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Environmental Toxicants Their Effect on Reproduction and Development in Natural, Population of Drosophila Melanogaster

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Abstract

Among the insects, dipteran fruitfly, Drosophila possess combination of advantages unrivaled in any other known material Bar various studies specially in genetics.

The striking features of Drosopitia studies that has been amply illustrated in recent years in its exploitati for experimental purpose of multiple biological aspect. Few species of genus- Drosophila have been utilized extensively for cytogenties population genetics, ecogenetics, behavioral genetics and also in biochemical, neurobiological developmental gentics, molecular biology. genetic engineering and recently in the study of role of toxicant on reproduction and developinent (D.K. Chawdhari et al. 1998).

Key words:- Combination, Population, Biochemical, Neurobiological, Developmental.

Introduction

Several species of Drosophila are world-wide and cosmopolitan and have been reported from almost all the six zoogeographical realms o 'the world including oriental region, of which India is a part. The enormous genetic information available for Drosophila permits study of genes those may be involved in specifying the basic body and differentiation of different segments during early

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embryonic development. Beside the genetic control, the embryonic development and differentiation of various organs depend on several environmental factors also eg. temperature and humidity.

The Drosophila has been found to complete its life cycle including oviposition, hatching development of larval instar and emergence of adult flies at 24, 1°C, the slight variation of 2-3 °C can alter the life cycle and developmental process in these flies and also affect the body size.

The pigmentation on the abdominal band is also a temperature dependent process, Proper humidity is also required to complete its life cycle and hence the rainy season with adeqate humid condition along with rich fermenting organic nutrients provide ample opportunity for rapid growth in fly population.

Present Stage of Knowledge

Modern society has been introducing for the past 50-60 years unprecedently the synthetic and xenobiotic substances into nearly every facet of civilization, may be in incustries or in agriculture and even in day to day routine without any adequate evaluation of their potential far adverse effect. The extensive use of pesticides has been great concem due to its adverse effect on human and wild life. The organophosphate are insecticides widely used in India in fruit orchards and also has application in commercial pest control (U.S. l'ublic health service 1997). Exposure to these chemicals is reported to affect respiratory system, cardiovascular system and nervous system in mammals, in addition to causing skin and eye irritation in human (Gallo and lawryk 1991). Thrasher et al. (1993) reported certain component of human immune system may be also affected by organophosphate insecticides. In rodent and insect cell lines, organophosphates have been shown to cause genotoxic effect (Amer and fahmy, 1982; Sobti et al. 1982). Effect of the chemicals on different developmental stage of fly on its survivorship, hatchability, emergence, fecundity, fertility and reproductive performance and their exact mekanism of its tolerance to the amount of toxicants in natural population is still under discussion, and the effect on various developmental stages as well as on adult may reflect effect on fecundity, which may ultimately decide the size of a population. This may in the long run may influence on adaptation vis on macro evolutioinary process.

Experimental evidence in past years has show stress proteins play an active role in cellular defense (welch, 1993). They are belived to buffer cell from harm under stressful condition by maintaining the proteins in correct conformation thus protecting the cells from further damage (Craig et.al.

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1983; 1994). Recent studies indicate that stress protein expression due to exposure to xenobiotics may reflect the injury inflicted on tissue and this may be useful to identify target organs vulnerable to toxicants (High tower, 1991, Geering et. Al 1992). Based on this fact it is tempting to speculate that such an assay in natural population may be developed to screen the cytotoxicity of environmental pollutants specially orgaophosphates.

Drosophila flies from natural population has been selected as test system because of it world wide occurrence and well studied population genetics in them. So far, no efforts has been made to investigate role of environmental factors from natural population including wild area. industrial area and agricultural field and also the effect of insecticide organophosphate in reproduction and development in natural population of Drosophila.

3- Review of Literature

From the perusal of literature, it has been observed that interest in effect of various environmental factors and toxicant, (including genobiotic substances) measurement of cytotoxicity and exact mechanism of tolerance for these toxicant in living sy tem has grown recently Previously a considerable data has been recorded for such a studiesin different organism like human, rodents, houself, cockroach, grain weevil Chitonomns, Drosophila from different scienstists of the international repote. The notable references includes, Amar and fahny, 1982, Bonnier G. 1960; Chadwick PR, 1962; Collins et al. 1979; Deacan et al. 1980; Gallo and lowryk 1991; Gerolt, 1976; Goering et al. 1992; Ganazaler et al. 1989; Kohler et al. 1999, Lints 1971, Pape-Linstram 1997; Ryan 1996 Sanders 1993; Stringham and Candido 1994; Woodrufet. Al. 1983.

Recently studies pertaining to role of environmental factors on reproduction and development, the stress protein (Heat shock protein) and its role as potential indicator of nontarget toxicity and their status as biomarker of environmental pollution has been carried out in different organism including transgenic stock Drosophila by different Indion workers, though the literature available are meager and scanty. The notable references includes; Gayathri and Krishnamurthy, 1981; Kar Chawdhari et. Al, 1998; 1999; 2001, Lakhotia and Mukherjee, 1980; Kalhotia and Singh, 1989; Mukhopadhyay et. Al. 2002; Patnaik and Tripathi, 1992;

4- Aims-

To study the use of organophosphate insecticide (Malathion, Mono Crotophos, Monocrotophus) in the natural population of Drosophila melanogaster, the effect of hatchability, Survivorship,

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emergence of flies, fecundity, fertility and reproductive performance in the natural population of Drosophila Melangaster in the lab condition.

5- Hypothesis

Drosophila are world-wide and cosmopolitan and have been reported from almost all the six zoogeographical realms of the world mcluding oriental region, of which India is a part. The enormous genelle information available for Drosophila permits study of genes those may be involved in Specifying the basic body and differentiation of different segments during early embryonic development. Beside the genetic control, the embryonic development and differentiation of various organs depend on several environmental factors also e.g. temperature and humidity. The Drosophila has teen found to complete its life cycle including oviposition, hatching development of larval instar and emergence of adult flies at 24. 1°C, the slight variation of 2-3°C can alter the life cycle and developmental process in these flies and also affect the body size. The pigmentation on the abdominal band is also a temperature dependent process. Proper humidity is also required to complete its lite cycle and hence the rainy season with adequate humid condition along with rich fermenting organic nutrients provide ample opportunity for rapid growth in fly population.

Methodology

The population sample of Drosophila for present study will be collected from different natural geographic location and agriculture fields of Raebareli & adjoining areas. The flies will be collected by exposing fermenting fruit as bait. The naturally impregnated females of the species will be transferred individually to a fresh culture vial lab. On corm-sugar-agar Drosophila food medium at 24.1°C. Additional yeast suspension will be provided for healthy growth.

Treatment schedule

Technical grade Organophosphate (Malathion, Methyl parathion Monocortophos) will be used for study. Four different concentrations of pesticides, corresponding to the recommended concentration for agricultural area (1/100 of recommended agricultural concentration), corresponding to the permissive maximum residue level (MRL) on fruit and vegetable and (1/100 of MRL concentration) dissolved in dimethyl sulfoxide (DMSO), finally mixed with food will be fed to larvae/adult. Two sets of control will be used. In set I control normal food will be fed to larvae/adult, while in set II control, DMSO-mixed food will be fed to larvae/adult.

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ORGANOPHOSPHATE:

Monocrotophos:

Nomenclature:

Commonname

Monocrotophos (BSI, E-ISO (m) f- ISO, ESA, JMAF)

IUPAC Name- Dimethyle (E)-1-Methyl-2 (Methyl Corbomyl) Vinyl phosphate 3-Dimethoxyphosyoloxy methyl, ISO crotonamide. N Phytotoxicity-Non phyototoxic where used as directed although slight injury may be caused to same verities of apples, pears, chomy. Peach and sorghum.

Tools

1-B.O.D.

11-Water Betch

III- Dissecting Microscope

IV- Trinacular Microscope

V-Ovan

VI- Electronic Balance

VII- Micro syringe

Observation

During present investigation flies of Drosophila collected from natural population and agricultural field will be cultered on Drosophila food medium. Four different concentration of proposed pesticides used will be mixed with food and fed to larvae and adults. Thus two sets of control will be used, set I, where normal food is fed and in set Il control, contaminated food is fed to larvae/adult LC will be determined in flies feed with different concentration of contaminated food.

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The effect of organophosphate (Malathion, Methyl parathion, Monocrotophos) en survivorship, hatchability, emergence, fecundity, fertility and reproductive performance.

Conclusion

The effect of organophosphate (Malathion, Methyl parathion, Monocrotophos) on survivorship, hatchability, emergence, fecundity, fertility and reproductive performance will be observed & compared with the control set of flies from natural population.

References

1. Amar SM. Fahmy MA. (1982) cytogenetic effects of pesticides. 1 induction of micronuclei in mouse bone marrow by the inseticide Dursban. Mutat Res. 101 (3)247-255.
2. Bliss Cl.(1935) The calculation of the dosage mortality curve. Anal Appl Biol, 22; 134-167.
3. Bonnier G.(1960) experiments on hybrid superiority in Drosophila melangaster II rate of development from egg hatching to eclosion. Genetics 46:86-91
4. Chadwick PR.(1962); Studies on the sublethal effect of pyrethrins on the grain weevil calandra oryzae L.pyrethrum post 6:20-26
5. Collins C. Kennedy JM. Miller T (1979) sub lethal poisoning. a comparision of Behaviour and histological changes in house thes CNS pestic biochem physol 11 135-158.