LIFE TABLE AND DEMOGRAPHIC PARAMETERS OF *Bactrocera dorsalis* (HENDEL) (DIPTERA: TEPHRITIDAE) REARED ON WHEAT GERM AND SWEET POTATO BASED ARTIFICIAL DIETS

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ABSTRACT

The mass production of insects such as fruit flies are commonly use artificial diets due to the easier management in the laboratory compare to using natural diets. However, some commercially imported artificial diets such as wheat germ are quite expensive and not cost effective. Thus, other alternative sources of artificial diets using local ingredients such as sweet potatoes is required as it is more economical compared to wheat germ. Therefore, this study aimed to compare the life table and demographic parameters of *Bactrocera dorsalis* reared on wheat germ (WG) and orange sweet potato (SP) based artificial diet. We used 3-cohorts of 100 of *B. dorsalis* eggs were reared on WG and SP diet, respectively and the fly's survivorship and fecundity were recorded daily in the laboratory. Larval and pupal duration, pupae weight, adult emergence and longevity, pre-oviposition and oviposition period were also recorded. Results showed that the age-specific survival (l_x) of *B. dorsalis* eggs reared on WG and SP diet successfully reached to adults' stage at 62.33% and 57.67%, respectively. The highest mortality of *B. dorsalis* stage recorded was at first instar larvae with K-value of 0.266 (WG) and 0.264 (SP), and the pattern of survivorship curves for both diets fall in Type III. Age-specific fecundity (m_x) for both diets showed the earliest egg laying was on day 37. There was no significant difference (P>0.05) of *B. dorsalis* larval duration, pupal duration, pupal weight, adult emergence, adult longevity, pre-oviposition, oviposition period and fecundity for both diets. However, the larval survival and the daily eggs produced for the fly reared on wheat germ-based diet were significantly higher (P<0.05) compared to sweet potato-based diets. In conclusion, *B. dorsalis* reared on orange sweet potato-based diet showed the similar potential as reared on wheat germ-based diet due to parallel biological parameters results.

Keywords: Artificial diet, *Bactrocera*, fruit fly, demographic parameters, life table

ABSTRAK

Pengeluaran besar-besaran serangga seperti lalat buah kebiasaannya menggunakan diet tiruan disebabkan oleh pengurusan yang lebih mudah di makmal berbanding menggunakan diet semula jadi. Walau bagaimanapun, beberapa diet tiruan yang diimport secara komersial seperti germa gandum agak mahal dan tidak menjimatkan kos. Justeru itu, sumber alternatif lain diet tiruan menggunakan bahan tempatan seperti ubi keledek adalah diperlukan kerana ia adalah lebih menjimatkan berbanding germa gandum. Oleh itu, kajian ini bertujuan untuk membandingkan jadual hidup dan parameter demografik *Bactrocera dorsalis* yang dipelihara dengan diet tiruan berasaskan germa gandum (WG) dan ubi keledek jingga (SP). Tiga kohort 100 telur *B. dorsalis* masing-masing dipelihara dalam diet WG dan SP dan kemandirian dan fekunditi lalat direkodkan setiap hari di makmal. Tempoh larva dan pupa, berat pupa, kemunculan dewasa dan tempoh hayat, tempoh pra-oviposit dan tempoh oviposit juga direkodkan. Hasil kajian menunjukkan bahawa kemandirian hidup spesifik (l_x) telur *B. dorsalis* yang dipelihara pada diet WG dan SP masing-masing telah mencapai peringkat dewasa pada kadar 62.33% dan 57.67%. Kematian tertinggi *B. dorsalis* yang direkodkan adalah pada tahap larva instar pertama dengan nilai K pada 0.266 (WG) dan 0.264 (SP), dan corak fekunditi untuk kedua-dua jenis diet jatuh pada Jenis III. Fekunditi umur spesifik (m_x) bagi kedua-dua diet menunjukkan telur terawal dikeluarkan pada hari ke 37. Tiada perbezaan bererti (P>0.05) pada tempoh larva, tempoh pupa, berat pupa, kemunculan dewasa, jangka hayat, tempoh pra-oviposit, tempoh oviposit dan fekunditi direkodkan untuk kedua-dua diet. Namun begitu, kemandirian larva dan penghasilan telur harian lalat yang dipelihara dengan diet berasaskan germa gandum adalah lebih tinggi secara bererti (P<0.05) berbanding diet berasaskan ubi keledek. Kesimpulannya, *B. dorsalis* yang dipelihara dengan diet yang berasaskan ubi keledek jingga telah menunjukkan potensi yang hampir sama dengan diet berasaskan germa gandum kerana hasil parameter biologi yang direkodkan adalah selari.

Kata kunci: Diet tiruan, *Bactrocera*, lalat buah, parameter demografi, jadual hidup

INTRODUCTION

Bactrocera dorsalis (Hendel) (Diptera: Tephritidae) is a great economic and agricultural important pest due to damage caused to commercial fruits throughout the world (Liu et al. 2019; Mutamiswa et al. 2020). Economic losses due to infestation by fruit flies can cause more than two billion dollars worldwide (Garcia & Ricalde 2013). This insect species is capable of damaging fruit crops at the severe stage. The severity of the damage is not only because of the aggressiveness and the high abundance of a species but also due to the competency of a single species to attack many hosts. It's rapid development also gives a huge challenge to overcome the pest population distribution. Therefore, the management control program of fruit flies must be efficient and consistent methods should be applied in order to reduce damage and loss to the crops. The study of insect's life history through the life table analysis is important to understand the biology of the fruit fly. Thus, a complete management control strategy for this species can be developed.

Life table analysis is one of the most effective methods to account for natality and reproduction of a population (Begon & Mortimer 1981; Price 1997). It is also can provide demographic information of the insect (Maia et al. 2000). Since the last three decades, fruit flies' life table studies and demographic analysis had been conducted by many researchers to develop better pest management strategies for economically important tephritid fruit flies (Gomina et al. 2014; Huang & Chi 2016; Salmah et al. 2019). According to Huang and Chi

(2012), life tables can provide the most detailed comprehensive description of the survival, development, population reproductions and population of life expectancy of fruit flies. However, more research should be done for information improvement such as the investigation of the best diet for mass-rearing of the insect species in the laboratory conditions.

Artificial diet is one of the main factors that directly affect the quality of the mass-reared fruit flies besides the temperature, photoperiod, fly density, and oviposition devices (Moadeli et al. 2018). Therefore, the comparison of the life history of *B. dorsalis* between different artificial diets are very important to obtain the best diet in terms of cost-effective and ease management in the laboratory. For instance, sweet potato has great antioxidants and contain high nutritional value of carbohydrates, high-quality proteins, minerals, vitamins and dietary fiber as well as is widely planted in East Coast of Peninsular Malaysia (Tan 2015). Furthermore, it is readily available and much cheaper than wheat germ as it is a major crop in the local area (Salmah et al. 2020). In contrast, wheat germ is a standard artificial diet and it is widely used for *Bactrocera* mass-rearing but due to its status as an imported and commercial product, so it is comparatively expensive (Ekesi & Mohamed 2011).

Therefore, this study aimed to compare basic information on the life table and demographic parameters of *B. dorsalis* conducted on wheat germ-based and sweet potato-based artificial diet under laboratory conditions.

MATERIALS AND METHODS

Cultures and Rearing of *Bactrocera dorsalis*

The experiment and insect culture were conducted at the Laboratory of Entomology, Faculty of Bioresources and Food Industry, University Sultan Zainal Abidin, Besut Besut, Terengganu. The rearing techniques of *B. dorsalis* were adopted from Ekesi and Mohamed (2011), Mohd Noor et al. (2011) and Walker et al. (1997). Fifth generation of *B. dorsalis* adults fed with water soaked on sponge and sugar cubes with a mixture of yeast extract and sugar at ratio 3:1 was used in this experiment. The culture of *B. dorsalis* was placed in the rearing cage (30 x 30 x 30 cm) and maintained in the laboratory at 28±2ºC, 70-80% RH, 12:12 h L:D.

Larval Diet Preparation

Two types of larval diet were used in this study, ie. wheat-germ (as standard diet) and orange sweet potato. The natural raw wheat germ (Health Paradise^{TM}) was purchased from the supermarket whilst orange sweet potatoes were brought from the local market in Besut, Terengganu. Orange sweet potato was chosen as it was similar to wheat germ in term of effect on the growth and development of *B. dorsalis* as shown in Salmah et al. (2020).

The composition of the sweet potatoes and wheat germ based-diet were adopted from Salmah et al. (2020) as presented in Table 1. Other ingredients used for the development of larval artificial diet were Brewer's yeast (Health Paradise^{TM}), Nipagin (Sigma-Aldrich), sodium benzoate (UNILAB), sugar (CSR), and water. All ingredients were thoroughly mixed by using a blender (PANASONIC MS 801s) for three minutes. Each 200 g of diet was placed in a plastic container (15 x 12 x 5 cm) and stored in chiller at 4°C for 24 hours. All pH diets were adjusted to value range between 4.5 - 5.0 by using concentrated hydrochloric acid (HCl) (0.5-3.55%) or citric acid. This pH range is to prevent any bacterial and fungal contamination (Ekesi & Mohamed 2011).

Table 1. Composition of different diets and their percentages of ingredients

Ingredients (%)	**Wheat germ**	**Orange sweet potato**
Wheat germ	25.0	-
Sweet potato	-	58.5
Yeast	8.1	8.1
Nipagin	0.2	0.2
Sodium benzoate	0.2	0.2
Sugar	8.0	8.0
Water	58.5	25.0
Total (%)	**100.0**	**100.0**

Survivorship Study

Survivorship from egg to adult emergence of *B. dorsalis* were studied with three different cohorts. Each cohort approximately comprising of 100 viable eggs of one-day-old of *B. dorsalis* obtained from fifth generation colonies. The freshly collected eggs were counted under an Olympus SZ51 microscope (Olympus, Japan). The eggs were divided into 10 groups with 10 eggs per group for hatching observation for each cohort. Each group of eggs was placed on 20g of wheat germ and orange sweet potato respectively in Petri dish (4 cm in diameter). The Petri dish was covered and sealed with parafilm for the first three days to ensure the eggs remain moist.

The larval developmental time was measured in days within each stage after egg hatching. The eggs and early instar larvae were observed under an Olympus SZ51 microscope (Olympus, Japan) to record eggs hatching and the survival of the first instar larvae until they reached the third instar larvae. The third instar larvae which can be identified by their jumping behaviour were transferred from rearing Petri dish using a fine forcep to small plastic cups (4 x 7 cm) containing 0.5cm sterilized fine vermiculite as pupation medium. After five days, the pupae were sieved from vermiculite and placed individually in a small plastic cup (4 x 7 cm) for adult emergence. The survival and mortality of eggs, larvae, pupae, and adults were observed and recorded daily.

Fecundity and Adult Longevity

Five pairs of 1-day old fruit fly adults were selected from adults that emerged in survival and mortality study and each pair was kept in a small plastic container (19 x 11 x 12 cm). The adults were fed with granulated sugar and water which was soaked in a piece of cotton wool in a Petri dish (4 cm in diameter), and yeast extract mixture (plastered on a small filter paper that was provided at 5-days old).

At day 12 of adult's age (which at this age the females of *B. dorsalis* were started to oviposit their eggs based on the preliminary study), a fresh sliced papaya (2 x 2 cm) which the flesh was scooped out and the outer skin of papaya were pierced several times with an entomological pin (size #0). The oviposition holes were provided as oviposition egging device. The papaya slice was exposed to females in each plastic container for 24 hours. The papaya slices were removed from the containers after 24 hours of exposure and the eggs were counted daily under an Olympus SZ51 microscope (Olympus, Japan). The new fresh sliced papaya was supplied every day for oviposition until the female died. The eggs laid by each female were counted and recorded daily until the death of all individuals. The pre-oviposition periods, oviposition periods and fecundity of females, longevity of females and males of *B. dorsalis* adults were recorded. Other biological parameters were also recorded as follows: pupae weight, larval survival (%), adult emergence (%), larval and pupal duration, and daily eggs.

Data Analysis
The experiment design was based on Completely Randomized Design (CRD) with three cohorts per diet for survivorship study and five replications for fecundity and other biological parameters. Collected data were analyzed using One-way Analysis of Variance (ANOVA) whereas that means were separated by Tukey's Range (HSD) Test at 0.05 level of significance. All analyses was done using MINITAB 18 software.

The standard life table parameters and population age structures were calculated from daily records of survival, mortality, and fecundity of each cohort. The symbol, formula and definition of parameters followed the procedures described by Carey (1993) and Southwood (1978) as shown in Table 2.

Table 2. Definition and formula for life table and demographic parameters

Parameter	Definition	Formula
x	Age internal in days/developmental stage.	
l_x	Proportion of individuals surviving to start of the age interval. The number of individuals alive, during a given age interval class as a fraction.	
L_x	Number of individuals alive between age x and x+1	$(l_x + l_{x+1})/2$
d_x	Number of dying during age interval x	
100_{qx}	Percent apparent mortality	$(d_x/l_x)100$
S_x	Survival stage rate within stage	
T_x	Total number of living individuals at age x and beyond the age x	$L_x + L_{x+1}...L_{x+n}$
e_x	Life expectancy for individuals of age x	T_x/l_x
m_x	Number of female eggs laid by average female at age x	
R_o	Net reproductive rate	$\sum l_x m_x$
T_c	Cohort generation time (in days)	$\sum x l_x m_x / \sum l_x m_x$
r_m	Intrinsic rate of natural increase	lnR_o/T_c
T	Corrected generation time	lnR_o/r_m
λ	Finite rate of increase, number of female offsprings female-1 day-1	e^{rm}
DT	Doubling time, the number of days required by a population to double	$ln2/r_m$
GRR	Gross reproduction rate, theoretical natality rate during lifetime of organism	$\sum m_x$
Pre-oviposition period	Amount of time prior to eggs being laid	
Daily reproduction	Average number of eggs produced per day in terms of entire female lifespan	
Female longevity	Life-span of female	
Male longevity	Life-span of male	

RESULTS AND DISCUSSION

Age-Specific Survival for *Bactrocera dorsalis*

The pattern of survivorship curves (l_x) of three cohorts of *B. dorsalis* reared on wheat germ-based diet and sweet potato-based diet are shown in Figure 1. It was observed that the high mortalities occurred during early instar larvae stage and low mortality during later life stages. It occurred for both diets indicated that it falls in Type III as classified by Schowalter (2016). According to Schowalter (2016), Type III survivorship among insects must have very high rates of mortality at the early stages of development but low on late stages as to ensure that it can reach ages of maturity to produce eggs for their next generation. The mean developmental times of eggs to adults' stage in all three cohorts for wheat germ was 23.0±0.58 days while for sweet potato-based diets was 22.33±1.67 days which similar to the previous study by Mohd Noor et al. (2011) but in contrast with Salmah et al. (2019).

The pooled life table of *B. dorsalis* for the three cohorts for wheat germ and sweet potato-based diets were shown in Table 3. All larvae underwent three larval moults before transforming into pupae which gradually changed from pale yellow to dark brown before adult emergence (Mohd Noor et al. 2011). From the total of 300 eggs of *B. dorsalis* in each diet, about 62.33% (wheat germ-based diet) and 57.67% (sweet potato-based diet) of individuals successfully reached the adult stage. The results were contrast with Salmah et al. (2019) which they found that only 22.33% of *B. dorsalis* individuals successfully reached the adult stage which was a very low number. It might be due to the diet used which wheat germ and sweet potatoes contained higher nutrient content (Salmah et al. 2020) compared to the mango pulp diet (Salmah et al. 2019).

Meanwhile, the increasing or decreasing of number from one generation to another is shown by a major factor known as 'K-value'. It was calculated as the difference between consecutive values for log 'l_x' but the total of mortality was calculated by adding the 'K' value of the different development stages shown as 'K' (Kakde et al. 2014). In this study, results for both diets showed that the highest mortality recorded was in the 1st instar larvae (23.34% and 23.21%) with K-value of 0.266 and 0.264 followed by mortality in the 2nd instar larvae (9.55% and 14.22%) with K-value of 0.100 and 0.153 (Table 3). Therefore, the highest K-value recorded during the 1st instar larvae indicated that it was the main factor regulating the population size of *B. dorsalis* and suggested that it is the most appropriate stage for controlling *B. dorsalis* population. The results are in line with Marina et al. (2019), Salmah et al. (2019) and Sule et al. (2012). Nonetheless, other factors may also contribute for the high mortalities of larvae such as intraspecific competition between larvae and injury to the larvae during daily checking and counting process (Salmah et al. 2019) as well as the microbial infections of the eggs (Chang et al. 2007; Mohd Noor et al. 2011).

In addition, the results showed that the lowest mortality for wheat germ-based diet was recorded in pupa stage (2.60%) with K-value of 0.026 whilst for sweet potato-based diet was recorded in eggs stage (2.33%) with K-value of 0.024 (Table 3). This might be due to eggs and pupae are immobile stages and eggs were inserted underneath the diet while pupae which safely concealed. This scenario is similar in the field which the eggs were inserted beneath the skin of host fruits while pupae were covered by hard integument and safely beneath the soil thus make it more survival and hard to control (Salmah et al. 2019).

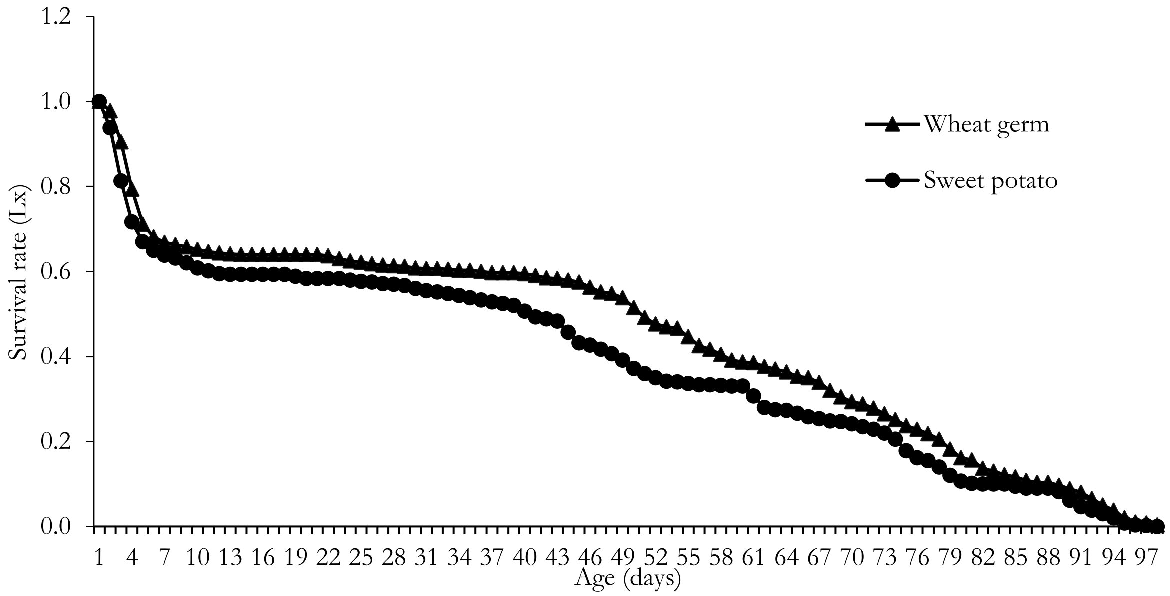

Figure 1. Patterns of survivorship curve (l_x) of *B. dorsalis* for wheat germ and orange sweet potato-based diets

Table 3. Stage-specific pooled life table of *B. dorsalis*

Diets	x	l_x	d_x	L_x	T_x	100_{qx}	S_x	e_x	K-value
	Eggs	300	13	293.50	1141.50	4.33	95.67	550.49	0.044
	Larval								
	First instar	287	67	253.50	848.00	23.34	76.66	473.83	0.266
Wheat	Second instar	220	21	209.50	594.50	9.55	90.45	383.38	0.100
germ	Third instar	199	7	195.50	385.00	3.52	96.48	286.90	0.036
	Pupa	192	5	189.50	189.50	2.60	97.40	189.50	0.026
	Adult	187							
	Eggs	300	7	296.50	1125.50	2.33	97.67	527.49	0.024
	Larval								
Orange	First instar	293	68	259.00	829.00	23.21	76.79	450.70	0.264
Sweet	Second instar	225	32	209.00	570.00	14.22	85.78	364.92	0.153
potato	Third instar	193	15	185.50	361.00	7.77	92.23	272.69	0.081
	Pupa	178	5	175.50	175.50	2.81	97.19	175.50	0.028
	Adult	173							

x=developmental stage in days, lx=proportion of number entering the stage, dx=number of dying in stage x, L_s=number alive between age x and x+1, 100_{qx}=percent apparent mortality, S_x=survival rate within the stage, T_x=total number of age x beyond the age, e_x=life expectancy

Age-Specific Fecundity Life Table for *Bactrocera dorsalis*

Figure 2 and Figure 3 show the survivorship (l_x) and fecundity (m_x) curve of *B. dorsalis* for wheat germ and sweet potato-based diets. It was noted that the first female emerged was on day 24 and first oviposition began after 13 days of emergence (day 37). The reproduction period of *B. dorsalis* was up to 56 days (wheat germ-based diet) and 57 days (sweet potato-based diet) after first adult emergence. For wheat germ-based diet, the number of eggs deposited per surviving individual was varied and range from 0.71 eggs (day 95) to 7 eggs (day 83) while for sweet potato-based diet, the number of eggs deposited per surviving individual was ranged from 0.50 eggs (day 97) to 6.50 eggs (day 80). It was observed that the eggs for wheat germ-based diet were actively produced when the female adults reached at age 13 to 69 days (day 37 until day 93) and the eggs for sweet potato-based diet were actively produced when the female adults reached at age 13 to 70 days (day 37 until day 94) which close to the findings by Huang and Chi (2014). On the contrary, Gomina et al. (2014) stated that *B. dorsalis* females deposited the maximum number of eggs on mango was between the 11th and the 28th day after emergence. Thus, the optimum reproduction age of *Bactrocera* fruit flies is when the female flies are about 3 to 7 weeks old (Walker et al. 1997). The fecundity decreased after day 93 and the females remained alive for a maximum of 86 days for wheat germ diet (Figure 2) while the fecundity also decreased after day 94 and the female remained alive for a maximum of 84 days for sweet potato diet (Figure 3).

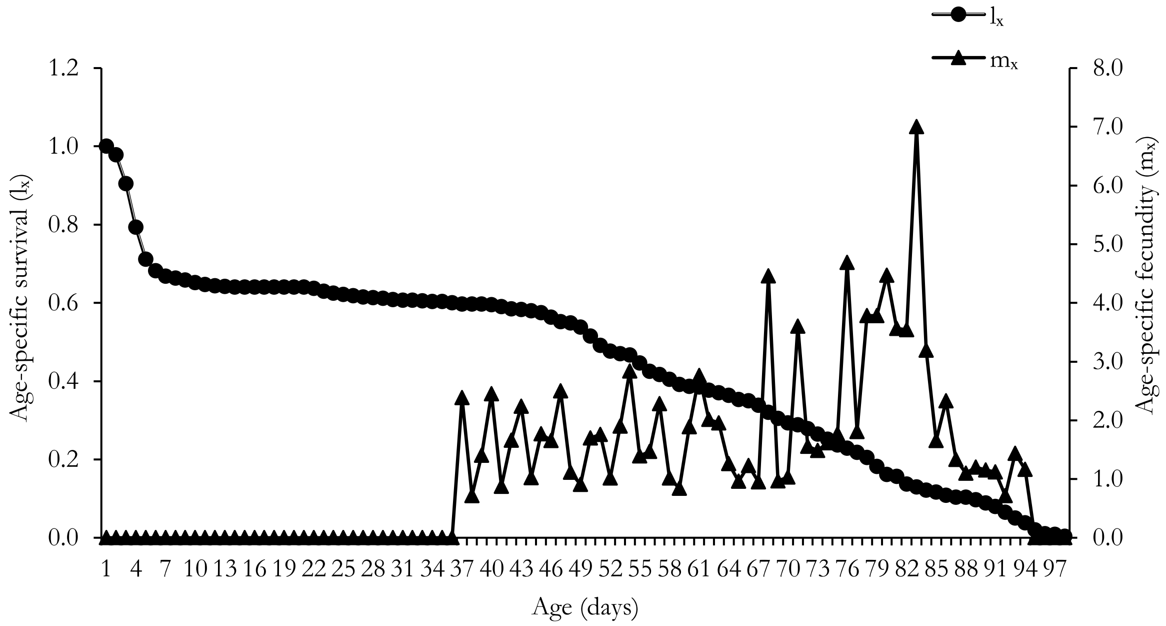

Figure 2. Daily age-specific survival (l_x) and fecundity (m_x) of female *B. dorsalis* for wheat germ-based diets

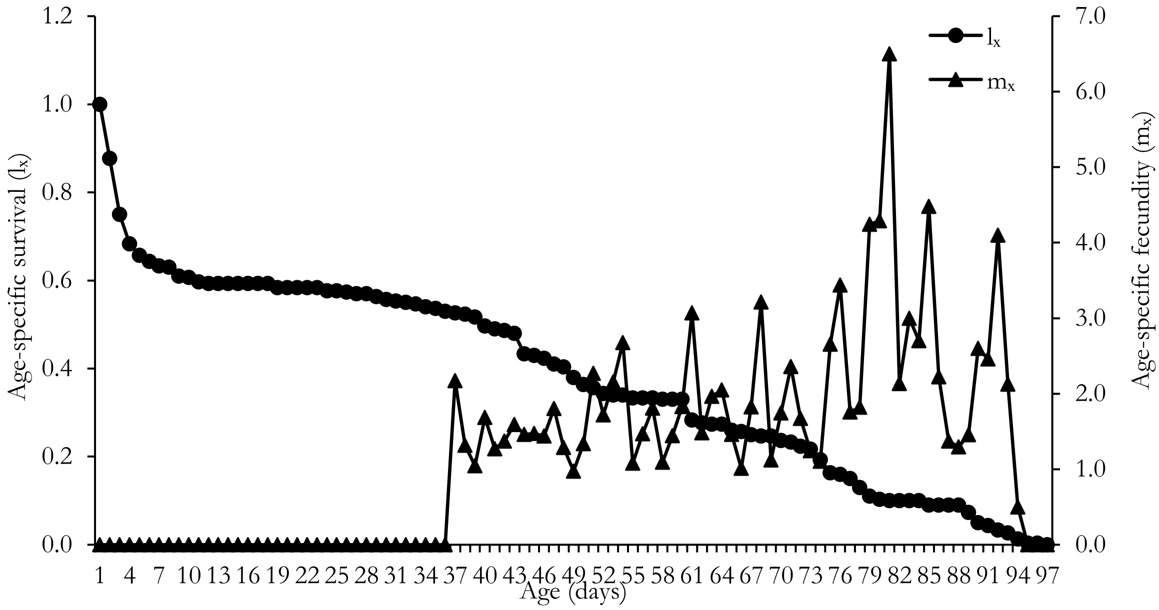

Figure 3. Daily age-specific survival (l_x) and fecundity (m_x) of female *B. dorsalis* for orange sweet potato-based diets

Table 4 summarized the population and reproductive parameters of *B. dorsalis* for both diets. The intrinsic rate of natural increase (r_m) of *B. dorsalis* for both diets were the same at 0.06 per female per day. The daily finite rate of increase (λ) was 1.06 female progenies per female per day with mean generation time (T_c) of around 59 days. For wheat germ-based diet, the gross reproduction rate (GRR) and net reproductive rate (R_o) of female were 111.71 and 35.12 while the gross reproduction rate (GRR) and net reproduction rate (R_o) of female for sweet potato-based diet were 118.25 and 26.77, respectively. The population of *B. dorsalis* for both diets required about 12 days to double its number. Generally, a short period of development and high reproduction rate are considered as the species adaptability. In this study, the life table results for both diets indicated that this particular *B. dorsalis* species shows high net reproductive rate (R_0) and finite rate of increase (λ) with lower doubling time (DT). This showed that the population of *B. dorsalis* has rapid build-up in a short period of time which similar to Salmah et al. (2019).

Table 4. Life table parameters of *B. dorsalis*

Parameters	**Formula**	**Wheat germ based-diet**	**Orange Sweet potato based-diet**
Gross reproduction rate (GRR)	$\sum m_x$	111.71	118.25
Net reproduction rate (R_o)	$\sum l_x m_x$	35.12	26.77
Mean generation time (T_c), in days	$\sum(x l_x m_x)/\sum l_x m_x$	58.51	58.72
Intrinsic rate of natural increase (r_m)	$\ln R_o/T_c$	0.06	0.06
Finite rate of increase (λ)	e^r	1.06	1.06
Doubling time (DT), in days	$\ln 2/r_m$	11.55	12.38

Growth and Development of *Bactrocera dorsalis*

The results regarding different biological parameters of *B. dorsalis* are given in Table 5. The individuals of *B. dorsalis* reared on wheat germ and sweet potato-based diets showed no significant difference (*P*>0.05) for larval duration, pupal duration, pupae weight, adult emergence, adult longevity, fecundity, pre-oviposition, and oviposition period for both diets.

Table 5. Biological Parameters of *B. dorsalis*

Biological parameters	Diet	
	Wheat germ (Mean±SE)	**Orange Sweet potato (Mean±SE)**
Larval duration (days)	10.00±0.58a	11.33±0.33a
Pupal duration (days)	12.00±1.15a	12.33±0.88a
Pupae weight (mg)	13.12±0.28a	13.88±0.19a
Larval survival (%)	64.00±1.15a	59.33±0.33b
Emergence (%)	62.33±1.45a	57.67±0.88a
Pre-oviposition period (days)	13.80±0.58a	13.60±0.40a
Oviposition period (days)	51.40±1.72a	55.40±1.44a
Daily eggs (eggs/day)	40.87±2.38a	29.49±2.45b
Fecundity (eggs/female)	2107.00±167.00a	1642.00±164.00a
Male longevity (days)	90.20±2.63a	92.00±1.87a
Female longevity (days)	87.00±2.43a	86.40±3.08a

Means with the same letters in different columns are not significantly different (P>0.05).

However, larval survival and the daily eggs were significantly higher (*P*<0.05) when the fly was reared on wheat germ-based diet compared to individuals reared on sweet potato-based diets. The differences of larval survival and daily eggs observed in *Bactrocera* species were mainly affected by the diet provided to the larval that has different nutrient contents (Salmah et al. 2020) although the experimental conditions could also affect the daily eggs production (Gomina et al. 2014). In this case, the larval reared with wheat germ-based diet showed a significantly higher survival.

Although the results showed that the daily survival of *B. dorsalis* larvae and eggs was much higher when fed with wheat germ diet, but sweet potato based-diet still showed the potential to be as good as wheat germ-based diet since there was no significant difference in other biological parameters between both diets, particularly on the larval duration, pupal duration and pupal weight. Ekesi and Mohamed (2011) found that the weight of pupa is considered a desirable trait in the production process, as this is a good indication of the body size of the fly which the size of fly is also a determining factor of fertility and insect fertility. Thus, pupal development period and weight are the vital key factors for the survival of insect pest (Jaleel et al. 2018).

In this study, we found that the orange sweet potato diet is potentially used for fruit flies' mass-rearing in the future, and plus in terms of cost it is more economical than the wheat germ diet (Salmah et al. 2020). This showed that expensive nutritious diets do not necessarily result in better performance from the flies produced compared to low-cost diets (Goane et al. 2019; Pascacio-Villafán et al. 2015). However, there is still a need to standardize materials to ensure the uniformity of fly quality in mass-rearing programs and more detailed studies will be needed to check the suitability of techniques for mass-rearing of fruit flies.

CONCLUSIONS

In this study, the life table and demographic parameters of *B. dorsalis* reared on wheat germ and sweet potato-based artificial diet were compared and showed similar results. *Bactrocera dorsalis* individuals reared on sweet potato-based diet showed the potential to perform compatible with wheat germ-based diet with respect to similar biological parameters which are the larval duration, pupal duration, pupal weight, adult emergence, adult longevity, pre-oviposition, oviposition period and fecundity. The results obtained is useful for researchers to emphasis mass-rearing of this species in laboratory particularly for IPM programs such as biological control programs. It is hoped that our findings could enhance the knowledge of *B. dorsalis* life history in order to develop a better monitoring and management control methods of this pest. We also hoped that this study will provide an economic and convenient way to construct life tables particularly for *B. dorsalis* population biology and ecological research.

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