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# MULTIPLE BAITS, EXPOSURE TIME AND TRAP DESIGN INFLUENCED TRAPPING EFFICIENCY OF FRUIT FLY *DROSOPHILA MELANOGASTER*

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## ABSTRACT

*Drosophila melanogaster (Diptera: Drosophilidae) commonly known as fruit fly, is a minor pest in agro-ecosystems, but not for fruit vendors trading on soft-skinned fruits. Amidst a plethora of fruit hosts obtainable in open markets, using baits to trap out these insects could be more effective, hence different baits performance in baited traps were tested. Also tested for catchability were two types of improvised traps viz.: with and without bait-holding chambers. With five fruits (banana, citrus, onions, pineapple and tomato), two beverages (beer and red wine) and water (control) as baits in a multiple-trap arena, a multiple-trap (for baits), and a two-trap (for design) trials were conducted. Among the multiple-trap trials, tomato-baited traps attracted significantly more D. melanogaster than the other baits as it accounts for four times more catch than the banana and orange-baited traps; and three times more than the pineapple baited traps. In 24 and 48 hours, all the baited traps had respectively mopped up 72 and 98.9 % of the 1591 flies released into the test arena. In the binary-trap trials, the trap without bait-holder was significantly more efficient than the trap that had bait holders. The poor effectiveness of the traps with bait-holding chambers and low attractiveness of some fruits as baits suggest that simple trap designs can be cost effective in trapping problematic fruit flies and that amidst plausible crosstalk of smell molecules within common arenas where economic fruits abound, some baits would perform less than others.*

**Keywords:** Traps, Mass trapping, Fruit fly, Attractant, Pest management

## INTRODUCTION

*Drosophila melanogaster* Meigen (Diptera: Drosophilidae), also known as fruit fly, is native to Africa and has remarkable affinity for organic matters; in search of which, it invades homes, restaurants, farms and fruit shops (Nmorsi *et al.,* 2007; Mansourian *et al.,* 2018; Egbon *et al.,* 2019). *D. melanogaster* is not only widely distributed and causes serious economic losses to soft-skinned fruits, its minute size, high fecundity, multivoltinism, broad host range, potential for long distance dispersal, and tolerance to a wide range of tropical weather conditions (Kenis *et al.,* 2016; Mansourian *et al.,* 2018; Egbon *et al.,* 2019; Leitch *et al.,* 2021), have encumbered man's ability to ward them off. Also, occasional visits to refuse and faecal matter contribute to their public health importance (Nmorsi *et al.,* 2007). In agriculture, the global menace of spotted wing *Drosophila suzukii* Matsumura, 1931 (Diptera: Drosophilidae) and other species, e.g., *D. melanogaster*, to fruit and non-fruit industries (Mansourian *et al.,* 2018; Egbon *et al.,* 2019; Stupp *et al.,* 2021) are no less profound for which several management strategies are being assessed.

The strategies deployed against drosophila comprise the use of broad spectrum insecticides (Daborn *et al.,* 2001; Bruck *et al.,* 2011; Gress and Zalom, 2019), and recently natural enemies (Wang *et al.,* 2016a,b; Ebrahim *et al.,* 2021). However, the insect's resilience and short development time may promote resistance to insecticides, with attendant non-target and residual effects. To avoid the shortcomings of some management strategies in suppressing problematic *Drosophila* species, alternatives such as sterile insect techniques (SIT), biological control and baited traps (Kenis *et al.,* 2016; Wang *et al.,* 2016a,b; Lanouette *et al.,* 2017; Yi *et al.,* 2020; Ebrahim *et al.,* 2021; Stupp *et al.,* 2021) are being considered, but SIT usage is technically limited to a few countries. Deploying biological control agents (BCA) is an unrealistic short-term response to drosophila impact on vulnerable fruits in food-handling facilities such as markets, unlike field situations, e.g., as seen among alien weeds (Zachariades *et al.,* 2022). Meanwhile, for want of toxic-free foods, relying on chemical control remains inappropriate for postharvest protection of fleshy fruits against *D. melanogaster* in market places (Sarkar *et al.,* 2021).

Given the inadequacies of SIT, chemical control and BCA in this context of ensuring quality, toxin-free fleshy fruits, deploying baited traps with either pheromone, fruit or toxic baits will suffice. Nonetheless, in fruit-handling facilities where food safety is of much serious concerns, using pesticides against *D. melanogaster* is completely ruled out; leaving baited, perhaps fruit-baited, traps as promising offers. Effective baits improve trap efficiency over long distances (Mansourain *et al.,* 2018), but to unknowingly use less attractive fruits as bait could render mass trapping ineffectual. That *D. melanogaster* utilises a wide array of fruits demands the need to identify fruit baits that can attract the flies regardless of any background noise or crosstalk of smell cues in shops where fruits are displayed for buyers' attraction.

Markets in developing countries, e.g., Nigeria, are often not immune to insect intrusions which makes perishable fruits soft targets for *D. melanogaster.* In displaying their fruits for sale, traders are aware of the impacts of fruit flies on their goods, but not the use of baited traps among them is unheard of. In such places and on food items, e.g., vegetable /mushrooms (Egbon *et al.,* 2019), on which insecticide applications are inappropriate, the use of lures (baits) can enhance trapping of drosophila. The attractions of *Drosophila* to baited traps over several kilometres are well known (Mansourian *et al.,* 2018; Leitch *et al.,* 2021). Here, using readily available polyethylene terephthalate (PET) bottles, multiple baits and trap designs (types) were tested for their attractiveness and catchability of *D. melanogaster* in multiple-choice and binary-choice arenas.

## MATERIALS AND METHODS

**Study Area:** The trials were conducted in October 2019 using a walk-in rectangular cage (3 x 3 x 1.5 $m^3$) mounted at the Faculty of Life Sciences, Ugbowo Campus, University of Benin, Benin City, Nigeria (6.39764° N, 5.61593° E; altitude 30.1 m above sea level obtained using a GARMIN Handheld GPS device). The cage's rooftop was held in place as an inverted 'v' and the entire cage was made from a specific fabric, Organza, bought from a local market in Benin City (Figure 1).

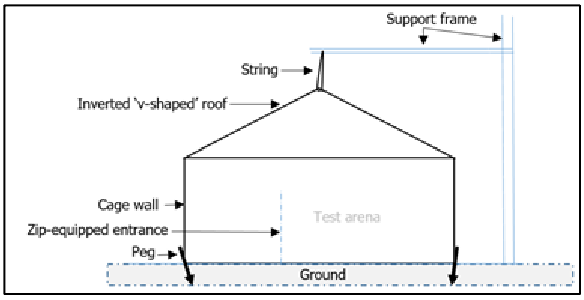

**Figure 1: An outline of the walk-in cage with a zip-equipped entrance, and its support structures – pegs, and a support frame fastened to the cage's roof top using a string**

The fabric had impassable mesh of regular sizes capable of preventing any intrusion of *Drosophila* species from the surroundings (through either the walls or the roof), and prevented the in-cage test population of *D. melanogaster*, which were bred in the laboratory and released into the cage for the trials, from escaping.

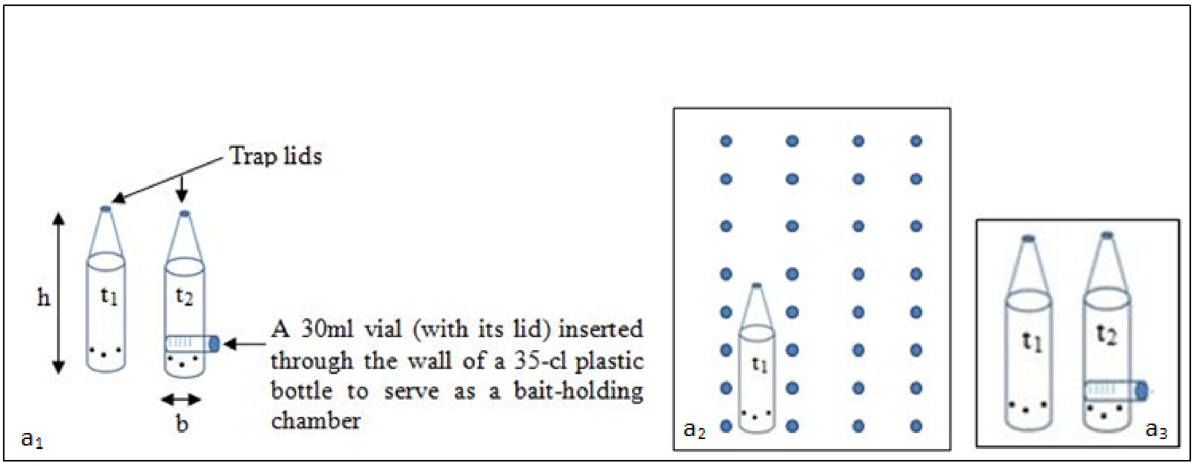

**Figure 2: The schema of ($a_1$): fabricated PET-bottle traps without ($t_1$) and with ($t_2$) bait holders (three spots represent the trap windows; letters 'h' –height, 'b' –basal diameter); ($a_2$): experiment I with 32 equidistantly mounted $t_1$ traps randomly containing four replicates of eight treatments for bait efficiency trials, and ($a_3$) experiment II with a $t_1$ and $t_2$ traps paired per cage that were replicated four times for trap efficiency trials**

As safeguards, the cage's helm was further buried into the topsoil at the points where they touched the ground, and fastened tightly with sturdy metallic pins to prevent accidental opening.

**Test Insect and Experimental Set Up:** The *D. melanogaster* population used for this study were trapped within the university using banana-baited trap from which ten unsexed adults were obtained and fed with ripe banana. From this population several more were raised on similar diet in the laboratory under ambient room temperature. The identity of the fly was established using the key of Chyb and Gompel (2013) and further confirmation using Yuzuki and Tidon (2020). Several hundreds of adults were reared and used in the trials. For the trials, adult flies were released at the topmost central point of the cage's roof. The test arena (cage) for the trials were bound on all sides with Organza and equipped with eight different baited traps, replicated four times in a completely randomised design. The baits used were: banana *Musa paradisiaca* (Musaceae), pineapple *Ananas cosmosus* (Bromeliaceae), onion *Allium cepa* (Amaryllidaceae), tomato *Solanum lycopersicum* (Solanaceae), orange *Citrus sinensis* (Rutaceae), beer (Star Lager), red wine (12 % alcohol) and water (control).

Two main tests; bait efficiency and trap performance were conducted in all. While the former relied on simple plastic bottle trap without modification ($t_1$) (Figure 2), the latter compare the performance of two traps (i.e., the $t_1$ and a modified trap with a bait holder, $t_2$). The two traps were fabricated from PET bottles of ~35 cl (height: 20.50 cm; basal diameter, ø: = 5.5 cm, tapers towards the top, ø = 3 cm) (Figure 2). A set of these bottles were modified to have a bait holder by horizontally inserting a transparent 30 ml vial into them at the basal 4 cm portion of the 35 cl bottles and the vial was held firmly in that horizontal position using a glue applied with a glue gun.

Before bait holders were inserted, five equidistant 2 mm wide slits were created at opposing sides of the vial using a handheld saw. These slits served as vents from which the baits placed within the vials can emit volatiles (smell molecules or cues) that attracted the fruit flies. Hence, these sets of traps were subsequently referred to as traps with bait holder (or bait-holding chamber). While the bottom of the 30 ml vial remained closed and enclosed within the trap bottles, the upper portion opened and extended out of the 35 cl bottle. Both the bottle and the vial were fastened with their screw caps to facilitate the introduction of baits into the bait holder or bottle wherever necessary. The other sets of traps had no bait holders, hence referred to as traps without bait holders. Both traps were perforated radially with six holes (diameter: 0.5

cm) at 3 cm basal portion of the 35 cl bottles as entrance holes for the flies.

For trials on bait efficiency (Figures $2a_1$ and $2a_2$), only the traps without bait holders ($t_1$) were used. In these traps, eight baits were introduced and tested for their attractiveness to *Drosophila* species in a common test arena i.e. the walk-in cage, where hundreds of laboratory reared unsexed adults were released. The trials were conducted in an outdoor setting in the walk-in cage. After 24 and 48 hours, data were obtained on the number of flies that were trapped alive and dead (i.e., those that drowned in the bait) and the entire number that were trapped at both periods. The total number of flies released into the walk-in cage was counted as the sum of all trapped flies in the different traps in addition to those counted within the cage that were untrapped but in the cage at the end of the trial.

For trials on trap efficiency (trap types: Figure $2a_1$ and $2a_3$), the trap without bait holder ($t_1$) and those with the holder ($t_2$) were evaluated for their performance in trapping *Drosophila* species in response to single bait (tomato). The trial was conducted in the laboratory using four boxes. Each box had a dimension 45 x 45 x 45 $cm^3$. In each box, both trap types were introduced with the chosen bait inserted in them before 60 – 80 flies were released into the cages under room temperature. The flies trapped alive and those that drown, likewise, the total number of trapped flies in 24 and 48 hours after their release into the test arena were assessed. Trap catchability (that is the proportion of the total flies released that were successfully trapped), and trap drowning efficiency (that is the proportion of the total flies trapped that were successfully drowned) were also assayed.

**Statistical Analyses:** Assumptions of normality and homoscedasticity of variance were evaluated graphically using Q-Q plots, histogram with normal curve and statistically using Shapiro-Wilk's and Levene's tests. The bait efficiency data did not satisfy the assumptions of parametric tests at 95 % confidence interval, thus were subjected to Kruskal-Wallis test ($\alpha = 0.05$), while relying on Fisher's Least Significant Difference for *post hoc* test in R version 4.1.1 (R Core Team, 2018). For trap efficiency trial, the assumptions of normality and homoscedasticity of variance were met as they both returned non-significant difference ($p>0.05$), thus were tested using unpaired Student t-tests in GenStat 9.2.

## RESULTS

**Bait Efficiency:** Out of the seven baits tested against a neutral substrate (water), in 24 hours after flies were released into the test arena, the tomato baited traps significantly (Kruskal-Wallis $H_{(7)} = 20.3$, $p = 0.0043$; $t = 2.06$) (Table 1) caught the highest number of *Drosophila* alive (12.3 ± 6.8 individuals) as opposed to the control, onion and wine baited traps that had no fly alive. Pineapple baited (3.8 ± 1.7) and orange (2.5 ± 1.5) baited traps had some *Drosophila* alive, the number caught alive did not differ statistically from those in tomato-baited traps, unlike the control, onion and wine baited traps, which trapped the least number of flies. As regards the drowned flies, tomato baited trap drowned the highest (110 ± 14.30) individuals, and this was significantly (Kruskal-Wallis $H_{(7)}$ = 19.5, $p<0.01$) higher than others, and a total of 123.3 ±18.6 flies were significantly ($H_{(7)}$ =19.9, $p<0.01$) trapped making this bait more attractive to fruit flies than the others, unlike pineapple baited traps (Table 1).

The pineapple baited trap (6.5 ± 2.2 individuals) had superior number of flies that were caught within 48 hours, followed by tomato, banana and orange baited traps. The number of flies caught by the above baits differed significantly (Kruskal-Wallis $H_{(7)} = 16.8$, $p = 0.02$) from the number of flies caught beer, onion, red wine baited traps and the control. And for all the captured flies, the tomato bait followed by pineapple, citrus and banana baits significantly (Kruskal-Wallis $H_{(7)} = 17.10$, $p = 0.016$) attracted more flies into the trap than the other baits such as beer, onions and red wine with the least number of flies (Table 1).

The aggregate of flies trapped throughout the trial revealed that water (control) had the least (3.75 ±2.50) individuals, as opposed to tomato baits that had the highest (Table 1).

**Table 1: The average number of *Drosophila* species (referred to as flies in the table) that were snared in trap ($t_1$) (which had no bait holder) over two exposure periods with focus on the flies that were trapped alive, those that drowned inside the bait and the total flies caught at the end of the period**

| Bait types | Flies trapped alive in $t_1$ | | Flies that drowned in $t_1$ | | All flies trapped in $t_1$ | | Aggregate Catch |
|---|---|---|---|---|---|---|---|
| | 24 hours | 48 hours | 24 hours | 48 hours | 24 hours | 48 hours | |
| **Banana** | 0.8 ±0.5$^{ab}$ | 4.8 ±3.7$^{ab}$ | 29.0 ±14.8$^{bc}$ | 6.25 ±3.6$^{ab}$ | 30.5 ±15.4$^{bc}$ | 12.8 ±6.6$^{cd}$ | 43.3 ±21.9$^{bc}$ |
| **Beer** | 1.0 ±0.7$^{ab}$ | 1.0 ±1.0$^{a}$ | 12.0 ±4.1$^{ab}$ | 1.75 ±0.6$^{a}$ | 13.0 ±4.0$^{ab}$ | 2.7 ±0.5b$^{ab}$ | 15.8 ±4.4$^{ab}$ |
| **Citrus** | 2.5 ±1.5$^{cb}$ | 4.0 ±1.9$^{ab}$ | 28.8 ±10.2$^{bc}$ | 5.5 ±3.4$^{a}$ | 32.0 ±10.0$^{bc}$ | 11.0 ±5.2$^{bcd}$ | 43.0 ±11.9$^{bc}$ |
| **Control** | 0.0 ±0.0$^{a}$ | 0.3 ±0.3$^{a}$ | 3.0 ±1.8$^{a}$ | 0.5 ±0.5$^{a}$ | 3.0 ±1.8$^{a}$ | 0.8 ±0.8$^{a}$ | 3.8 ±2.5$^{a}$ |
| **Onion** | 0.0 ±0.0$^{a}$ | 0.3 ±0.3$^{a}$ | 13.0 ±1.3$^{bc}$ | 2.0 ±1.7$^{a}$ | 13.0 ±1.3$^{b}$ | 2.3 ±1.6$^{ab}$ | 15.3 ±2.7$^{ab}$ |
| **Pineapple** | 3.8 ±1.7$^{cb}$ | 6.5 ±2.2$^{b}$ | 44.5 ±8.2$^{cd}$ | 4.0 ±2.6$^{a}$ | 49.0 ±9.4$^{cd}$ | 10.5 ±2.5$^{cd}$ | 59.5 ±11.3$^{cd}$ |
| **Red wine** | 0.00 ± 0.0$^{a}$ | 1.0 ±1.0$^{a}$ | 23.8 ±17.1$^{ab}$ | 8.0 ±5.4$^{a}$ | 24.5 ±17.6$^{ab}$ | 9.0 ±6.4$^{abc}$ | 33.3 ±23.1$^{b}$ |
| **Tomato** | 12.3 ±6.8$^{c}$ | 5.3 ±2.5$^{b}$ | 110.0 ±14.3$^{d}$ | 51.3 ±20.8$^{b}$ | 123.3 ±18.6$^{d}$ | 56.5 ±21.8$^{d}$ | 179.8 ±40.1$^{d}$ |
| **Statistics** | | | | | | | |
| **Kruskal-Wallis** $H_{(7)}$ | 20.3 | 16.8 | 19.5 | 11.5 | 19.9 | 17.1 | 19.3 |

*Mean values on the same column with the same letters superscripts are not significantly different ($p>0.05$). Note: the multiple comparisons of central tendencies are based on nonparametric statistics, Kruskal-Wallis (H), which relies on median for its outputs as represented in superscripts*

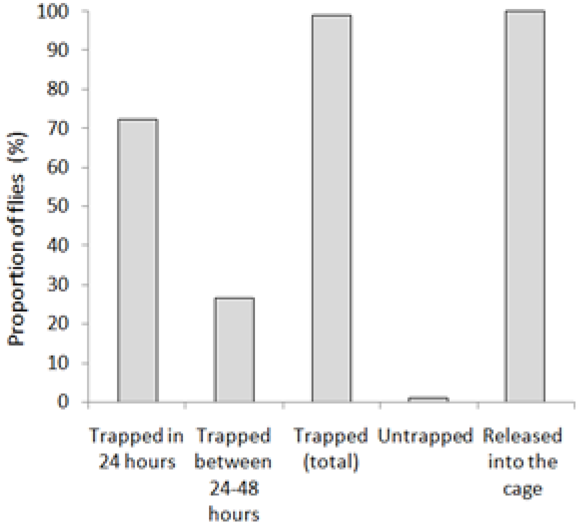

**Figure 3: Proportion of *Drosophila melanogaster* trapped from the same fly population**

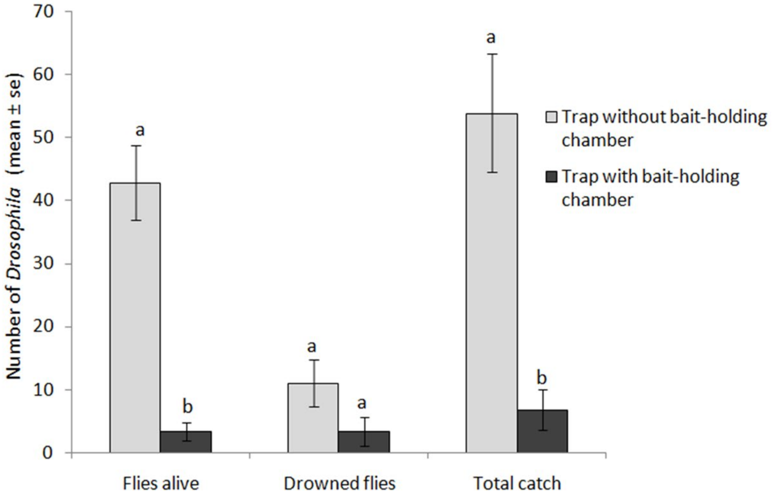

**Figure 4: Comparative catchability of two types of PET bottle traps equipped with and without bait holding holders by measuring using the flies trapped alive, those that drowned and the total flies caught**

In fact, though tomato baited trap were numerically (3 folds) more effective than the pineapple baited trap, they did not differ significantly ($p>0.05$); except that they significantly ($p<0.01$) outperformed the citrus, banana, beer, onions and red wine baited traps (Table 1).

The performance of all baited traps revealed that not all released flies were caught after the first trials, because only 72.41 % of 1591 were trap within the initial trial. With an additional catch of 26.52 % in the ensuing 24 hours (i.e., between the 24th and the 48th hour), a total of 98.93 % trapping efficiency was attained in all traps (Figure 3).

**Trap Efficiency:** Comparatively, the trap without bait holders (trap $t_1$) were the most efficient snares for fruit flies, as they significantly caught (t statistics = 6.49, $p<0.01$) more individuals (42.72 ± 5.90) of *D. melanogaster* than traps with bait-holding chambers (trap $t_2$) in which 3.25 ± 1.40 individuals were caught (Figure 4). Though $t_1$ trap also drowned more individuals (11.00 ± 3.70) than its counterpart trap, their catch did not differ significantly (t statistic = 1.78, p = 0.14). On the contrary, the total trapped flies (6.75 ± 3.20 individuals) in $t_2$ were significantly (t statistics = 4.75, p = 0.01) less than that in $t_1$ (53.75 ± 9.40 individuals) (Figure 4). The proportion of flies trapped in $t_1$ amounted to 86.69 % of the total number of *Drosophila* released in the test arena as opposed to 10.69 % efficiency for trap $t_2$ with 2.62 % of the total released flies remained untrapped at the end of the trial.

## DISCUSSION

This study examined the relative attractiveness of *D. melanogaster* to certain baits and how trap designs could influence trap performance. From the results of this study, fruit baits were not equally attractive as evident in the differential number of trapped flies. In fact, the findings of this study revealed that trap performance remarkably improves with bait type, trap type and exposure period. Despite the differential attractiveness of fruit baits within the competing odour plume of multiple baits that abound in the test arena, *D. melanogaster* exhibited preferential attraction to selected baits (tomato and pineapple). One of the key implications of these findings which corroborate the findings of Singh *et al. (*2021) is that trap efficiency varies with multiple sources of smell cues. The differential effects of these smell cues were rife as all baited traps lured some flies, albeit less evenly. The presence of multiple cues can undermine bait efficacy if traps were mounted amidst variable fruits, as obtainable in fruit and vegetable markets. With multiple fruits on display by fruit vendors, as akin to multiple baited traps in this current study, a careful selection of the most attractive fruit as bait becomes vital for effective mass trapping programme to decimate problematic population of fruit flies inflicting damage on susceptible food items. Given the outcome here, tomato bait registered a strong pulling effect on *D. melanogaster* despite the existential possibility of crosstalk of smell molecules from multiple sources – which could dampen traps' catchability if the most attractive bait was not used. Some have argued that *Drosophila* species attraction to fruit baits is independent on fruity volatiles, but on the in-fruit pathogen-associated volatiles (Becher *et al.,* 2012; Iglesias *et al.,* 2014; Batista *et al.,* 2017). Pathogen such as yeasts, facilitate fruit fermentation in fruit-sugar concentration-dependent manner. The fermentation process is up-regulated in baits with high sugar loads as opposed to those with less sugar which are partly a by-product of fermentation e.g., wine and beer. While the sugar in fruit baits may herald the release of pathogen-linked volatiles as fermentation unfolds, substrates (wine and beer) with spent sugar would do less (Batista *et al.,* 2017). The bioactivities of such microbes in fruity baits could explain why the fruit baits were preferred to wine and beer. The uneven preference of fruit flies among baits may not be unconnected with the microbe compositions in the different fruit baits.

The design of traps influenced their effectiveness as seen in the poor performance of traps with bait holders that had remarkably fewer flies than those without bait holders. The observed reduction may have been caused by poor emission rate of smell molecules from the bait holders, through their lateral slits, into the trap gallery; then from the trap gallery to the exterior. The difference here lies in trap design (with and without bait holders) and the flaws of trap $t_2$ may not be entirely linked to the bait holders but partly to the number of slits on the bait holders. This drawback may be corrected for with more slits in bait-holding chamber of traps. The implication is that the number of slits in bait holders if needed deserves careful considerations when designing new traps. Invariably, where the insertion of bait holders in traps would negatively influence trap's effectiveness, the bait holders should be excluded for maximal fly catch. Regardless of baits, where necessary, keeping things (traps) simple matters as the presence of bait-holder in $t_2$ traps compromised trap's catchability. Although a previous study by Iglesias *et al. (*2014) rated bait type as more vital than trap designs, our findings suggest equal considerations for both factors. Any trap model, albeit simple, with less restriction on olfactory cues should be prioritised. Deploying mass-trapping techniques by fruit and food handlers (including mushroom growers (Egbon *et al.,* 2019)) can be useful alternatives to chemical applications that leave residues in fruits and foods.

Managing multivoltine herbivores within a mosaic of background odour cues could be challenging and relying on insecticides at the latter stages of food supply chain could leave toxic residues on ready-to-eat fleshy fruits. To deal with drosophilid flies in food handling facilities such as in markets, restaurants, and farms (e.g., mushroom farms, where off-season opportunistic use of non-fruit resources by drosophilids, could render the flies problematic (Egbon *et al.,* 2019)), simple traps fabricated from cheap PET plastics can be helpful in places where chemical applications down the post-harvest food supply chain remain intolerable. Also, where a plethora of fruit abound, e.g., in fruit and vegetable markets as often the case in developing countries, tomato baited traps can lure three or four times more *D. melanogaster* into simple traps than any other fruit baits.

Adopting PET bottles for trapping fruit flies has several advantages, which includes efficiency, low environmental impact and low cost: benefit ratio, and durability (Lasa *et al.,* 2014). Because they are cheap, freely sourced PET bottles can favour mass deployment of traps against these flies and other similar flies; however, bait attractiveness differ by bait type. Unlike costly insecticides and their health risks from residual toxicity, PET bottles for traps are cheap to source, alas, there is low level of awareness about lure-to-trap technique. The use of PET bottles will cost $0.00 (as they are freely obtained from waste bins), and with a $0.02 worth of bait (e.g., a half ball of tomato) a trap is ready for deployment. If a hundred traps are needed to exert target-specific or locality specific control, it would only cost $2 of bait.

Comparatively, our trap designs differ from previous designs, e.g., one of Lasa *et al. (*2014) traps in two ways viz.: the position of the entry holes and the presence of bait holders. Unlike theirs (which were apically situated), ours were arbitrarily situated at the lower half of the bottles laterally. The different positions of the entry holes and insect type e.g., *Anastrepha ludens* Loew, 1873 (Diptera: Tephritidae) in Lasa *et al.* (2014) and *D. melanogaster* in this current study, may have influenced the high percentage escapees in traps used by Lasa *et al.* (2017) unlike the traps used in this study. The basally situated entrance hole employed here, allows easy access of flies to the trap galleries, but not easy exit. With $CO_2$ being a by-product of fermentation, trapped flies that fly for too long, especially towards to apical hemispherical roof of the trap were asphyxiated in the cloud of $CO_2$ gas. While in dire need of oxygen to fuel their escape flight attempts, trapped flies in flight quickly get exhausted and drop downwards into the pool of bait where drowning occurs. Here, the trap design elaborates its pros over those with apically situated entrance holes, though with some improved versions (Lasa *et al.,* 2017).

Adopting mass trapping and sanitary measures against filth flies like drosophila (Nmorsi *et al.,* 2007) can douse their nuisance and improve postharvest quality of fleshy fruits and their safety (e.g. phytosanitory status) along the food supply chains. Overall, the findings of this study propose that relative to the other baits assayed, tomato had better volatiles that can lure *D. melanogaster* and identifying these volatiles might facilitate their synthesis and use as attractants (Cha *et al.,* 2014) in mass-trapping options for pest management practice. Such promising volatiles would complement any sanitary measure against the flies and halt their burgeoning populations around human facilities (homes, farms and markets). Besides, using synthetic volatiles from effective fruits could replace short-term need for bait replacements arising from the fruit deterioration due to microbial activities. Given drosophila's vectorial role as habitual visitors to filth (Nmorsi *et al.,* 2007) and their abundance as a crucial correlate of disease outbreaks (Collinet-Adler *et al.,* 2015); any user-friendly and cost-effective strategy, such as mass trapping, employed to halt their proliferation and attendant problems is warranted and worth prioritising.

**Conclusion:** In summary, the role of *D. melanogaster* in food decomposition and crop loss has been widely acknowledged, and their relentless impact on soft-skinned fruits is threatening key sectors in food supply chains in sub-Saharan Africa. By mass trapping drosophila at the fruits' most vulnerable stages (i.e., between fruit ripening and final consumption), the optimal values of the fruits become achievable. Our trials showcased certain perspective into the dynamics of trap efficiency relative to bait choices and proposed that despite insect's attraction to several fruit baits, some are remarkably more attractive than others. Our findings present a case for an informed decision in choosing baits for mass trapping purposes in scenarios where the background cues from other useful fruits may dampen some baits' effects.

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