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Effect of Dietary Restriction on Survival, Longevity and Fecundity of Blowfly *Chrysomya Chloropyga (*Wied.) (Diptera: Calliphoridae)

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Abstract: *Dietary Restriction (DR) was used to determined the survival, longevity, adult weights and fecundity of adult reared blowfly Chrysomya chloropyga.Twenty males and 20 females each were put in cages and exposed to continuous feeding (control) and 24, 48, 72 and 96 hr dietary restrictions periods. The flies were fed on a mixture of ground rice and fish paste for an hour after every restriction periods. Sugar and water were provided. Developments of the ovaries under various treatments were determined by dissecting females at day 18 of exposure. Protein contents of whole male and female from each of the treatments were also determined*

DR reduced the life span of the adult blowfly C. chloropyga. Maximum longevity of control male and female flies was 59 and 67 days; 44 and 45 days for 24 hr and 38 and 33 days for 96 hr restrictions respectively. Adult male and female weights decreased with increase in exposure and with age. There were no developed ovaries in females exposed to restricted diets hence no egg laying and mean fecundity in control females was 106.8±9.12 eggs.Protein concentrations in male decreased with age from 5-30 days and with exposure to dietary restriction but no pattern with female age except with exposure to dietary restriction. Protein content with age or with exposure to restricted diets was higher in females than in males. In conclusion, the study showed that dietary restriction in C. chloropyga did not prolong the lifespan of the blowfly species. The non-production of eggs in females exposed to restricted diets is probably due to insufficiency of proteins from the diet used in this study. A diet of blood source is recommended for a similar study.

Keywords: *Chrysomya chloropyga, dietary restriction, survival, fecundity*

I. Introduction

Dietary restrictions (DR) have been shown to increase life span in yeast (Jiang *et al.*, 2000), nematodes (Klass, 1977). It was reported that DR may extend life span in primates (roth *et al.*, 1999) and potentially give health benefits in humans (Fontana *et al.*, 2004). Nevertheless, DR does not appear to extend lifespan in the housefly *Musca domestica* (Cooper *et al*., 2004), and medfly *Ceratitis capitata* (Carey *et al*., 2002), as it decreased their life span while in the fruit fly *Drosophila melanogaster* (Pletcher *et al*., 2002; Mair *et al*., 2003). Mair *et al.* (2005) demonstrated that the reduction of either dietary yeast or sugar in *Drosophila melanogaster* reduced mortality and extend life span. Pletcher *et al.* (2002) showed that the control life span of 25.4 days in *Drosophila* was extended by above 80% (46.2 days). Patridge *et al.* (2005) demonstrated that life span of *Drosophila* increased to a maximum through DR and then decreased through starvation. Daily and lifetime fecundities of females were reduced by food dilution throughout the DR and starvation range. Metaxakis and Patridge (2013) showed that dietary restriction increased the lifespan of wild-derived population as well as lab-adapted strain of *D. melanogaster* and decreased female fecundity. Min *et al.* (2007) showed that *Drosophila* maintained on low-yeast diet are long- lived with median life span of 46 days and 32 days for high yeast which also induces high egg production and weight gain.

Burger *et al.* (2007) studied virgin female *Drosophila* on one of three diets, with sucrose and yeast concentrations ranging from 7, 11 to 16 (w/v) and confirmed that DR extends lifespan: median life span ranged from 38 (16% diet), 46 (11% diet) and 54 days (7% diet), and also showed that DR reduced fecundity. Le bourg and Minois (1996) reported no positive effect of food restriction on longevity in either sex in mated and virgin *Drosophila melanogaster*. Adult caloric restriction in the butterfly, *Speyeria mormonia* had no effect on male or female life span but reduced female fecundity (Boggs and Ross, 1993). Chen *et al*. (2009) observed an extension of life span upon caloric restriction in the silkworm *Bombyx mori* . Adler *et al.* (2013) found that DR extended life span of both sexes of the neriid fly *Telostylinus angusticollis*n by 65% and rendering the females completely infertile. Ellers *et al.* (2011) used dietary dilution and intermittent feeding to examine the effect of DR on longevity and fecundity and showed that only the dietary dilution treatment showed an effect of DR with the highest longevity recorded at 80% sucrose with no effect on fecundity. This is in contrast with the work of Roll *et al*. (2011) who showed that intermittent feeding significantly extended longevity of crickets with a maximum longevity of 128% and 140% for DR24 and DR36 greater than control respectively for females, and

maximum longevity of 123% and 118% for males on DR24 and DR36 respectively.Diet restriction did not extend life span in *Musca domestica*. *Chrysomya chloropyga*, a dipterous fly, share several similar characteristics with the housefly, except size and colour hence the present study on dietary restriction in *C.chloropyga*, a ubiquitous blowfly in Nigeria.

II. Materials And Methods

Effect of dietary restriction on survival and longevity.

Laboratory-reared adult flies were distributed into five cages ($40 \times 30 \times 30$ cm^3) containing 20 males and 20 females each and exposed to different feeding regimes which included: continuous feeding, 24, 48, 72, and 96 hours of diet restriction on a mixture of ground rice and fish paste (Anantiko et al.,1982). Flies were fed for one hour after each restriction. For the continuous feeding regime, which served as control, the flies were fed *ad libitum* with the diet replaced every 72h. Water and sugar were provided in all the cages throughout the experiment which were replicated in triplicate. Survival of adult males and females on the various feeding regimes were determined by picking and recording dead flies daily until the death of the entire population. Longevity was determined by the maximum number of days the insects lived.

Effect of dietary restriction on body weight and fecundity.

Adult weights of males and females from each of the feeding regimes were taken every three days as they age up to day 30 on Mettler weighing balance. Eggs laid by the control females and females exposed to 24, 48, 72 and 96 hr dietary restrictions were removed and counted to determine accordingly.

Dietary restriction and ovary development.

Adult females from each of the dietary restrictions and control were dissected using illuminated dissecting microscope (Zeiss Instrument, Stemi 2000) at 18 days of age to determine the condition of the ovary under the various dietary regimes.

Total protein content of adult males and females.

Newly emerged adult males and females from the five dietary restricted groups (0, 24, 48, 72, and 96 hrs.) were collected at age 5, 20, and 30 days in a plastic bottle and freeze killed. Male and female whole body homogenates from each of the samples were prepared by homogenizing the flies with 1ml distilled water. Total protein content of the samples were determined according to Lowry *et al.* (1951) using Bovine Serum Albumin (Sigma) as standard.

III. Results

Survival of males exposed to various dietary restrictions.

Mean percent survival of males exposed to 24, 48, 72, and 96 hours respectively at 96 and 100 percent was between days 0 and 6 but up to day 9 in unexposed (control) males (Fig. 1). Control males exhibited progressive decrease in survival from days 9 up to 63 days. Estimates from the slope between days 8 and 20 for control, 24, 48, 72 and 96 hours were approximately 1 for control and 2 for the restricted males dying per day during the periods. At day 40, survival of males in the control was 55% indicating 51% survival but between 6 and 14% for those exposed to the various diet restriction. Percent survival at day 24 for the control was 68% compared with 59,37,34 and 23% for males restricted at 24, 48, 72 and 96 hours respectively.

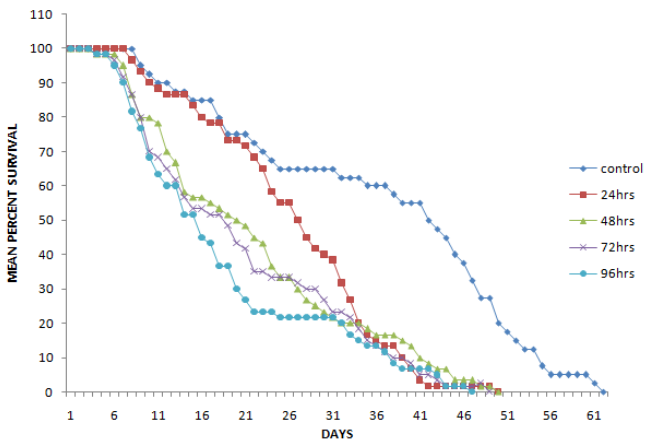

Fig.1. Mean percent survival of male *C. chloropyga* exposed to 24, 48, 72 and 96 hours dietary restriction and the control.

Survival of females exposed to various dietary restrictions.

Mean percent survival of females exposed to 24, 48, 72, and 96 hours respectively at 96 and 100 percent was between days 0 and 7 but up to day 15 in females not exposed to diet restriction (Fig.1). Control females exhibited progressive decrease in survival from days 15 up to 68 days. Estimates from the slope between days 12 and 20 for control, 24, 48, 72 and 96 hours were approximately 1 for control and 2 for the restricted females dying per day during the periods. Percent survival at day 24 for the control was 72% compared with 62,44,34 and 26% for females restricted at 24, 48, 72 and 96 hours respectively. At day 40, survival of females in the control was 50% indicating 50% mortality but between 5 and 13% for those exposed to the various diet restriction.

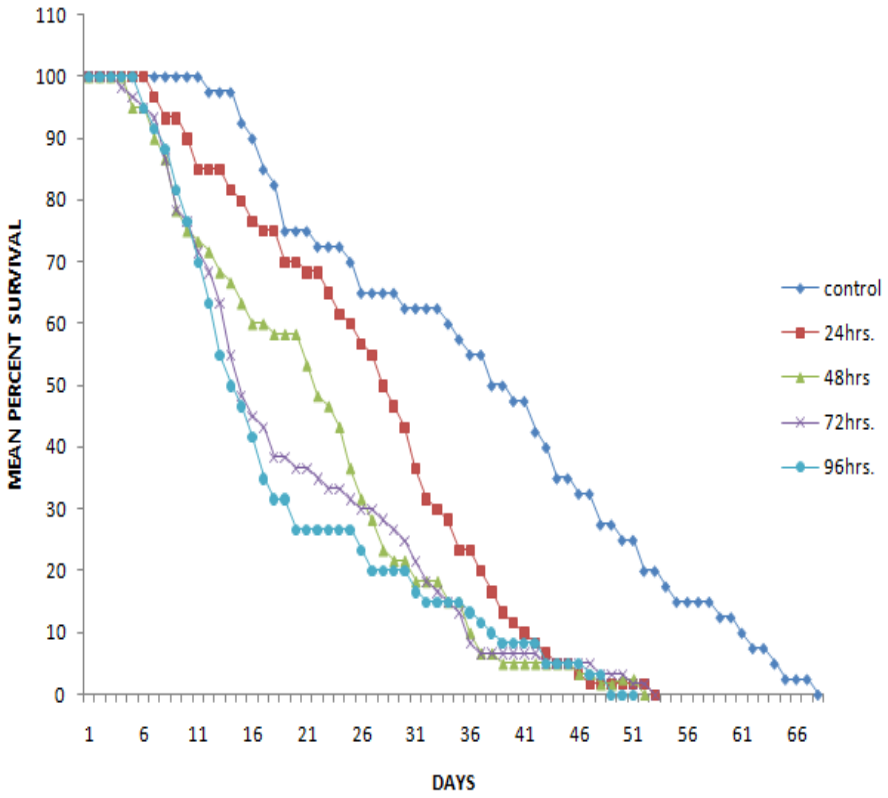

Fig.2. Mean percent survival of female *C. chloropyga* exposed to 24, 48, 72 and 96 hours dietary restriction and the control.

Median survival time of males and females exposed to various dietary restriction.

Median survival time (i.e the age when 50% of the flies were deceased) of males and females *C. chloropyga* under different diet restriction is shown in Table 1. The median survival times of males exposed to 24, 48, 72, and 96 hrs were 29, 20, 19, and 18 days while those of females similarly exposed were 28, 21, 20, and 19 days respectively. Median survival time of unexposed (control) males and females were 34 and 39 days respectively. There was no significant difference in the median survival time of males as well as females throughout the period of exposure ($p > 0.05$). Comparison of median survival time between males and females at each time of exposure showed no significant difference ($p > 0.05$). There was also no significant difference on comparison between males and females exposed to 24, 48, and 72 hr diet restriction with males and females unexposed (control), but there was a significant difference in males exposed to 96hr diet restriction when compared with the control males ($p < 0.05$).

Table I Median survival time (days) of males and females *C.chloropyga* under different dietary restrictions.

Median survival time (days)		
Dietary restriction (hr.)	Male	Female
24	29 ± 2.08	28± 0.58
48	20± 8.51	21± 6.36
72	19± 7.00	20± 6.51
96	18± 6.00	19± 6.33
Control	34± 5.00	39± 8.50

Longevity of males and females exposed to various dietary restrictions.

Maximum longevity of males and females exposed to 24, 48, 72, and 96 hr. dietary restriction fluctuated between 24 and 96 hours with the lowest and highest at 38 and 44 days for the males and 33 and 45 days for females respectively (Table 2). Control males and females lived for 59 and 67 days respectively. There was no significant difference in the mean longevity of males and females separately exposed to various period of dietary restriction ($p > 0.05$). A comparison between males and females each at 24, 48, 72, and 96 hours dietary restriction showed no significant difference in the longevity ($p > 0.05$). Maximum longevity at 24, 48, 72, and 96 hours of males and females exposed to dietary restriction were separately compared with the unexposed males and females (control), were not significantly different from each other ($p > 0.05$). Males exposed to 24 hours dietary restriction was however significantly different from the control males ($p < 0.05$).

Table II Maximum longevity (days) of males and females *C.chloropyga* under different dietary restrictions

Maximum longevity (days)		
Dietary restriction (hr.)	Male	Female
24	44 ± 2.85	45± 3.61
48	38 ± 6.01	39 ± 7.45
72	43 ± 3.46	36 ± 8.76
96	38 ± 4.26	33 ± 8.45
Control	59 ± 4.00	67 ± 1.50

Dietary restriction and weights of male *C. chloropyga.*

Mean weight of adult male *C. chloropyga* exposed to different dietary restrictions at different ages is shown in Table 3. Mean weight at different periods of exposure ranged between 20.00 and 50.00mg. Weight decreased with increase in exposure to dietary restriction at ages 3, 6, 9, 12, 18, and 21 days and became constant at 20.00mg at 24, 27, and 30 days of age. Weight of control males were generally higher than weight of males exposed to dietary restriction. Mean weight generally decreased from ages 9 to 30 days in both the control and those exposed to dietary restriction. There was significant difference in the weight of males separately exposed to 24, 48, 72, and 96 hours dietary restriction at ages 0-30 days ($p < 0.05$), but there was absence significant difference in the weight of males unexposed to dietary restriction ($p > 0.05$). There was significant difference in the weight of males exposed to the various periods of dietary restriction when compared with the control males ($p < 0.05$).

Table III Mean weight (mg) of adult males *C. chloropyga* under different dietary restrictions at different ages.

	Dietary restrictions (hr.)				
Age (Days)	**24**	**48**	**72**	**96**	**Control**
0	30.00±0.00^{ab}	30.00±0.00^{ab}	30.00±.00^{abcd}	33.33±3.33^{b}	36.67±3.33^{a}
3	50.00±5.77^{d}	40.00±0.00^{bc}	36.667±3.33^{cd}	36.67±3.33^{b}	46.67±8.82^{a}
6	50.00±0.00^{d}	46.67±3.33^{c}	40.00±0.00^{d}	30.00±0.00^{ab}	50.00±5.77^{a}
9	40.00±0.77^{cd}	30.00 ±0.00^{ab}	33.33±0.33^{bcd}	30.00 ±0.00^{ab}	53.333±6.67^{a}
12	30.00 ±0.00^{ab}	30.000 ±0.00^{ab}	26.67 3.33^{abc}	30.00 ±0.00^{ab}	50.00±5.77^{a}
15	30.00 ±0.00^{ab}	26.67 ±3.33^{a}	23.33 ±3.33^{ab}	26.67±3.33^{ab}	50.00 ±0.00^{a}
18	30.00±0.00^{ab}	26.67±3.33^{a}	30.00±0.00^{abcd}	26.667±3.333^{ab}	50.000 0.00^{a}
21	30.00 ±0.00^{ab}	23.33 ±3.33^{a}	23.33±3.33^{ab}	20.00 ±0.00^{a}	46.67 ±3.33^{a}
24	20.00 ±0.00^{a}30	20.00 ±0.00^{a}	20.00 ±0.00^{a}	20.00 ±0.00^{a}	40.00 ±0.00^{a}
27	20.00 ±0.00^{a}	20.00 ±0.00^{a}	20.00 ±0.00^{a}	20.00±0.00^{a}	40.00±0.00^{a}
30	20.00±0.00^{a}	20.00±0.00^{a}	20.00±0.00^{a}	20.00±0.00^{a}	40.00±0.00^{a}

Mean followed by the same letter along the same column are not significantly different ($p > 0.05$) by Turkey HSD test.

Dietary restriction and weights of female *C. chloropyga.*

Mean weight of adult female *C. chloropyga* exposed to different dietary restriction at different ages is shown in Table 4. There was general increase in weight of females from day 0 to 3-day-old females in females nexposed to restricted diets and inthe control Weight of females under various dietary restrictions decreased progressively from ages 9 to 30 days. Weights of the control females were generally higher than weight of females exposed to various dietary restriction at all ages of the adult. Control females continuously increased in weight from 36.67±3.33 at day 0 to 56.67±3.33 at 15 days of development. Females exposure to 24, 48, 72, and 96 hr dietary restriction and the control generally increased in body weight within three days of exposure There was significant difference in the weight of females separately exposed to 24, 48, 72, and 96 hours dietary restriction and also in the control at all ages ($p < 0.05$). Male and female weights were significantly different from each other at 24, 48, and 72 hr. dietary restriction ($p < 0.05$) but not significantly different at 96 hr. and in the control male and female. There was significant difference weights of females exposed to various dietary restrictions when compared with control females ($p < 0.05$).

Table IV Mean weight (mg) of adult females *C. chloropyga* under different dietary restrictions at different ages.

Dietary restriction (hr.)					
Age (Days)	**24**	**48**	**72**	**96**	**Control**
0	30.00±0.00^{a}	30.00±0.00^{b}	30.00±0.00^{abc}	33.33±3.33^{bc}	36.67±3.33^{a}
3	50.00±5.74^{bc}	46.67±3.33^{d}	46.67±3.33^{d}	36.67±3.33^{bc}	43.33±3.33^{abc}
6	53.33±3.33^{bc}	50.00±0.00^{e}	46.67±3.33^{d}	40.00±0.00^{c}	50.00±0.00^{bcd}
9	46.67±3.33^{abc}	40.00±0.00^{cd}	36.67±3.33^{cd}	36.67±3.33^{bc}	50.00±0.00^{bcd}
12	36.67±3.33^{abc}	30.00±0.00^{b}	33.33±3.33^{bc}	30.00±0.00^{b}	53.33 ±3.33^{cd}
15	33.33±3.33^{ab}	30.00±0.00^{b}	30.00±0.00^{abc}	30.00±0.00^{b}	56.67±3.33^{d}
18	36.67±6.67^{abc}	33.33±3.33^{bc}	30.00±0.00^{abc}	30.00±0.00^{b}	50.00±0.00^{bcd}
21	36.67±3.33^{abc}	30.00±0.00^{b}	30.00±0.00^{abc}	20.00±0.00^{a}	46.67±3.33^{abcd}
24	33.33±3.33^{ab}	26.67±3.33^{ab}	30.00±0.00^{abc}	20.00±0.00^{a}	43.33±3.33^{abc}
27	33.33±3.33^{ab}	20.00±0.00^{a}	23.33±3.33^{a}	20.00±0.00^{a}	40.00±0.00^{ab}
30	30.00±0.000^{a}	20.00±0.00^{a}	20.00±0.00^{a}	20.00±0.00^{a}	40.00±0.00^{ab}

Mean followed by the same letter along the same column are not significantly different ($p>0.05$) by Turkey HSD test

Dietary restriction and fecundity.

Table 5 shows the mean fecundity and age at first egg laying of females exposed to different dietary restrictions. Mean fecundity of control females was 106.8±9.12 and age at first egg laying was 11±0.33 days. There was no egg deposit in females exposed to 24, 48, 72, and 96 hours dietary restriction.

Table V Mean fecundity and age at first egg-laying of females *C. chloropyga* exposed to different dietary restrictions.

Dietary restriction (hr.)	Mean Fecundity	Age at first egg laying (days)
Control	106.8±9.12	11±0.33
24	0	No egg laid
48	0	No egg laid
72	0	No egg laid
96	0	No egg laid

Dietary restriction and ovary development

Eggs were fully developed in the ovary of females exposed to continuous feeding (control) as shown in Plate 2. Ovaries of females under 24hr dietary restriction showed several minute undeveloped eggs. There were few minute eggs in the ovaries of females exposed to 48hr dietary restriction and ovarioles were discernible in females under 72 and 96hr dietary restrictions (Plate 3).

Plate 2 Ovary with mature eggs in control females (continuous feeding) at 18 days of age

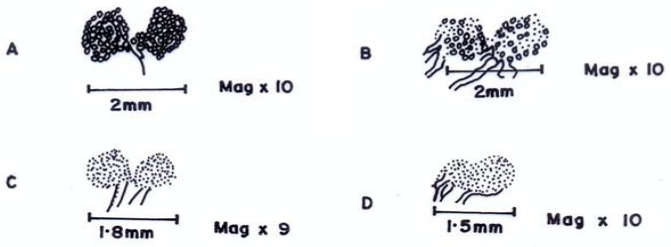

Plate 3 : Conditions of the ovaries in females exposed to dietary restriction at A 24, B 48, C 72, and D 96 hrs.

Protein concentrations of males exposed to dietary restriction

Protein concentrations of male *C. chloropyga* exposed to 24, 48, 72, and 96 hours dietary restriction and unexposed (control) at different periods are shown in Table 6. In males maintained for 5, 20, and 30 days, protein concentrations of males decreased from 5-30 days but fluctuated at each period of dietary restriction, with the minimum concentration of 0.90, 1.16 and 0.86mg/ml respectively at 96hr dietary restriction. Protein concentrations for control females were 2.98, 2.96 and 2.60mg/ml respectively. There was significant difference in the protein concentration of males maintained for 5, 20 and 30 days and exposed to various dietary restrictions. Protein concentration of males maintained for 5 days and exposed to various periods of dietary restriction showed significant difference when compared with the control ($p < 0.05$).Those similarly exposed for 20 days was significant at 72hr. exposure when compared with the control ($p < 0.05$). There was significant difference in males maintained for 30 days and exposed to 96hr dietary restriction in comparison with the control ($p < 0.05$). There was no significant difference in the protein concentrations of males and females maintained for 5, 20 and 30 days on exposure to various dietary restrictions.

Table VI Mean of protein concentrations (mg/ml) of males *C. Chloropyga* exposed to different dietary restrictions.

Dietary restriction (hr)					
Age (Days)	Control	24	48	72	96
5	2.98±0.25	2.27±0.26	1.73±0.21	1.95±0.07	0.90±0.07
20	2.96±0.44	2.50±0.37	1.85±0.17	1.80±0.09	1.16 ±0.09
30	2.60±0.28	1.73±0.06	1.16±0.18	1.43±0.23	0.86±0.03

Protein concentrations of females exposed to dietary restriction

Protein concentrations of whole body homogenate of females exposed to 24, 48, 72, and 96 hours dietary restriction and unexposed (control) at different periods are shown in Table 7. Protein concentrations of females exposed to 24, 48, 72, and 96 hours dietary restriction generally decreased with increase in exposure and also decreased with age from 2.01mg/ml at day 5 to 0.88mg/ml at day 30. In the control females, protein concentrations fluctuated with age increasing from 2.74±0.25 at day 5 to 3.42±0.24mg/ml at day 20 and thereafter decreased to 3.32± 0.32mg/ml at day 30. There was significant difference in the protein concentration of females maintained for 20 and 30 days and exposed to dietary restriction for 24, 48, 72, and 96 hours ($p<0.05$), but not significant for those maintained for 5 days ($p >0.05$). There was no significant difference in females maintained for 20 days and exposed to 48 and 96hr dietary restriction respectively and even when compared with the control females ($p > 0.05$). There was also no significant difference in the protein concentration of females maintained for 30 days and similarly treated but significant for females exposed to 24 and 96hr dietary restriction respectively ($p < 0.05$).

Table VII Mean of protein concentrations (mg/ml) of female *C. chloropyga* exposed to different dietary restrictions.

Dietary restriction (hr)					
Age (Days)	Control	24	48	72	96
5	2.74±0.25	2.01±0.33	2.09±0.25	1.77±0.07	1.25±0.25
20	3.42±0.24	2.27±0.28	1.92±0.02	1.87±0.13	1.00±0.07
30	3.32±0.32	1.93±0.18	1.83±0.07	1.70±0.11	0.88±0.06

IV. Discussion

Males and females exposed to different periods of dietary restrictions (DR) between 24, 48, 72 and 96 hr. including the control demonstrated progressive decrease in population from time of exposure till the time the population dies out. There was however stability of the population at 100% survival for control males and females lasting 8 and 12 days respectively. Essentially there was no significant difference in the survival of the population of males and females exposed to DR. Indicating that DR has no effect on survival of males and females since decrease in population was synchronous at each period of exposure. It is however observed that the higher the exposure the lower the survival. It shows survival of males and females *C. chloropyga* is not dependent on quantity of diet. This is also the same for maximum longevity which shows no significant difference in males and females exposed and those unexposed. Although there was no significant difference in survival and longevity in males and females, survival in the control was far better than males and females exposed to DR, also unexposed males and females lived longer than those exposed to DR. Consistency in the survival in the expose and unexposed males and females was demonstrated in the median survival time which also decreased with increase in exposure to diet. DR shorten the life span of males and females *C. chloropyga* exposed to different 24, 48, 72 and 96 hr dietary restriction. This is in consistent with the work of Cooper *et al*.

(2004) where caloric restriction failed to extend the life span of male houseflies *Musca domestica* fed sucrose only. Mollema *et al.* (2008) reported a reduction in life span in the fruit feeding butterfly *Bicyclus anynana* under caloric restriction.

There was no egg laying in females exposed to 24, 48, 72 and 96 hr. The current result is consistent with (Adler *et al*., 2011) who reported that dietary restriction rendered the neriid fly *Telostylinus angusticollis* completely infertile and Austad (1989) who reported that diet restriction in the spider *Frontinella pyramitela* delayed egg laying, reduced total fecundity. Partridge *et al*. (2005) reported a reduction in female's fecundity by dietary restriction. Burger *et al*. (2006) showed that dietary restriction reduced fecundity in *D. melanogaster*. Metaxakis and Patridge (2013) reported that dietary restriction decreased female fecundity of wild-derived population as well as lab- adapted strain of *D. melanogaster*. The present study of *C. chloropyga* is in agreement with earlier studies, indicating that the quantity of food available to the females *C. chloropyga* at those periods of exposure were grossly inadequate to initiate ovarian development and eventual egg formation. These are in contrast with control females with a mean fecundity of 106.8±9.12 and first egg laying at day 11.

The exposures to various period of DR also affected the weight since there was decrease in weight with increase in exposure to DR. It was also observe that the weight decreases with increase in age therefore the longer the exposure to DR the lower the weight of male and even with females which increase in weight from day 0-15 in the control females. Generally females weight higher than males at different period and at different ages. This is unexpected since there was no reproductive development in the expose females suggesting that female component part in respective of ovarian development are heavier than those of males. The reduction in body size as a result dietary restriction in female of butterfly *Bicychus anynana* and the lady bird beetle *Harmonia axyridis*, respectively was reported by (Bauerfeind and Fischer, 2005; Dmitriew and Rowe, 2011).

In the current studies females exposed to dietary restriction for 24, 48, 72 and 96 hr dissected at 18 days of age revealed entirely undeveloped ovaries except in the unexposed females with eggs. Probably the insufficiency of protein, resulting from duration of feeding may be responsible for the undeveloped ovaries in this study. The result is in agreement with Adler *et al*. (2013) who reported undeveloped ovaries in the neriid fly *Telostylinus angusticolli* exposed to dietary restriction. Schwartz *et al.*, 1985 reported that without dietary yeast (protein) oogenesis is arrested at previtellogenic stages. Lantz *et al*. (1994) reported that Orb homozygotes arrest ovarian development in the absence of dietary yeast. Omar (1995) reported the need of *Chrysomya albiceps* to feed on proteinous meal to start and complete its ovarian development. During ovarian development females exhibit food seeking behaviour for the protein needed for the development of the ovaries (Brown, 1992). Preference of female blowflies to a protein rich diet is correlated with the stage of ovarian development.

Protein concentration was determined at ages 5, 20 and 30days at different period of exposure up to 96 hr. The older the males and female, the more the number of days of exposure to DR, hence, higher protein concentration in 20 than 30-day-old males and females. These indicate that, the longer the exposure to DR the lower the protein concentration of whole body homogenate of males and females *C. chloropyga.* The protein concentration in males and females unexposed were higher than male and females expose to DR. The decrease in protein concentration with age and exposure to DR might weaken females selecting for mating partner and increase receptivity (Moskalik and uetz, 2011). Protein deprivation in adult stages affects adult size, longevity, and fecundity of the medfly (Cangussu and Zucoloto (1995). Protein ingestion is associated with egg production (Lee et al., 2008). Q-flies need to ingest protein for egg production and increasing protein intake leads to higher egg production rate (Meat and Leighton, 2004).

V. Conclusion

The restriction of mixture of ground rice and fish and water paste diet in the blowfly, *Chrysomya chloropyga* significantly reduced fecundity, survival and longevity.

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