most abundant corresponding to approximately 9% of the drosophilids collected in Tandil. This is probably a species originally from the Argentinean Chaco which was distributed by humans – together with its host *Opuntia ficus-indica* – to many parts of the world (Tidon-Sklorz and Sene, 1999).

Although this is still a preliminary study of the drosophilid fauna in Tandil, the diversity of the sampled species (10) was greater than that observed in areas near to those where we made our study. Iriarte and López (1995), evaluating during the four seasons of the year the fauna of these insects in the city of Mar del Plata, registered the occurrence of only seven species of which six were sampled in the present study. Data such as this suggest that further sampling of drosophilids should be made, during the different seasons of the year in Buenos Aires province.

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***Curcumin longa* and *Emblica officinalis* increase lifespan in *Drosophila melanogaster*.**

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Introduction

Every living organism ages with time. However, every individual wants to stay healthy, look younger, and live longer. In recent years, scientists are interested to discover the scientific clues to the aging process and to determine if the process of ageing is genetically or environmentally controlled, or by both. To this respect, different food components have been shown to increase life-span of many organisms; however, no conclusive evidence in favor of any particular food component has yet been established. Principally, oxygen free radicals or reactive oxygen species (ROS) are known to cause aging. Aerobic cells generate ROS as a by-product of oxidative metabolism. The primary assumption of this theory is that normal antioxidant defense levels are not sufficient, so that some ROS escape elimination causing molecular damage, some of which is irreparable and accumulates with age. If ROS cause aging, then enhanced defense against ROS

should reduce oxidative stress, slow down aging process, and ultimately extend the lifespan. These theoretical assumptions can be possible to test practically in model organisms like *Drosophila* as a baseline work which could further be extended to other organisms including humans.

Emblica officinalis (common Indian name "amla") and *Curcumin longa* (common Indian name "haldi", in English "turmeric") are very familiar plant derivatives in India and are considered to contain medicinal properties. Turmeric is commonly used in everyday life as a component of spices, and "amla" is very commonly taken as common practice. Both amla and turmeric are known to have high antioxidant property. Amla is known to contain Vitamin C and a number of tannins, whereas turmeric has curcuminoids known to be potential antioxidants. Earlier report has provided evidence of the fact that Amla (*Emblica officinalis*) extract increases life span of tumor bearing animals by up to 60% (Jose *et al*., 2001). However, such evidence is based on very limited studies with small number of animal models (Wiegant *et al*., 2009; Sowjanya Sree and Padmaja, 2008). It is well known that *Drosophila* has served as an important model organism for gaining information in genetical and biological aspects (including gerontological) that have direct relevance to human health (Birney, 2007; Bier, 2005). We hypothesize that if amla and turmeric bear any component that alters lifespan, it can very well be experimented with the *Drosophila* model. Since *Drosophila* share about 70% of its genome similarities with humans, any information from this research could be directly applied in human benefit.

Materials and Methods

Flies of *Drosophila melanogaster* used in the present experiments have been derived from a mass culture already being maintained in our lab since 2009. The flies were grown on standard Maize-yeast medium in the laboratory. For experimental set ups, the regular food media was mixed with turmeric extract in different concentrations (0.25 g/100 ml, 0.5 g/100 ml, and 0.7 g/100 ml). Similarly, for amla, two concentrations were taken, 20 ml/100 ml and 30 ml/100ml. In each case, virgin males and females (of similar age) were collected from the mass culture and three pairs (three males and three females) were transferred to a food vial with different concentrations of either amla or turmeric. In each experimental food vial these three pairs of flies were kept for five days, after which they were transferred to fresh food vials of similar concentrations. Each vial was minutely monitored and the numbers of dead flies were recorded. Each experiment was replicated 35 times (216 flies), and a controlled experiment (without any amla or turmeric) was also run simultaneously. For each experiment, life span of each fly was noted by simply noting the survivability of flies. All these experiments were conducted inside a BOD incubator with constant temperature (25˚C) and other environmental conditions.

Results

Life span with turmeric supplement

Variations in the rate of survivability of *D. melanogaster* flies in each category (with normal and supplemented food) were found and noted down in term of the number of days. For the control and the treated categories (for all the concentrations), the observations were tabulated (Table 1) and plotted (Figure 1). For the food supplemented with different concentrations of turmeric, a marginal increase in mean lifespan of the flies (~3%) at the turmeric concentration of 0.25 gm/100 ml of food in comparison to the controlled experiments was observed. However, at a turmeric concentration of 0.50 gm/100ml of food, a significant increase in life span was observed (Table 1, Figure 1). An

increasing trend of lifespan was also observed in the experimental flies supplemented with 0.7 gm/100 ml of food. However, the increase was not that linear as observed from 0.25 gm/100 ml to 0.50 gm/100 ml of turmeric supplement (Table 1, Figure 1).

Table 1. Survivability rate of *Drosophila melanogaster* flies under different concentrations of food supplements of turmeric and amla.

Survivability	Life span (in days)					
	Control	Turmeric			Amla	
		(0.25g/100 ml)	(0.5g/100 ml)	(0.7g/100ml)	(20 ml/100ml)	(30 ml/100ml)
Minimum	30	32	35	36	33	33
Maximum	36	38	43	44	37	38
Mean	34	35	40	40	36	36

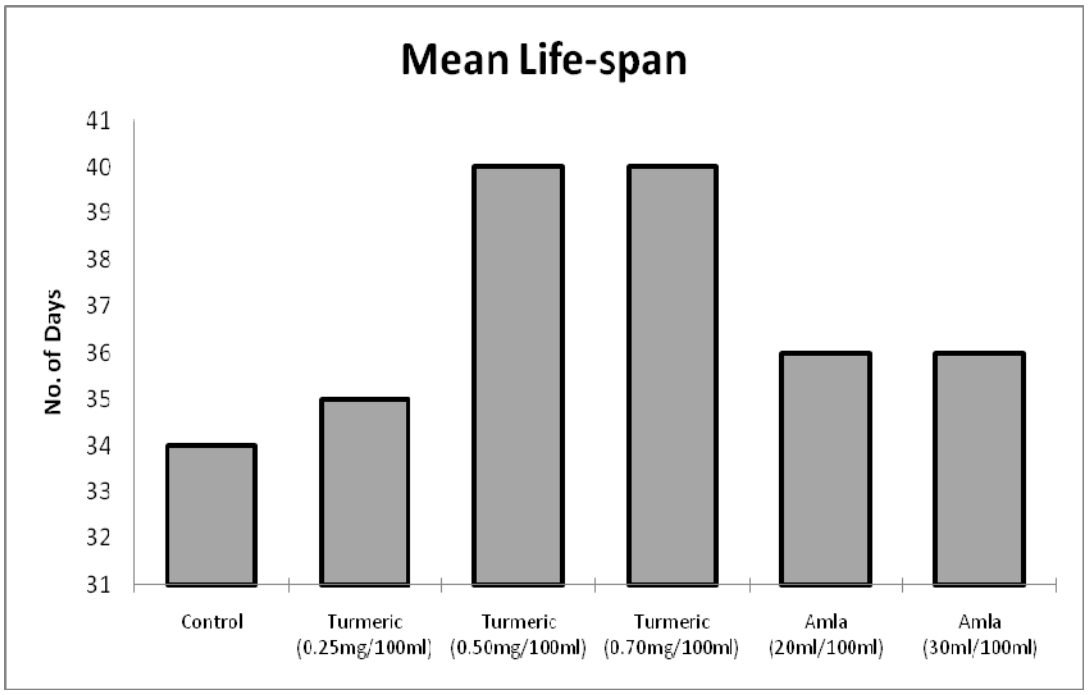

Figure 1. Mean lifespan of *D. melanogaster* flies exposed to different concentrations of turmeric and amla.

Life span with amla supplement

Like in the case of different concentrations of turmeric (see above), *D. melanogaster* flies fed with different concentrations of amla extract were found to affect the rate of survivability but at a lesser extent. At amla concentration of 20 ml/100 ml of food, there was a small increase in lifespan in comparison to the corresponding control lines (Table 1, Figure 1). For a concentration of 30 ml/100 ml, however, no visible increase in the average lifespan could be detected (Table 1, Figure 1). Thus, it is clear from the dataset that while turmeric has a high impact on the survivability rate of *D. melanogaster*, in comparison, amla does not increase the average lifespan of *D. melanogaster* flies to any significant extent.

Discussion and Conclusion

Various concentrations of turmeric and amla were tested for their effect on lifespan of *Drosophila melanogaster*. At lower turmeric concentrations, there was a marginal increase in lifespan of the flies. Higher concentrations increased the life span of flies significantly. Increasing the concentrations further did not show more increase in lifespan. This indicates that there is a particular concentration of turmeric which causes maximum lifespan extension (around 0.5 mg/100 ml of food). Concentrations beyond that do not further increase the lifespan, which may be due to the absorption threshold of turmeric and so, higher concentrations may not get absorbed completely, thereby, having no further effects on the lifespan. The increase in lifespan of the flies due to turmeric can be attributed to the high anti-oxidant properties of turmeric, as has been already documented before. However, observation of a very little effect of different concentrations of amla on the lifespan of *D. melanogaster* signifies that although amla was found to enhance the longevity of *D. melanogaster* flies, it does not bear the same property as of turmeric to drastically enhance the longevity.

Although the exact mechanisms of the action of turmeric and amla by which these plant products are able to enhance the survivability of *D. melanogaster* could not be ascertained from this study, it can be presumed that the results might hold of some significance in humans too. Turmeric and amla are two most commonly used plant products in India and are regularly used in preparation of many traditional herbal-based medicines (Ayurveda). However, enhanced lifespan cannot be attributed to just because of turmeric/amla, as several other factors, like genetic as well as environmental factors (living conditions, life-style, demographic location, pollution and contaminant levels, etc.), might have profound effect on this parameter. Whatever the case may be, it is shown here that turmeric has significant effect on the enhancement of longevity, at least in *D. melanogaster*.

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