and Tidon, 2011), in a protected area included at Parque Estadual Serra do Tabuleiro (Figure 1) with geographical coordinates: 27º48'20" S; 48º33'50" W. Adults collected were identified according with external morphology (Freire Maia and Pavan, 1949), after which, the male genitalia dissection technique of was performed (Kaneshiro, 1969).

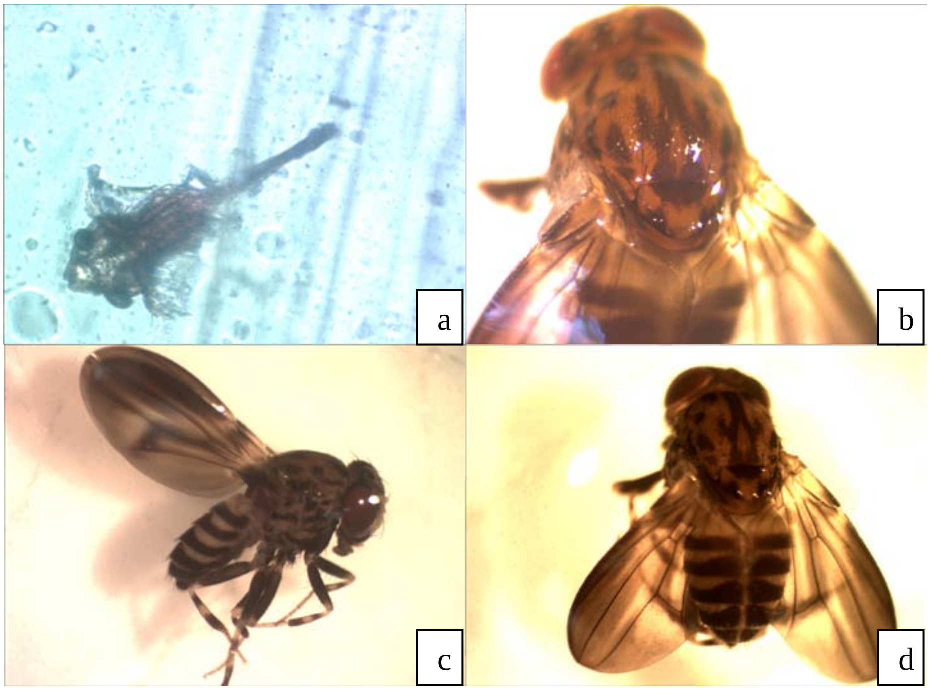

Figure 2. Pictures of external morphology of *Canalinea* group male terminalia, in a frontal view (a) and parts of the body (b, c, d) in different views.

Results

Three male individuals of *Canalinea* group were collected in a protected area included at Parque Estadual Serra do Tabuleiro, Santa Catarina State, South of Brazil. The frontal view of the internal male terminalia (Figure 2) shows very simillar with *D. canalinea*, but not so angulous. In this three individuals the tip of *aedeagus* is more rounded.

Conclusions

This is the first record of *Canalinea group* in this area of Santa Catarina State, that spread broadly its distribution, in these last 10 years, since it was collected by Doge, *et al.* (2008) in Joinville, SC. Further studies must be done about the dispersion and ecology, the breeding and feeding sites, of these groups as well as the description of these and 3 other new species of this group founded in the Santa Catarina State (Doge, *et al*, 2008).

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Viability and lifespan effect of *Drosophila* vital gene *hsf* under elevated temperature conditions.

Weisman, Natalya. Institute of Cytology and Genetics SB RAS, 630090 Novosibirsk, Russia; weisman@bionet.nsc.ru

There are less studied cases of haplo-advantage described for mutations of some genes influencing longevity and stress resistance, observed in *Drosophila*. Thus, null-allele of *Methuselah (mth*) gene displayed pre-adult lethality in homozygotes. However, *mth*/+ heterozygotes of null allele exhibit longevity 30-35% higher than +/+ wild type flies.

The main goal of this study was to analyze the survival effects of mild heat shock on *hsf*^{1}-heterozygous carriers throughout the whole life cycle: (a) pre-adult viability from fertilization to eclosion and (b) from eclosion to death, analyzing the survival dynamics of both sexes. Since HSF protein is present pre-zygotically in eggs (Voellmy, 2004; Fichelson *et al.*, 2010) we analyzed the role of maternal (*hsf* ^{1}/+) and paternal (+/*hsf* ^{1}) origin of these mutations in survival and lifespan (LS) of F1 progeny.

Material and Methods

We used the wild-type Canton S (CS) strain and the loss-of-function lethal chemically induced (Jedlicka *et al.*, 1997) *hsf* ^{1} mutation in balanced condition *hsf* ^{1}/*Cy* obtained from Bloomington Drosophila Stock Center, USA. Mutation *hsf* ^{1} in homozygous carriers arrests development at the first or second larval stage.

We conducted the reciprocal crosses between mutant strain and the wild-type strain CS. Animals *Cy*/+ and +/*Cy* with two normal dosages of *hsf* gene were grown under the same genetic and environmental background as flies *hsf* ^{1}/+ and +/ *hsf* ^{1}. Therefore, they served as an internal control for mutant heterozygous flies with one normal dosage of the relevant gene. Reciprocal flies *hsf* ^{1}/+ as well as +/ *hsf* ^{1} exhibit normal phenotype. Survival rate and LS of F1 progeny were evaluated under normal (25^{o}C) and elevated (29^{o}C) temperature conditions.

For statistical evaluation of significance of differences between experimental and control groups we used Student's criterion. Log-rank test was applied to determine the significance of differences between the survival curves of the tested flies (Bland and Altman, 2004).

Results

Relative viability during embryonic period

To evaluate pre-adult viability from fertilization to eclosion, the vials with freshly laid eggs were placed into thermostats with either normal (25^{o}C) or elevated (29^{o}C) temperature. The survival changes were measured basing on the statistically significant deviations from the expected segregation of the phenotypes registered in the hatched flies (*Cy vs* wild type).

Under normal temperature conditions (25^{o}C) segregation ratio in the progenies of two reciprocal crosses *hsf* ^{1}/*Cy* × +/+ does not deviate from theoretically expected values 1:1. Embryonic survival of two reciprocal classes *hsf* ^{1}/+ and +/ *hsf* ^{1} was practically equal. Development under conditions of elevated temperature (29^{o}C) dramatically increased (by 30-39%) the viability of heterozygotes (in comparison with the expected values). In crosses with maternal *hsf* ^{1} origin the percentage of *hsf* ^{1}/+ females in F1 progeny was 67.1 and males – 68.1%. In reciprocal crosses with paternal *hsf* ^{1} origin corresponding values were 62.5 and 70.6%.

Life span experiments. Average life span analysis

For measuring of LS, fly cultures were maintained to imago stage at optimal temperature (25^{o}C). Immediately after eclosion virgin females and males of the same age (50 flies per vial) separately were transferred to an incubator with a constant temperature of either 25^o or 29^{o}C. Every three days, live flies were counted and transferred to fresh food. In total for an experiment 300 flies of each sex of each genotype were used.

Both classes of reciprocal heterozygotes *hsf* ^{1}/+ and +/ *hsf* ^{1} exhibited mean LS advantage in comparison with the control *Cy*/+ and+/*Cy* flies already at the optimal temperature (*hsf* ^{1}/+ : *Cy*/+ females - 75.9 ± 1.0 : 63.2 ± 0.9 days and males- 80.3 ± 1.0 : 74.6 ± 1.5 days, respectively; +/ *hsf* ^{1} : +/*Cy* females - 76.2 ± 1.9 : 65.7 ± 1.3 days and males- 77.6 ± 1.5 : 71.7 ± 1.7 days, respectively.

As expected, at 29^{o}C the average LS was drastically reduced up to 40-50% in all genotypes. However, at this temperature mutant heterozygotes preserved their LS advantage in comparison with the control (*hsf* ^{1}/+ : *Cy*/+ females 38.0 ± 0.3 : 34.4 ± 0.3 days and males 35.5 ± 0.4 : 29.6 ± 0.4 days; +/ *hsf* ^{1} : +/*Cy* females 35.6

± 0.6 : 31.9 ± 0.6 days and males 30.9 ± 0.2 : 31.9 ± 0.3 days. The clear-cut maternal effect was manifested under these conditions.

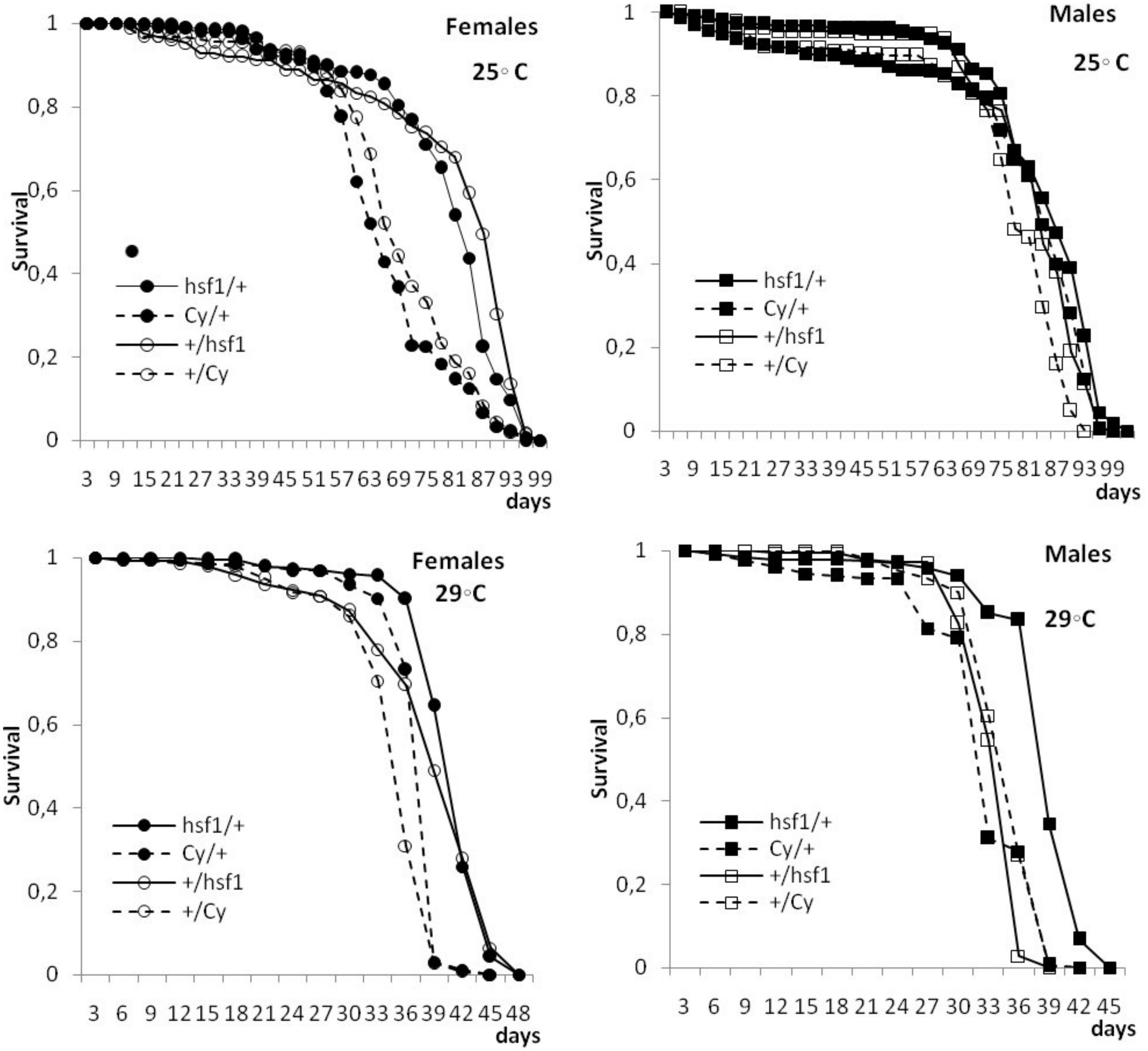

Figure 1. Survival of heterozygous and control females at normal and elevated temperature.

Dynamics of aging and mortality

Survival curves of *hsf* ^{1}/+ and +/ *hsf* ^{1} females differed from those of the control at optimal temperature ($\chi^2 = 74.9$ and $\chi^2 = 42.5$ respectively; $f = 1$, $p = 0.05$).

In control females transition from gradual to mass mortality period at LT10 (10% mortality level) occurred approximately by 12 days earlier than in *hsf* ^{1}/+ and by 36 days earlier than in reciprocal +/ *hsf* ^{1} heterozygotes. The female 50% mortality level (LT50) in the control group also occurred earlier than in heterozygotes. The time interval between LT50 for the control group and LT50 for *hsf* ^{1}/+ and +/ *hsf* ^{1} genotypes reached 21 days. At the elevated temperature differences between heterozygous females and control group are less pronounced but still statistically significant ($\chi^2 = 62.1$ and $\chi^2 = 38.62$, correspondingly; $f = 1$, $p = 0.05$).

We also observed clear-cut differences in the survival dynamics between females and males for the above genotypes. Under optimal conditions heterozygous males exhibited survival advantage starting from the beginning of life cycle up to the stage of mass mortality. The LT10 point of $hsf^1/+$ and $+/hsf^1$ flies occurred 33 and 9 days later than in the control group, correspondingly. However, intervals between LT50 (control) – LT50 ($hsf^1/+$) and - LT50 ($+/hsf^1$) were equal to only 3 and 6 days, respectively. The survival curves of heterozygous males differed from those of the control group not so dramatically ($\chi^2 = 2.3$ and $\chi^2 = 14.54$; $f = 1$, $p = 0.05$) as in the females.

At 29°C sex specific differences in survival dynamics were also observed in the compared groups. Thus, $hsf^1/+$ males appeared to be less sensitive to the stressful conditions of maintenance. The differences at both T10 and LT50 points increased between $hsf^1/+$ mutants and control. Survival curves of heterozygous males $hsf^1/+$ and $+/hsf^1$ and control were significantly different ($\chi^2 = 91.5$ and $\chi^2 = 7.7$, correspondingly; $f = 1$, $p = 0.05$).

In general it is possible to conclude that the dynamics of aging and survival of *hsf*- heterozygotes appeared to depend on the direction of cross, stage of life cycle, sex, and response to elevated temperature.

Acknowledgments: The manuscript draft was constructively critiqued by Michael Golubovsky.

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Distribution of drosophilids breeding in *Solanum lycocarpum* (Solanaceae) fruits.

Valadão, H., and R. Tidon. Programa de Pós-Graduação em Ecologia, Universidade de Brasília, Campus Darcy Ribeiro, Brasília, DF 70910-900, Brazil.

One of the main goals of community ecology is to understand species distribution through space and time. Temporal environmental variations, such as temperature and humidity, can substantially change community structure and dynamics (Hone and Clutton-Brock, 2007; Shimadzu *et al.*, 2013), particularly in insects (Wolda, 1988). Seasonal changes can alter developmental rates and adult reproduction, and consequently the survival of the offspring. Because seasonal changes can also alter the availability of resources throughout the year in terms of abundance and quality, the probability of encountering suitable resources also changes over time.

The drosophilids in the Brazilian Savanna are an excellent system in which to study the effects of seasonality, because this biome is characterized by the alternation of dry and rainy seasons. The average annual rainfall is 1,500 mm, but the rains are strongly concentrated in the rainy season (Eiten, 1972), which occurs from November to March. In the wet months, when the richness and abundance of drosophilids are very high (Mata and Tidon, 2013; Mata *et al.*, 2015; Tidon, 2006), many plant species produce fleshy fruits (Oliveira, 1998) that are used as breeding sites. Conversely, drosophilid populations are constricted in the dry season (May to September), when relatively few food resources can be found.

In this study, we examine a local frugivorous drosophilid community exploiting *Solanum lycocarpum* St. Hil. (Solanaceae), a neotropical species with fruits that provide a patchy resource for the feeding and breeding of these flies. The focus of the study is to investigate the effects of temporal variation of fruits on the community of drosophilids.

Materials and Methods

Solanum lycocarpum, an abundant neotropical species of the central regions of South America, is a small tree with fruits of 8-15 cm in diameter and an average weight of 500 g. Due to its size, this fleshy fruit (Figure 1) is an important resource for drosophilids in this region (Leão and Tidon, 2004).