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RESEARCH ARTICLE

Effect of Mucuna pruriens seed and Glycyrrhiza glabra root extract on longevity of Drosophila melanogaster and vestigial wing mutant.

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Abstract

Intake of food and nutrition plays a major role in affecting aging process and longevity. However, the precise mechanisms underlying the ageing process are still unclear. To this respect, diet has been considered to be a determinant of ageing process. In order to better illustrate this, we used *Drosophila melanogaster* and *vestigial wing mutant*as a model and fed them orally with different concentrations of two commonly used Indian medicinal plant extract, *Mucuna pruriens* seed and *Glycyrrhiza glabra* root. The results revealed significant increase in life span of *Drosophila* flies and vestigial wing mutant exposure to both the plant extract more efficiently when compared to control flies .

INTRODUCTION

Ayurveda is a natural system of treatment and most of the medicines used for treatment are made of herbs, which are present in abundance in our surroundings. Many herbs are part of Indian diet and used as ayurvedic home remedies and for healthy life. We are familiar with all the common herbs and use them in our day-to-day life. It can be used in the form of juices, paste, powder, infusion and decoctions etc. Life style diseases are wholly or partially attributed to diet and have become major health concern (Cordain et al., 2005; Ruden, 2005; Sung, 2011; Ames, 2006). Ayurveda is equally about maintaining or preserving good health as it is about treating disorders--"*Swaasthasya Rakshanam*"(Protection of health) is one of the goal of *Ayurveda*. Ayurvedic texts like Sushruta Samhita (Sharma, 1994) divide the discipline into eight branches, of which the rejuvenating Rasayana therapy aims at promotion of long life, enhancement of physical and mental strength, and strengthening of resistance against the infirmities and ailments of old age. Rasayana therapy calls for ethical living in conjunction with intramural or extramural protocols involving life style, diet, cleansing procedures and the intake of medicinal formulations. The intramural as well as extramural methods of Rasayana therapy require oral administration of drugs, which are mostly based on plant products but may also include drugs derived from animal and mineral/metal. Improvement in nutritional status and better qualities of body tissues (dhatus) are believed to lead to a series of secondary attributes like longevity, immunity against disease, improved mental and intellectual competence etc (Singh, 2003). Etymologically, Rasayana implies supply of the nutrient sap (Rasa) resulting from the digestion of food to the target (ayana) body tissues. As described in Charka Samhita.The two plant extract *Glycyrrhiza glabra* and *Mucuna pruriens. Glycyrrhiza glabra*, Linn belongs to the family leguminaceae is a genus of perennial herbs and under shrubs distributed in the subtropical and warm temperature regions of the world. The roots are unearthed in the autumn season. It is grown in India, Spain, Iran, Russia, China and Italy. A number of components have been isolated from licorice, including water soluble, biologically active complex that account 40-50 percent of total dry material weight. This complex is composed of triterpene , saponins, flavonoids, polysaccharides, pectins, simple sugars, amino acids, mineral salts and various other substances (Obolensteva, 1999). Glycyrrhizin a tritepenoid compound accounts for the sweet taste of licorice root. This compound represents a mixture of potassium calcium magnesium salts of glycyrrhizic acid that varies within a 2-25 percent range (Yamamura, 1992) and *Mucuna*

pruriens is an annual climbing legume indigenous to tropical regions especially Africa, India and West Indies. In India it is found in the foothills of Himalayas, the plains of west Bengal, Madhya Pradesh and Karnataka. It also grows throughout Southern and South East Asian regions (Dukes, 2003). It grows widely in India and cultivated as fodder crop. The plant is commonly called as cowitch, velvet bean, cowage, kapikachu and naikarnanam. It's constituent of more than 200 indigenous formulations. It contains L-dopa as major constituent in seeds (Bell and Janzen,1971) epoxy fatty acids such as cis 12, 13-epoxyactodec-trans-9-cis-acid,cis-12,13-epoxyoctadectrans-9 enoic acid (Misra and Wagner, 2006). It contains active constituent alkaloids such as mucanine pruridine tannic acid resin lecithin and L-dopa Seed powder contains high concentration of levodopa, it is a direct precursor of neurotransmitter called dopamine. Phytochemical analysis of *G.glabra* root extracts and *M.pruriens* showed that saponin triterenes, flavonoids and other constituents such as coumarins, sugars, amino acids tannins, starch, cholin, phytosterols and bitter principles (Snow, 1996; Fukai et al., 1998; Arystanova et al., 2001). Thus the extract has been used for the treatment of different diseases such as addison's disease, brachitis, cough, arthritis, rheumatism, hypoglycemia, inflammatory and allergic conditions (Chatterjee, 1996) and gastric ulcer (Alkofahi and Atta, 1999; Khayyal et al., 2001) and antioxidant capacity towards LDL oxidation (Vaya et al., 1998). In view of this the present investigations have been carried out to understand the effect of *Mucuna pruriens* seed extract and *Glycyrrhiza glabra* root extract on longevity of *Drosophila melanogaster* and vestigial wing mutant.

Materials and Methods

Drosophila melanogaster and vestigial wing mutant used in the present experiments have been obtained from Drosophila stock center, University of Mysore, Manasagangotri, Mysore. The isogenic culture of these flies was maintained under standard wheat cream agar media (Hegde and Krishnamurthy, 1979; Guruprasad, 2008). Then flies were maintained at 22 ± 1^0C and 75% relative humidity in 30 ml culture bottles containing wheat cream agar medium. *Mucuna pruriens* seeds and *Glycyrrhiza glabra* root were collected from local panchasara store Mysore, Karnataka. Then the *Mucuna pruriens* seeds and *Glycyrrhiza glabra* root were shade dried and milled into coarse powdered by mechanical grinder. The coarse powder plant material was extracted with water by decoction using round bottom flask. The water was evaporated into semisolid mass. The semisolid mass were dried and stored for future and the aqueous extract of *Mucuna* pruriens seed and *Glycyrrhiza glabra* root were used for further studies (Dhingra and Sharma, 2006). For treated groups or experimental groups *of Mucuna pruriens* seed extract two concentration were taken viz, 2.0mg/100ml (0.02mg/ml) and 2.5mg/100ml (0.025mg/ml) mixed in wheat cream agar medium mentioned as T1 and T2 respectively. In order to fix the concentrations of seed extract of *Mucuna pruriens* and root extract of *Glycyrrihiza glabra* LC 50 was determined using log dose probit method. The lethal concentration for this test is 3.0mg/100ml (0.03mg/ml). The sub lethal (Effective concentration) concentration is T1and T2 as Similarly, for *Glycyrrhiza glabra* root two concentrations were taken, viz, 1.0mg/100ml (0.01mg/ml) and 2.0 mg/100ml (0.02mg/ml) mixed in wheat cream agar medium mentioned as T1 and T2 respectively. The lethal concentration for this test is 3.0mg/100ml (0.03mg/ml). Longevity will be analyzed by following the procedure of (Priyadarshini et al., 2010) Virgin females and males from both control and *Mucuna pruriens* seed extract of 2.0 mg and 2.5 mg and *G.glabra* root extract 1.0 mg and 2.0 mg experimental groups were used test longevity. 25 replicates were maintained for each of the group, such as control and treatment groups separately. Virgin flies after treatment was placed in each vial. The flies were transferred to fresh food once in a two days. Longevity was assessed by checking the vials daily for deaths and recording the date of death for each male and female in each of the vials.

Results:

Effect of *Glycyrrhiza* glabra root extract and *Mucuna pruriens* seed extract on longevity of *D. melanogaster* and vestigial wing mutant flies in control and treated groups is depicted in figure1 and 2. For the treated groups of T1 and T2 concentrations of *Glycyrrhiza glabra* root extract and *Mucuna pruriens* seed extract enhance the lifespan of *D.melanogaster* and wing mutant flies when compared to the control flies. However, a significant increase in the life span was observed in T_2 groups when compared to T_1 and control in both the extracts of *D.melanogaster* and vestigial wing mutant. Statistical analysis revealed that there was a significant difference in the longevity among control and treated groups ($P<0.05$) (Table 1, 2).

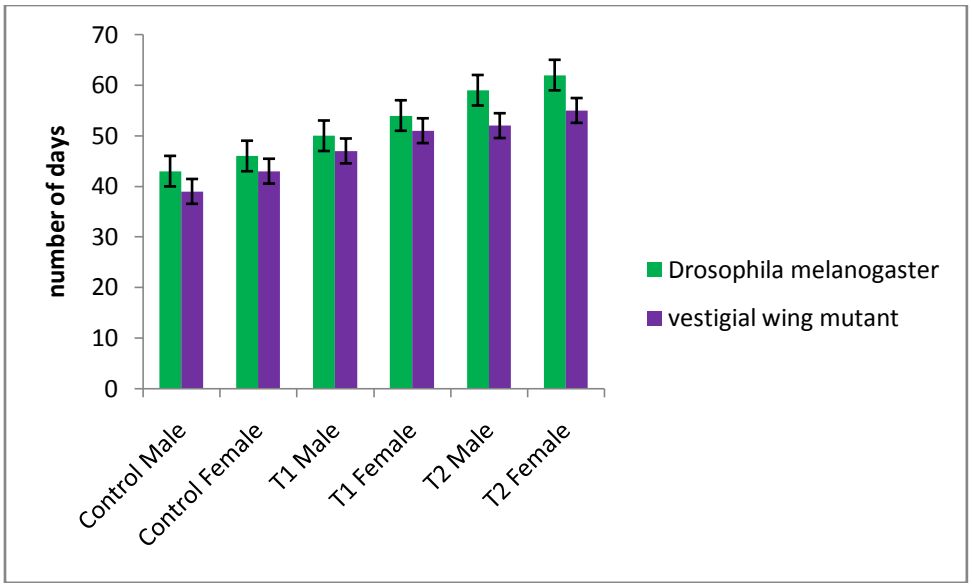

Figure 1: Shows that Longevity of *D.melanogaster* and vestigial wing mutant in both control and treated groups of *Glycyrrihiza glabra* root extract.

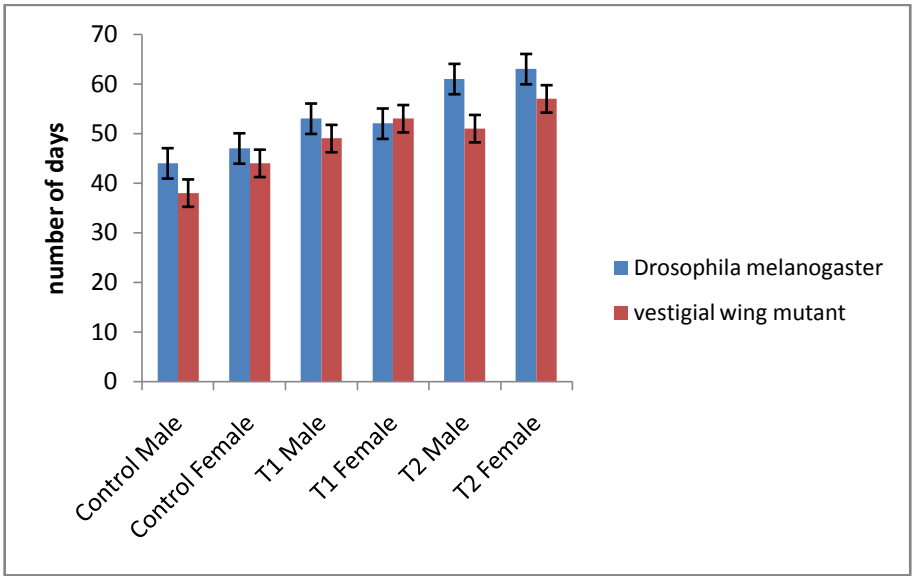

Figure 2: Shows that Longevity of *D.melanogaster* and vestigial wing mutant in both control and treated groups of *Mucuna pruriens* seed extract.

Table 1: Longevity of *D.melanogaster* and vestigial wing mutant in both control and treated groups of *Glycyrrhiza glabra* root extract.

STRAINS	**longevity**	**Mean ± SE**	**F**	**Sig**
D.melanogaster (Male)	Control	41.0±0.47	413.345	0.000
	1.0 mg	49.0±0.33		

	2.0mg	57.0±0.30		
D.melanogaster (Female)	control	43.0±0.68	174.114	0.000
	1.0 mg	51.0±0.5		
	2.0mg	60.0±0.3		
D.melanogaster Vestigial wing mutant (Male)	Control	38±0.2	238.316	0.000
	1.0 mg	49±0.58		
	2.0mg	50±0.32		
D.melanogaster Vestigial wing mutant(Female)	control	40±0.44	227.340	0.000
	1.0 mg	50±0.26		
	2.0mg	53±0.56		

Table2: Longevity of *D.melanogaster* and vestigial wing mutant in both control and treated groups of *Mucuna* pruriens seed extract.

STRAINS	**Longevity**	**Mean ± SE**	**F**	**Sig**
D.melanogaster (Male)	Control	41±0.6	5.165	0.003
	1.0 mg	51±0.4		
	2.0mg	60±0.2		
D.melanogaster (Female)	control	44±0.6	270.209	0.000
	1.0 mg	50±0.3		
	2.0mg	61±0.4		
D.melanogaster Vestigial wing	Control	47±5.1		

mutant (Male)	1.0 mg	46±0.3	427.334	0.000
	2.0mg	55±0.3		
D.melanogaster Vestigial wing mutant(Female)	control	41±0.6	227.02 0	0.000
	1.0 mg	51±0.3		
	2.0mg	49±0.2		

Discussion:

Nutrition plays a crucial role in overall health of an organism. However, both under- and over nutrition may seriously impact long term health and life expectancy. Therefore, the study on dietary nutraceuticals has become challenging and fascinating demanding greater attention than before (Sung et al., 2011). *D.melanogaster* is an excellent model organism to study aging due to its short generation time and lifespan (Sanz, 2010). In the present study, we have exposed *D. melanogaster* and *vestigial wing* flies to food media supplemented with two concentrations of *Glycyrrhiza glabra* root extract and *Mucuna pruriens* seed extract to evaluate their effect on lifespan. Interestingly, the observed effects seem to generally agree with the reported usages of the two formulations in human (Patel, 1986). Fruits of Amla or Indian gooseberry, the principal component of Amalaki Rasayana are known to be very rich in anti-oxidants as revealed in several studies on different extracts of these fruits (Poltanov et al., 2009; Govindarajan, 2005; Khan, 2009; Chatterjee, 2011; Scartezzini and Speroni, 2000). In the present study *Mucuna ruriens* seed and *G.glabra* root extracts enhances life span of *D.melanogaster* and wing mutant flies when compared to control flies. Similar results also observed in *Curcuma longa* and *Emblica oficinials* which increases the life span of *D.melanogaster* (Shilpa et al., 2014). Very similar observation has been made in another experimental oraganism C. elegans (Liao, 2011). Suchitra et al, (2014) reported that *Mucuna pruriens* seed and *G.glabra* root extracts enhances sexual activity, fertility, fecundity in *D.meanogaster*. In the present study life span is significantly increased in *D.melanogaster* and wing mutant flies exposed to *Glycyrrhiza glabra* root extract and *Mucuna pruriens* seed extract when compared to control flies. This due to the antioxidant property of *Glycyrrhiza glabra* and *Mucuna pruriens* which enhnces the life span of *D.melanogaster* and wing mutant flies.

Conclusion

Thus the present study demonstrated that *Glycyrrhiza glabra* root and *Mucuna pruriens* seed extract increases the life span of *D .melanogaster* and wing mutant flies when compared to control flies.

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