those reared in cornmeal, but statistically shorter of those reared in potato-based diet (χ^2 = 144.83, p < 0.0001, Fig. 2).

3.3 Ovariole number and wing length

Table 3
Analysis of deviance table of ovariole number and wing length. Statistics taken from type II Wald χ^2 tests. “Df” stands for “Degrees of freedom”.

Ovariole number	χ^2	**Df**	**p-value**
Diet	3.99	2	0.1363
Wing length	χ^2	**Df**	**p-value**
Diet	71.94	2	< 0.0001
Sex	556.75	1	< 0.0001
Diet:Sex	5.27	2	0.0717

Developmental diet had no effect on ovariole number (Table. 3). Females had a mean ovariole number across diets of ~ 24 ovarioles per female. In contrast, the model detected sex dimorphism in wing length, females tended to have larger wings (+ 12.06%) than males, no interaction with diet was found (Table. 3). Developmental diet had a significant effect over wing length (Table. 3). Although the diet factor was significant (Table. 3), *post-hoc* comparisons revealed only slight differences across diets. In fact, flies reared in *O. sulphurea* developed wings 1.6% and 2.5% longer than in corn meal and potato, respectively.

3.4 Fatty acid profiles

Twelve fatty acids were identified in adults’ fatty acid fraction, the most abundant were C16:0 (Palmitic) and C18:1 (Oleic), accounting for 47–51% of the total fatty acid fraction (Fig. 3). Univariate analyses of fatty acids showed that flies reared in *O. sulphurea* have higher average concentration of polyunsaturated fatty acids (namely C18:2 and C18:3) and lower concentration of monounsaturated fatty (C14:1 and C16:1) acids than those reared in cornmeal or potato diets (Fig. 3, Table S1)**Figure 3.** Relative average contribution of each fatty acid to total fatty acid fraction by diet.

The first dimension of the principal components analysis accounted for 62.7% of total variance and can significantly (χ^2 = 434, p < 0.0001) distinguish the experimental groups (Fig. 4). Samples reared on potato and cornmeal diets have negative values of PC1, associated with higher values of C16:1, C14:0 and C14:1 (Fig. 4). Alternatively, cactus-reared adult flies have positive PC1 values, associated with higher values of 18-carbon fatty acids like C18:0, C18:2 and C18:3 (Fig. 4). The second dimension accounts for 19.4% of total and was mainly driven by two of the most abundant FAs (C16:0 and C18:1, see Fig. S3), which together contributed over 70% of the PC. Cornmeal-reared samples have positive PC2 values, associated with high C18:1 values, while potato-reared samples have negative values, associated with high C16:0 values.

4. Discussion

Our study demonstrates that the prickly pear, *Opuntia sulphurea*, can serve as a host for the spotted-wing drosophila, *Drosophila suzukii*. This species is an invasive pest that causes substantial economic losses worldwide. Identifying potential alternative hosts for may help to explain how populations persist during periods when primary host fruits are unavailable and may facilitate the colonization of previously unknown environments.

Our study constitutes the first record of experimental rearing of this fly in cactus. As mentioned before, this species is known to exploit a wide variety of host plants, including species with chemical defenses against herbivory. Cactus diet did not significantly affect the measured fitness-related traits, as cactus-reared flies generally do not differ from those reared in cornmeal, which is the standard laboratory diet for this species (Belloni et al., 2018; Flaibani et al., 2023; Grant & Sial, 2021). Neither mean viability nor developmental time (Fig. 2) nor ovariole number (Table. 3) were statistically different to that of cornmeal, whereas wing length was marginally differentially affected by the cactus diet.

Though we found similar values of viability when comparing flies reared in *O*. *sulphurea* and lab standard diets, information of viability in natural hosts can provide insights into the relevance of our results in a more ecological context. In Figure S4 we compared mean viability of cactus-reared flies (41.8%) with commonly used host plants across selected literature. Similar values (~ 40%) have been reported on *D. suzukii* host fruits such as blueberries (Jaramillo et al., 2015), white dogwood fruit (*Cornus alba*) (Fragnière et al., 2024) and several other berries of the *Vaccinium* genus (Fragnière et al., 2024; Grant & Sial, 2021) (Fig. S4), as well as in artificial cornmeal laboratory diets (Hoffmann Schlesener et al., 2018; Jaramillo et al., 2015). In similar experimental assays, *D. suzukii* yielded comparable egg-to-adult viability in semi-natural diets based on blackcurrant, raspberry, strawberry and grape (Olazcuaga et al., 2019) (Fig. S4). In fact, viability in cactus chlorenchyma appears to be higher than some well-known host plants, such as prunes (Flaibani et al., 2023; Fragnière et al., 2024), grapes or elderberries (Fragnière et al., 2024) (Fig. S4). It is, however, important to acknowledge that viability is affected by larval density (Flaibani et al., 2023), which is not always informed. As with viability, developmental time in the cactus-based diet (~ 11 days) is close to the performance reached in fruits such as prunes, strawberries, blueberries and grapes, as well as in semi-natural (Bellamy et al., 2013) and laboratory diets (Bellamy et al., 2013; Fragnière et al., 2024; Hoffmann Schlesener et al., 2018; Jaramillo et al., 2015; Kim et al., 2015; Ryan et al., 2016; Tochen et al., 2014), but slightly longer than in raspberry, cherry, blackberry (Bellamy et al., 2013) or wayfaring tree fruit (*Viburnum lantana*) (Fragnière et al., 2024). In the same vein, average ovariole number (~ 24 ovarioles per female) was also very close to previously reported values for this species (Silva-Soares et al., 2017). Likewise, fatty acid composition of flies reared in cactus overlaps with data from literature of flies reared in blueberries and cornmeal (Wiman et al., 2020) (Fig. S5).

Nutritionally, the cactus diet has a caloric content of 35 Kcal/100 g (Table 1), which is close to the optimal value reported for *D. suzukii*'s development (Silva-Soares et al., 2017). Its Protein:Carbohydrate ratio (P:C) is 1:4, which is higher than that of cornmeal (1:6) but lower than the reported optimal ratio, 1.5:1 (Silva-Soares et al., 2017). While lipid portion is higher than in cornmeal and potato diets (Table 1), fatty acid profile of *O. sulphurea* diet (Fig. S3) is similar to many plant species (Gunstone et al., 2007),

composed primarily of palmitic acid (C16:0) and 18-carbon fatty acids such as linoleic, stearic and oleic acid (C18:2, C18:0, C18:1, respectively).

Although preference for prickly pear cactus as an oviposition host is yet to be tested under natural conditions, our acceptance assay shows that female flies can definitely lay eggs in this plant. Mean egg number on cactus was 27.8 eggs per plate (Table 2), with a maximum of 134 eggs. Similar values (25–30 eggs) were found in other no-choice assays in blueberry, banana (Cai et al., 2019) and in a tomato-based semi-natural diet (Olazcuaga et al., 2019). While oviposition occurred almost exclusively in exposed chlorenchyma, that does not preclude cactus from being a potential host, as they can certainly be subject to mechanical damage in nature. Indeed, several insect species (Martínez-Falcón et al., 2023), such as *Drosophila* fruitflies of the *repleta* species group (Hasson et al., 2009; Markow, 2015), have evolved to exploit fallen and broken cactus branches in the wild. In addition, phytophagous insects such as the larvae of the cactus moth *Cactoblastis cactorum* (Lepidoptera: Pyralidae) actively burrow in the cladodes (Varone et al., 2014), making in its way punctures in the cactus' cuticle that could be suitable for *Drosophila* oviposition.

Being predominantly green, cactus tissues lack the visual cues that generally attract female *D. suzukii*, which prefers contrasting colors over green background (Little et al., 2019). However, rotten cactus volatiles and fresh fruits volatiles share several key compounds, such as ethyl acetate, nonanal, acetic acid and octenol (Crowley-Gall et al., 2025), that were shown to elicit an electroantennographic response in *D. suzukii* (Revadi et al., 2015) and thus could serve as olfactory cues for oviposition.Phytophagous insects are known to shift host during the winter season (Liu et al., 2017). Moreover, oviposition site choice is modulated by temperature in *D. melanogaster* females, which prefer high protein vegetal diet as oviposition site at low temperatures, resulting in positive fitness effects on its offspring (Brankatschk et al., 2018). Though *D. suzukii* is capable of overwintering in extreme thermal conditions, information about the feeding and rearing resources along the winter season is scarce. Our results suggest that prickly pear cactus may potentially serve as an alternative host during cold seasons, when crops are not available. This would be consistent with the high PUFAs concentration and high UFA/SFA and PUFA/MUFA ratios found in cactus-reared flies, as high unsaturation is associated with higher cold tolerance in this species (Enriquez & Colinet, 2019) Further studies should test both development and oviposition preferences at low temperatures.Invasive Drosophilids such as *D. suzukii* and *D. melanogaster* proliferate and thrive in anthropized environments such as crops, but owe much of their success to the exploitation of local plant species as novel hosts (Deconninck et al., 2026). This includes native and invasive plant species, such as the American black cherry in Europe (Poyet et al., 2014). *D. suzukii* is known to exploit native plant species during crops off-season (Buonocore Biancheri, Kirschbaum, et al., 2024). As it has been pointed out, *D. suzukii* has been collected in sites overlapping native *O. sulphurea* occurrence (Fig. S1). Several other *Opuntia* species—most notably *Opuntia ficus-indica*—are cultivated for human consumption of both fruits and cladodes, predominantly in the Americas and northern Africa, and also in the Indian subcontinent, Southeast Asia, the Middle East, and Europe (Khan et al., 2024), all regions where *D. suzukii* has been detected (Aouari et al., 2022; Nair & Peterson, 2023; Ouantar et al., 2020; Parchami-Araghi et al., 2015). *O. ficus-indica* is considered an

invasive species in eastern and southern Africa and mediterranean Europe. In Australia, both *O. ficus-indica* (Tesfay et al., 2023)d *sulphurea* are considered invasive (Osunkoya et al., 2025). In addition, some *Opuntia* species are grown in association with crops as a means of alleviation of soil erosion and biological fencing (Louhaichi et al., 2017). As of yet, the potential of cactus species as an alternative host for *D. suzukii* in nature is still contentious. However, as pest species continue to expand their range, driven by human activity, new unexpected interactions with the natural environment are likely to arise, underscoring the importance of anticipating and characterizing such associations.

Declarations

Competing interests

The authors have no relevant financial or non-financial interests to disclose.

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Author contributions

J.M. and P.E.S. proposed the original idea and together with E.H. oversaw the project. L.K. conducted the experiments and analyzed the data. Fatty acid analyses were performed by V.C. J.M., P.E.S. and L.K. wrote the first draft of the manuscript and all authors contributed to the writing and approved the final version. J.M. and P.E.S. jointly supervised this work.

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Data availability

The raw data can be accessed through the following link: 10.6084/m9.figshare.31955760

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Figures

Figure 1

Photograph of a cactus (*Opuntia sulphurea*) plate used in the oviposition assay showing larvae and clusters of eggs laid in exposed chlorenchyma under the cuticle.

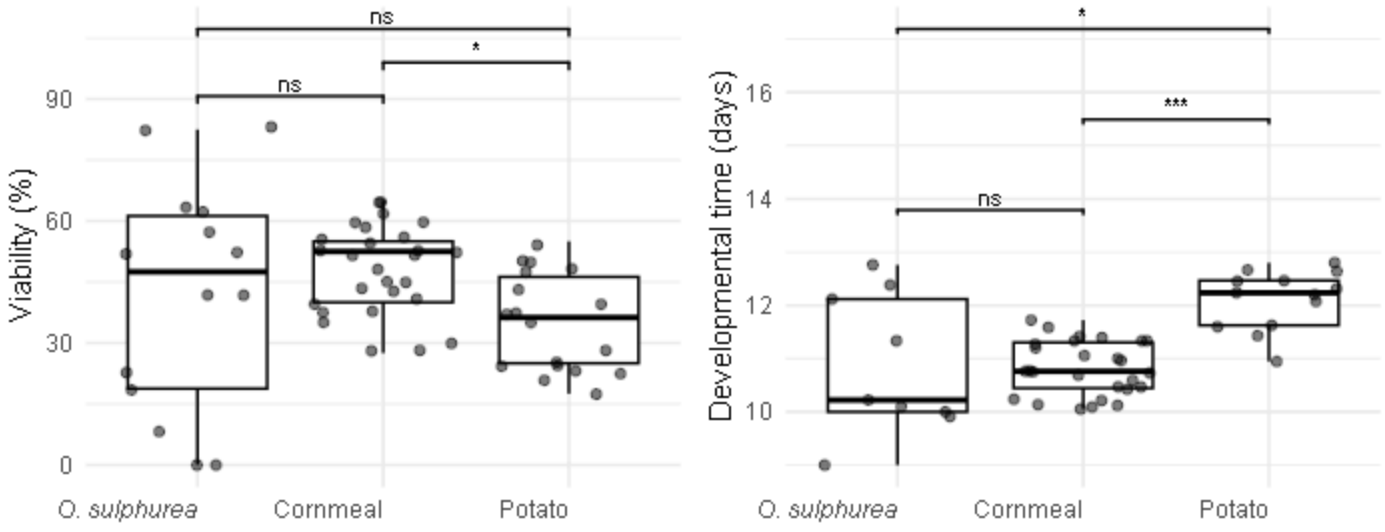

Figure 2

Boxplots and datapoints of life-history traits *D. suzukii* larvae by rearing diet. The line inside each box represents the median value of each group. * Denotes p-value lower than 0.05, *** denote p-value lower than 0.0001 and “ns” stands for “no significance”. Points represent individual vials. **Left**: Larva to adult viability. **Right**: Developmental time by rearing diet.

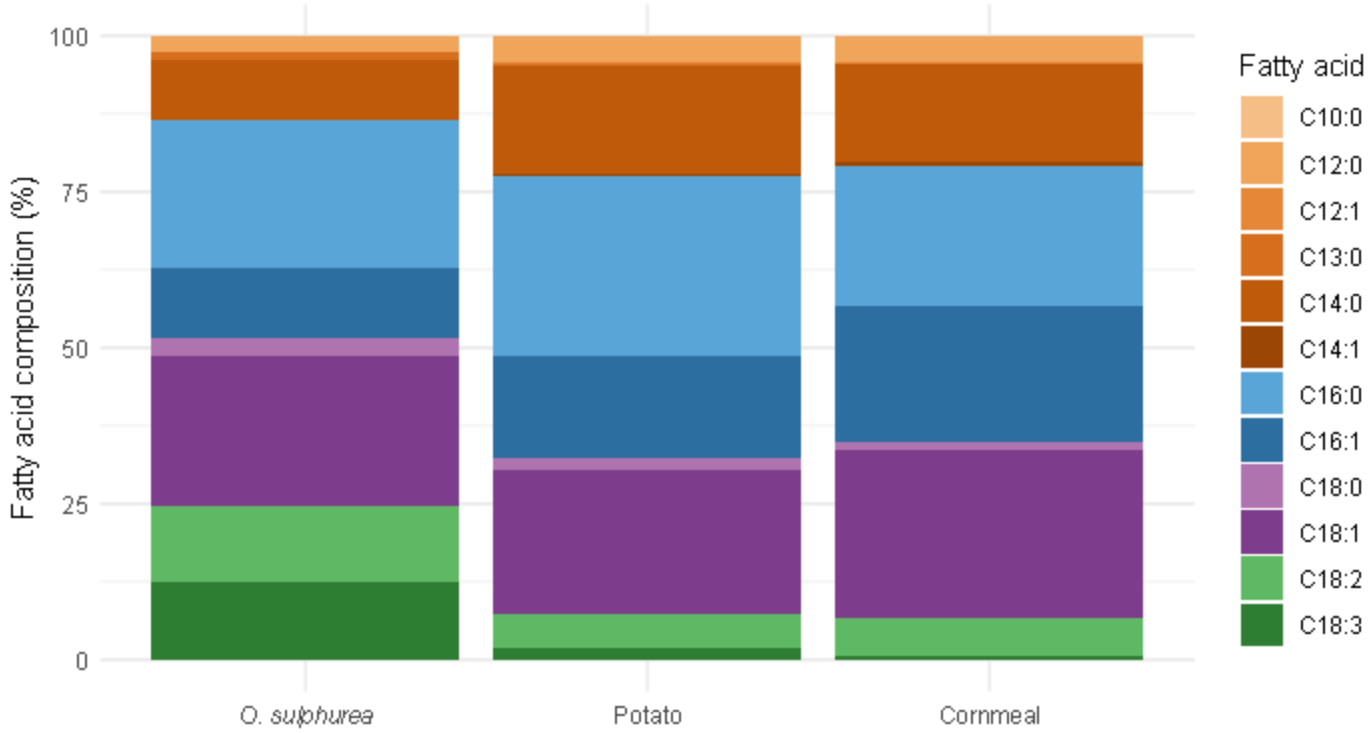

Figure 3

Relative average contribution of each fatty acid to total fatty acid fraction by diet.

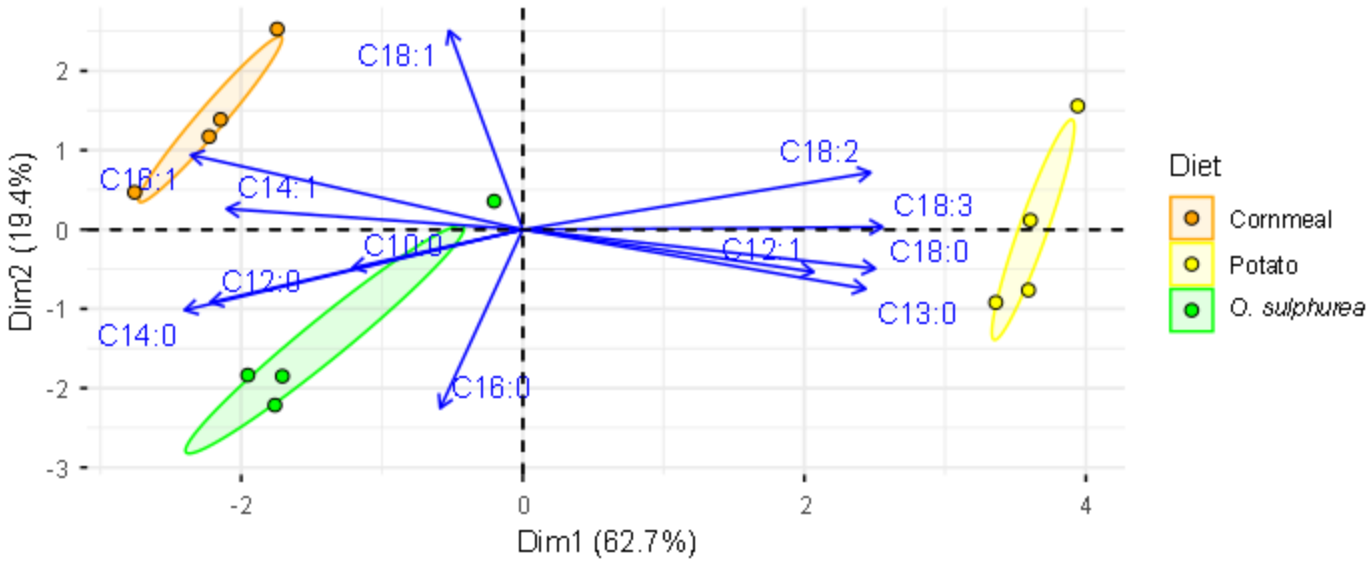

Figure 4

Principal Component Analysis (PCA) of fatty acid profiles across diets. Colors indicate developmental diets. Blue arrows illustrate the contribution of each variable (fatty acid) to the first two principal components, which together explain 81.1% of total variance. Ellipses enclose replicates by diet and were calculated using Khachiyan's algorithm (Pedersen, 2024).

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