INTRODUCTION

The bioaccumulation of toxic heavy metals in the food chain can be highly dangerous to human health due to their persistent nature and potential toxicity. They can neither be created or destroyed nor can one heavy metal transformed into another i.e. they are immutable. Arsenic contaminated drinking water threatens more than 150 million people all over the world. Arsenic is entering through the ground water by natural weathering processes and by the discharge of effluents of various industries. Drinking water is the main source of exposure of arsenic in human. It generates the reactive oxygen species and free radicals like hydrogen peroxide (Chen et al., 1998) or superoxide (Lynn et al., 2000) and has been found to be genotoxic in human cell (Gradacka et al., 2001, Graham et al., 2004). In addition, a few studies have shown that exposure to arsenic increases the frequency of micronuclei, chromosome aberrations, and sister chromatid exchanges both in humans and animals (Wadlavecik et al., 2001). Reactive oxygen species are an important factor in DNA damage, oxidative stress-induced damage and many other cellular processes (Fahmy et al., 2009, Ye et al., 2010). Members of Food and Nutrition Board of National Council (USA) recently defined a dietary antioxidant as a substance in food which significantly decrease the adverse effect of ROS, RNS or both in human. Various antioxidant have been shown to some protective role against arsenic toxicity (Gupta et al., 2005, Sahu and Paul, 2006). Epidemiological studies have indicated that frequent consumption of natural antioxidant is associated with a lower risk of various diseases and cancer (Renaud et al., 2004). Fruits and vegetables contain high amount of antioxidant such as ascorbic acid, beta-carotene and folic acid which are useful to the body as a bioactive that is directly related to the prevention of lipid peroxidation and vascular diseases, (Frinazzi et al., 2012). Ameliorating effect of papaya fruit has been found to some extent on arsenic induced meiotic chromosomal abnormalities in mice (Singh and Kumari, 2013). However, it could not negate completely. Guava fruit could also ameliorate the arsenic induced mitotic chromosomal abnormalities in mice (Iqbal et al., 2014). Therefore, the present work was undertaken to study the ameliorating effect of another antioxidant rich fruit, guava on arsenic induced meiotic chromosomal abnormalities. Guava (Psidium guajava) is believed to overcome several health problems including a source of antioxidants (Sandra et al., 2012) and free radical scavenges capacity (Chen et al., 2007). It is one of the most common, easily available cheaper fruit which has long been used as a traditional medicine and also known as the poor’s man apple.

MATERIAL AND METHOD

Four to five week old male Albino Swiss mice (Mus musculus) were obtained from the laboratory inbred stock (seed colony supplied by Central Drug Research Institute, Lucknow) and maintained in the animal house of the department. They were housed individually in cage under the standard laboratory condition (25±5°C, RH=50±10%). The animals were fed on food grains (maize and wheat) and tap water ad libitum. All animal treatment and protocols employed in this study received prior approval of the Institutional Head and Departmental Research Committee.

Treatment

Male Albino Swiss mice were put into four groups and subjected to various treatments for 15 days as shown in Table-1. Arsenic Trioxide used as a water pollutants and ripe guava extract (aqueous) was used as an ameliorating agent. Predetermined sub lethal dose of Arsenic Trioxide (1.5mg/kg.b.wt/day) was selected (Yasmin et al., 2011). Such treatment of Arsenic Trioxide have been given because at this dose mice can
survive and above this dose mice would die. The dose of guava fruit extract was 60mg/animal in proportion to human recommended daily allowances (RDA) at which genotoxicity of Arsenic Trioxide can be reduced.

**Slide Preparation**

The animals of each group were sacrificed by cervical dislocation after the completion of treatments. The slides of meiotic chromosomes were prepared by following the technique suggested by Das and Nayak., 1988 ie Colchicine-Hypotonic-Acetoalcohol-Flame Drying-Giemsa Staining.

**Screening of Slides**

The chromosomal complex cell in Diplotene / Diakinesis / Metaphase I was screened under the microscope for screening the structural, numerical and synaptical chromosomal abnormalities in each group. 300 well spread metaphase-I plates from each group of animals were screened by random selection. Student t-test was applied for the data calculation.

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<th>Table 1: Summary of the treatment protocol</th>
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**RESULTS AND DISCUSSION**

Structural, numerical and synaptical types of chromosomal abnormalities were observed in each group of mice. Among the four groups of mice the percentage of abnormality was 37.33% in Arsenic trioxide supplementation. Similar percentage of abnormality was observed in both the control (9.33%) and guava (7.33%) fed animals. However, guava fruit extract fed with Arsenic Trioxide (AT+G) significantly decreased the abnormality incidence to 22.66% from control group. Thus, the result showed the genotoxic effect of arsenic trioxide in meiotic cells like bone marrow cell (Saleha et al., 2001, Singh and Kumari., 2012). The present finding also showed that concurrent treatment of guava and Arsenic trioxide had ameliorating property. The major mechanism behind this toxicity is oxidative stress that needs to a number of diseases in human. Oxidative stress and DNA damage induced by arsenic trioxide occur via production of superoxide and hydrogen peroxide radicals, specifically reactive oxygen species (Matsui et al., 1999). Guava fruit is a rich source of Vit C and it acts as an antioxidant, scavenges the aqueous reactive oxygen species by very rapid electron transfer and inhibit lipid peroxidation (Barchowsky et al., 1999). However, the mechanism of genotoxicity is not clearly understood, but may be due to the ability of arsenate to inhibit DNA and replicating or repair enzymes (Li et al., 1989). Free radicals are produced in mice after acute exposure to inorganic arsenic (EPA., 2008). These free radicals are neutralized by an antioxidant defense system. Antioxidants act through different mechanism and different compartments but are mainly free radical scavengers). Therefore, from the above findings it is suggested that such type of cheap and antioxidant rich fruit in diet are beneficial for reducing the toxic effect of Arsenic contaminated drinking water.

<table>
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<th>Table 2: Incidence of chromosomal abnormalities in meiotic cells of mice treated with arsenic trioxide and guava fruit</th>
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<td>Exp. Variant</td>
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<td>AT+G</td>
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a, b and c indicates the significant difference between C, AT and G.

**REFERENCES**


20. Singh N and Kumari D. Amelioration of genotoxicity by papaya extract induced by Arsenic contaminated drinking water. The bioscan, an international journal of environmental science, 2013 Vol 1, 2, 623-626.


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