Pavan 1943, Bolm. Fac. Filos Cienc. S. Paulo 36(4): 7-72; Dubinin, N.P., and G.G. Tiniakov 1945, American Naturalist 79: 570-572; Heed, W.B., and J.S. Russell 1971, Univ. Texas Publ. 7103: 91-130; Heed, W.B., and N.B. Krishnamurthy 1959, Univ. Texas Publ. 5914: 155-178; Rodhe, C., and V.L.S. Valente 1996, Brazilian Journal of Genetics 19: 27-32; Wasserman, M., 1986, Evolution of the repleta *group.* In: *The Genetics and Biology of* Drosophila*.* (Ashburner, M., H.L. Carson, and J.N. Thompson, jr., eds.), 548 p., Academic Press, New York.

Radio-protective effect of piperine on reproductive organs of *Drosophila* model by induction of electron beam radiation.

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Introduction

Piperine is a major pungent substance and active component of black pepper (*Piper nigrum* Linn.) and long pepper (*Piper longum* Linn.). Both plants are used worldwide as household spices and condiments. They are also used as important ingredients in folklore medicine in many Asian countries. Piperine significantly enhances the absorption rate of nutrients such as Beta-Carotene, Vitamin B6, and Selenium. Selenium and Vitamin B6 levels increased from 30% to 40% percent, while Beta-Carotene increased by sixty (60%) percent. Study on piperine influence on chromosomes in rat bone marrow cells was analyzed in which male Wistar rats were orally administered piperine, then treated with cyclophosphamide by intraperitoneal injection. The results of chromosomal analysis demonstrated that piperine, at a dose of 100 mg/kg body weight, gave a statistically significant reduction in cyclophosphamide-induced chromosomal aberrations, thus indicating that piperine can have antimutagenic potential. Aqueous ethanolic extracts obtained from *Piper* species showed potent inhibitory activity for testosterone 5α-reductase. Piperine also showed *in vivo* anti-androgenic activity. It is suggested that piperine inhibits lipid droplet accumulation in mouse macrophages and especially inhibited cholesteryl ester (CE) synthesis. Studies on curcumin administered rats showed markedly elevated activity of the antioxidant enzymes malondialdehyde (MDA), catalase, and glutathione S-transferase (GST) in the cerebrum and cerebellum of epileptic rats due to PTZ-induced oxidative stress. Piperine (20 mg/kg orally) administered along with curcumin enhanced the bioavailability of the latter up to 20-fold more. Administration of piperine inhibited lipopolysaccharide (LPS), induced endotoxin shock, leukocyte accumulation and the production of tumor necrosis factor-alpha. Black pepper and its constituents like hot pepper, exhibit anti-inflammatory, antioxidant, and anticancer activities which are showed by using proinflammatory transcription factor NF-kappaB, COX -1 and -2 enzymes, human tumor cell proliferation, and lipid peroxidation (LPO) studies. Piperine, the compound of black pepper, can cause a significant decrease of blood pressure in normotensive rats possibly via calcium channel blockade, a pathway that is known to be effective in prevention of L-NAME (N (G)-nitro-L-arginine) methyl ester induced hypertension.

Black pepper, *Piper nigrum* L. (Piperaceae), has insecticidal properties and could potentially be utilized as an alternative to synthetic insecticides. Treatment of *D. melanogaster* with *P. nigrum*

extract led to a greater than 2-fold upregulation of transcription of the cytochrome P450 phase I metabolism genes *Cyp 6a8, Cyp 9b2*, and *Cyp 12d1* as well as the glutathione-S-transferase phase II metabolism gene *Gst-S1*. Therefore, any agent that can protect against such alterations can provide protection against radiation damage. In the present investigation, the flies were exposed to electron beam irradiation at 1.5 Gy. It was found that there was severe decrease in the size of gonads of unfed, irradiated *Drosophila* flies.

Materials and Methods

Drosophila melanogaster

D. melanogaster (Oregon K) adult flies (8-10 days old) were obtained from *Drosophila* stock centre, Department of Studies in Zoology, University of Mysore, Manasagangotri, Mysore, Karnataka, India.

Preparation of compounds for feeding the flies

Piperine was dissolved in 0.5% dimethyl sulfoxide (DMSO) was used as control. The concentrations of compound used were 100, 150, and 200 µg/ml. The test compound was introduced into the medium at semisolid state and mixed well and allowed to solidify. 50 adult flies were introduced into the vials containing media.

Evaluation of compounds

Studies were carried out to find out whether the compounds are mutagenic or cause any abnormality in the experimental batches. In this set of experiments, the male and female flies (test) were fed separately on a medium containing piperine (100, 150, and 200 µg/ml that are below LD_{50} concentration), while control flies (Batch I) were fed with regular wheat cream agar medium for 7 days. Lethality due to compounds was monitored by counting dead flies every 24h up to 7 days, and data were expressed in terms of percentage mortality.

Irradiation

Using Microtron Accelerator at Mangalore University, 2-3 days old flies taken in 2 mm thick polypropylene tubes of 65×25 mm were exposed to 1.5 Gy electron beam radiation. Just before irradiation, the flies were introduced into fresh vials containing standard wheat cream agar medium.

Anatomical investigations

Flies were mildly anesthetized using diethyl ether, and their gonads dissected out in saline solution by fine needles.

Results and Discussion

In the present study, our primary focus was to examine the radioprotective nature of piperin using electron beam as radiation source in *Drosophila*, which is a widely employed eukaryotic model organism for genetic studies. This model organism offers several advantages. The first one is that it allows rapid screening of potential therapeutic agents and physiochemical.

The results of our study showed decrease in the size of gonads in both sexes of both control and tested groups. But the hallmark point was that treated flies showed much less decrease in their gonad size compared to untreated ones.

References: Bae, G.S. *et al*., 2010, Eur. J. Pharmacol. 10: 642(1-3): 154-62; Bezerra, D.P. *et al*., 2006, Braz. J. Med. Biol. Res. 39(6): 801-7; Chan, W.H., C.C. Wu, and J.S. Yu 2003, J. Cell. Biochem. 90: 327-338; Hirata, N. *et al*., 2007, Biol. Pharm. Bull. 30(12): 2402-5; Hlavackova, L. *et al.,* 2010, Bratisl. Lek. Listy. 111(8): 426-31; Jagetia, G.C., and G.K. Rajanikant 2004, J. Surg. Res. 12: 127-138; Jensen, H.R. *et al.,* 2006, J. Agric. Food Chem. 54(4): 1289-95; Liu, Y. *et al.,* 2010, Nat. Prod. Commun. 5(8): 1253-7; Liu, Y., V.R. Yadev, B.B. Aggarwal, and M.G. Nair 2010, Nat. Prod. Commun. 5(8): 1253-7; Matsuda, D. *et al*., 2008, Biol. Pharm. Bull. 31(6): 1063-6; McNamara, F.N., A. Randall, and M.J. Gunthorpe 2005, Br. J. Pharmacol. 144 (6): 781–90; Muhammad, H., 2001; Ravikumar, H., and Muralidhara 2009, Neuro. Toxicolo. 30: 977-985; Sharma, V. *et al.,* 2010, Methods Find Exp. Clin. Pharmacol. 32(4): 227-32; Tilak, J.C., and T.P. Devasagayam 2007, BARC Newsletter 249: 98-104; Wongpa, S., L. Himakoun, S. Soontornchai, and P. Temcharoen 2007. Asian Pac. J. Cancer Prev. 8(4): 623-7.

NBAD-hydrolase processing in brain and epidermis of *Drosophila melanogaster*.

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In recent years, research on N-β-alanyl-derivative metabolism in insects has shed new light on its physiological relevance. While NBAD (N-β-alanyldopamine), the first conjugate studied in this metabolism, was originally described as the main sclerotization precursor of insect brown cuticles (Hopkins and Kramer, 1992), new roles have been proposed in neural tissue (Pérez *et al*., 2004, 2010, 2011; Schachter *et al*., 2007). Another studied N-β-alanyl-derivative is carcinine (N-β-alanylhistamine, NBAHA), which has been suggested as of physiological importance for the visual system (Borycz *et al.*, 2002; True *et al.*, 2005; Wagner *et al.,* 2007). Both NBAHA and NBAD have been proposed as shuttle/recycling agents of histamine (HA) and dopamine (DA), between glial and neuronal cells (Borycz *et al.*, 2002; True *et al*., 2005; Pérez *et al*., 2010).

NBAD and NBAHA are both synthesized by the same enzyme: NBAD-synthase, also known as Ebony protein in *Drosophila melanogaster*. This enzyme shows rather wide substrate specificity, since tyramine, octopamine, norepinephrine, tyrosine, and serotonin can also be conjugated to β-alanine (Pérez *et al*., 1997, 2002, 2004, 2010; Richardt *et al*., 2003; Schachter *et al*., 2007).

The hydrolysis of these conjugates is catalyzed by NBAD-hydrolase (also known as Tan), which is encoded in *D. melanogaster* by the gene *tan* (Wright, 1987; True *et al.*, 2005) and has recently been partially characterized in *C. capitata* and *D. melanogaster* (Badaracco *et al*., 2009; Aust *et al*., 2010; Pérez *et al*., 2011). As the synthase, it shows a wide substrate specificity, since it hydrolyses at least NBAD, NBAHA, and NBANE (Wright, 1987; True *et al*., 2005; Pérez *et al*., 2011). The study of NBAD-hydrolase has revealed a constitutive expression in neural tissue and epidermis throughout the *Drosophila* life cycle (True *et al*., 2005; Badaracco *et al.*, 2009; Pérez *et al*., 2011).

By expression in *E. coli*, Tan was described as a homo-dimeric protein with subunits of around 30 and 15 kDa apparent molecular weight (aMW). Apparently, these subunits arise from self-processing of a precursor polypeptide of around 45 kDa (Wagner *et al*., 2007; Aust *et al*., 2010). A Gly-Cys motif, at position 121, was crucial for this self-processing, and the Tan^1 mutant protein, with