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Extended Longevity of *Drosophila melanogaster* by Natural Waste *Citrullus lanatus* Seed

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Abstract: *Citrullus lanatus* (CL) have been used in many areas for centuries throughout the world. The study was investigated the effects of CL on the longevity of *Drosophila melanogaster* Meigen. The effects of different rates of CL (0.5-10% medium) were determined to female and male populations of insect for controls and CL groups. The findings demonstrated that the seed of CL as a source for natural waste product have potential uses for insect feeding.

Keywords: *Drosophila melanogaster*, *Citrullus lanatus, Ageing*

INTRODUCTION

Citrullus lanatus Thunb. (Cucubitaceae) have been used in many areas for centuries throughout the world [1,2]. The mature composition of watermelon include (per 100 g edible portion) [3]: carbohydrate 7.2 g, protein 0.6 g, fat 0.4 g, water 91.5 g, minerals (calcium 8 mg, phosphorous 9 mg, iron 0.17 mg) and vitamins (thiamine 0.08 mg, riboflavin 0.02 mg, niacin 0.2 mg, folate 2 mg and ascorbic acid 9.6 mg). The use of herbal products, such as watermelon seed (CL), is popular in folk uses because of their low side effects, accessibility, affordability and use as a cookie [2]. The seeds of CL has good antioxidant, antiinflammatory and analgesic potential [4,5].

These products are used as nutritional supplements, regional remedies, or as environmental pollutants without knowing the results, because the usage is limited. CL seeds are one among the less preferred fruit by products in survivorship experiments and insect diet [1,11] despite it presumed high nutrient level. In studies, the growth performance and potential effects of creatures diet with CL seed of such as fish have been investigate [2,6-10].

In this paper, the effects of CL seeds on the longevity in male and female population of *Drosophila melanogaster* Meigen (Diptera; Drosophilidae) were evaluated.

MATERIALS AND METHODS

The fruit fly (W^{1118}) strain has been maintained for many years (25° ± 1°C on standard patato medium, SPM [12]; in darkness and 40–60% humidity) in the Laboratory at the Necmettin Erbakan University in Konya. The virgins females are used in experiments. The flies transfer into fresh medium usually twice weekly.

The CL seeds were taken commercially in April (2019), and cleaned then dried under room temperature for 3 weeks. Then CL (0.5-10 %) were separately crushed in a mortar and powdered. It was dissolved using with 150 mL distilled water and added to SPM. The effects of CL on longevity were studied separately in female and male populations, and these experiments were repeated four times. Resveratrol (200 µM, Sigma-Aldrich) containing diet was used as a positive control group. On average, the same age and not mated individuals (N:100) were feed with experimental groups (Control SPM, 0.5-10% CL and Resveratrol). Mortality was recorded every day; the dead flies were removed from the vial. The feeding experiment was carried out until the last fly died.

The data were analyzed with Statistical Package programe, and graphics were drawn with Microsoft Excell programe. The mean longevity values of the all groups were subjected to Duncan's test ($p<0.05$ and 0.01).

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RESULT AND DISCUSSION

Many studies have confirmed that CL seed display significant on animals about antimicrobial, antiplasmodial, antiinflammatory, antioxidant, and analgesic properties [2]. It was found that the female lifespan of the control (SPM) was 58 days; and males of the same group were 56 days. The maximum female and male lifespan of the resveratrol group were 60 and 64 days, respectively. The difference between control and resveratrol groups is statistically significant ($p<0.05$) (Table 1).

Table 1. The longevity of male and female populations of CL-fed insect.

Treatment (%)	Female (N)	Max. life-span	Life-span (M ± SE)	p	Male (N)	Max. life-span	Life-span (M ± SE)	p
SPM (1)	100	58	57.38±1.96		100	56	54.30±2.16	
Resveratrol (2)	100	60	59.60±2.12	2-1,2,3*	100	64	58.90±2.00	2-1,2,3*
0.5 % CL (3)	100	58	56.06±1.50		100	56	53.93±1.90	
10 % CL (4)	100	58	57.52±1.92		100	55	54.58±1.48	

SPM: Control, M: Mean, Max: Maximum, SE: Standard error, N: total number of individuals, p: Probability levels between groups; *The mean difference is significant at the 0.05 level.

According to experimental groups, in the female population feed with CL (0.5%) and the highest CL group (10%) the maximum lifespan was 58 days. It was also found that the maximum male lifespan in 0.5% and 10% CL were 55 and 56 days, respectively (Figure 1). It was determined that the CL was not change the maximum lifespan of male and female population according to SPM, but using 0.5% CL slightly shortened the lifespan, which was statistically insignificant (Table 1). Bonjour and Fargo [11] found that the CL seed had significant effect on developmental time in the adult of *Anasa tristis*. For the fruit fly, the consumption of fruit may create a protective effect with endogenous enzymatic antioxidant defense systems, and change the longevity of male and female population [13,14] . The study confirms the work of other supported to availability of CL in food [1-12].

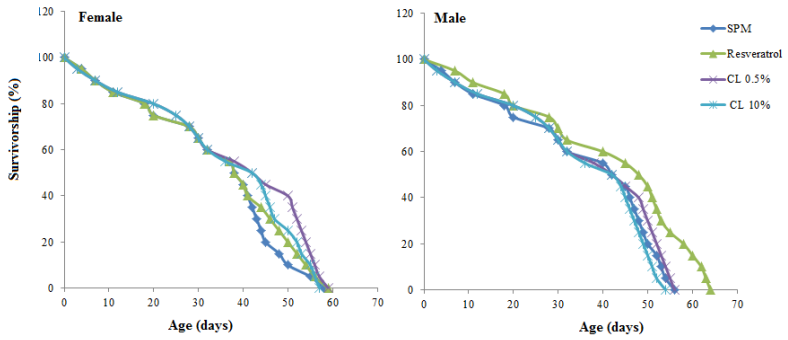

Figure 1. Survival curves of female and male populations of CL-fed insect.

CONCLUSIONS

The theories of aging caused by free radicals, longevity and use of food waste as feed additives are the most important issues studied in recent years. Although there is published regarding the chemical content of CL and seed, there are insufficient studies on the effects on longevity and aging of organisms. The findings obtained may provide a basis to antioxidant-oxidant-based aging studies the subject further.

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