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Food production and disease control are the most important challenges facing humanity in the 21st century that deserves special attention. These challenges are associated with the increasing global human population and with the control of arthropod pests. Arthropod pests are responsible for global harvest crop losses of approximately 20-50% of potential production and for transmitting a number of world’s most important diseases (Thacker, 2002). Therefore controlling the arthropod pests is critical for the enhanced food production and disease control. The persistent use of organic pesticides has saved millions of lives by controlling human diseases and by greatly increasing the yields of agricultural crops.

Insect pest control, an essential component of crop protection and public health, has evolved over a recorded history of three millennia (Casida and Quistad, 1998; Ware, 2000). Plants were used as sources of insecticidal compounds by the Egyptians during the time of Pharaohs. Sulfur was first referred to by Homer in 1000 BC as a fumigant for pest control, and in California, it is still used in larger amounts than any other pesticide. Pliny, in 77 AD, makes reference to the use of arsenic, soda and olive oil. Chinese employed moderate amounts of mercury and arsenic for body louse control by the AD 100-200. Nicotine in the form of tobacco extracts were reported in 1690s as the first plant derived insecticide, followed by the pyrethrums and rotenone in the early 1800s. Synthetic organics in the 1940s to 1970s largely replaced with inorganic and botanicals with the introduction of
organophosphates, methylcarbmates, organochlorines and pyrethroids, and are still widely used today for insect control (Thacker, 2002; Tomizawa and Casida, 2005). The main target for these chemical compounds is the insect nervous system, at a very limited number of primary points: acetylcholinesterase for organophosphates and carbamates, sodium channels for DDT and pyrethroids, octapamine receptors for formamidine and GABA-gated chloride channels for cyclodienes and avermectins (Graf, 1993).

The number of pesticide application increased year after year. The major problem with these broad spectrum modern insecticides concerns their effect on both target and non-target beneficial species. Van den Bosch (1966) reported that the application of insecticide produced a greater loss of beneficial arthropods than any other agricultural practices. Another deplorable aspect of the utilization of broad spectrum toxins for insect control has been associated with their effect on the environment. Most of these pesticides are discharged into the soil and aquatic system and found to be highly toxic to many organisms in the ecosystem. Human can be exposed to pesticides by eating contaminated food or drinking contaminated water, by inhaling pesticide droplets from the atmosphere, by coming into contact with treated vegetation or through involvement in their manufacture or application.

In recent past, the carbamate compounds are preferred over other pesticides because of their reversible inhibitory effect on acetylcholinesterase
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(Goldberg *et al*., 1963; Pradhan and Mhatre, 1970; Bhavan and Geraldine, 2002; Srinivasan, 2005). Among these carbamates, carbaryl was found to be the most commonly detected pesticide in the environment (Caroline, 1994) which is used to kill a range of chewing and sucking insects on over 120 agricultural crops over 100 species of insects (Caroline, 1994; Clive, 1994; WHO, 1994). Carbaryl persists in the plants (Antonovich, 1970; Molozhana, 1970) and fruits after treatment (Antonovich, 1970; Yadav and Jaglan, 1982; Frank *et al*., 1989). Based on the anticipated coverage of plant protection measures, the requirements of technical grade pesticides have been estimated and approximately 80,000 metric tons in India during 1982 and the production of carbaryl used in the present study was estimated to be 7,500 metric tons during that year (Krishnamurthy and Dikshith, 1982).

As like most other pesticides carbaryl also pollute every component of the ecosystem and found to be highly toxic to many non-target organisms, like predators and parasites of the insect pest, earthworms, some of the predatory vertebrates etc. and can also concern their adverse effects upon the human population. The sub-lethal dose of carbaryl exposure to organisms resulted in abnormalities of sperm and damages in the testis of rats, mammals and some other animals (Meeker *et al*., 2004; Xia *et al*., 2005). There is some fair amount of direct but frequently contradictory experimental evidence showing the effect of sub-lethal dosage of insecticide carbaryl on female insect reproductive system of western corn root worm (Ball and Su, 1979).
Hitherto hundreds of contributions to the topographical anatomy of insects including the reproductive system have been made. However, the morphology of the heteropteran male reproductive system was studied in a few insects (Ambika, 1973; Sareen and Kaur, 1987; Dorn et al., 1992; Lemos et al., 2005). There have been only a few studies so far on spermatogenesis in hemipteran insects (Ambika, 1973; Sareen and Kaur, 1987). Further the effects of carbaryl on the reproductive system of hemipteran insects were not studied. In the present study a heteropteran bug, *Iphita limbata*, was taken as a model organism to study the effects of carbaryl on biochemical and histological aspects in the male reproductive system of non-target organisms. The structure of the male reproductive system of *I. limbata* was also studied in detail. The present study also focuses on the toxicity of carbaryl in general to non-target organisms and its importance in assessing the public and environmental health risks.