INTRODUCTION

Biological pesticides are becoming recognized as an important factor in crops and forest protection and in insect vector control. These pesticides are natural, disease causing microorganisms such as viruses, bacteria and fungi, which infect specific pest group. Bacterial insecticides, especially *Bacillus thuringiensis*, have become important factors in insect control programs because of their efficacy and safety. **(Spear, 1987).**

Bacillus thuringiensis (B.t.) is a living microorganism that kills certain insects and is used to kill unwanted insects in forests, agriculture and urban areas. In a purified farm, some of the proteins produced by *B. thuringiensis* are actually toxic to mammals. However, in their natural farm, acute toxicity of commonly-used *B. thuringiensis* varieties is limited to caterpillars, mosquito larvae, and beetle larvae *B. thuringiensis* is closely related to *B. cereus*, a bacterial that causes food poisoning and to *B. anthracies*, the agent of the disease anthrax. Few studies have been conducted on the chronic health effects carcinogenicity or mutagenicity of *B. thuringiensis*. **(Swadener, 1994).** *B. thuringiensis* is a species of bacteria that has insecticidal properties affecting a selective range of insect orders. There are at least 34 sub species of *B. thuringiensis* **(De Barjac, *et al.*, 1990)** also called serotype or varieties) and probably over 800 strain isolates **(Ellis, 1991)** *B. thuringiensis* was first isolated in 1901 in Japan from diseased silk worm

larvae. It was later isolated from Mediterranean flour moths and named *Bacillus thuringiensis* in 1911 **(Lambert, *et al.*, 1992).** It was not until 1958 that *B. thuringiensis* was used commercially in the United States **(Jenkins, J. 1992)** *Bacillus thuringiensis* products available in the United States are comprised of one var. *morrisoni*, which cause disease in moth and butterfly caterpillars; *B. thuringiensis* var. *israelensis* which causes disease in mosquito and black fly larvae; *B. thuringiensis* var. *aizawai* which cause disease in wax moth caterpillars); and B. *thuringiensis* var. tendebrionis; also called var. Sandiego, which causes disease in beetle larvae. **(Farm chemical hand book, 1992.)** and **(Entwistle, *et al.*, 1993).** Other strains of *B. thuringiensis* have been discovered that exhibit pesticidal activity against nematodes, mites, flat warms, and protozoa. **(Feitelson, *et al.*, 1992).**

Mode of action:

When conditions for bacterial growth are not optimal *B. thuringiensis*, like many bacteria, form spores. Spores are the dormant stage of the bacterial life cycle, when the organism waits for better growing conditions. Unlike many other bacteria when *B thuringiensis* creates spores it also creates protein crystals. This crystal is the toxic component of *B. thuringiensis* after the insects ingest *B. thuringiensis*, the crystal is dissolved in the insect's alkaline gut. Then the insect's digestive enzymes break down the crystal structure and activate. B.t.'s insecticidal component called the delta endotoxin (δ-endotoxin). The delta

endotoxin binds to the cells lining the midgut membrane and creates pores in the membrane, upsetting the gut's ion balance. The insect soon stops feeding and starves to death. Of the insect is not susceptible to the direct action of the delta-endotoxin, death occurs after *B. thuringiensis* starts its vegetative growth inside the insect's gut. The spore germinates after the gut membrane is broken, it then reproduces and makes more spores. This body-wide infection eventually kills the insect **(British Columbia Ministry of Health, 1992).**

The earliest tests done regarding B.t.'s toxicity were conducted using *B. thuringiensis* var. *thuringiensis*, a *B. thuringiensis* strain known to contain a second toxin called beta-exotoxin or (Thuringiensis). Thuringiensis is an adenosine derivative linked through a glucose moiety to the 5H position of phosphorallaric acid, secreted outside the bacterial cell **(Gunnel Carlberg, *et al.*, 1995).** Due to the chemical composition a certain affinity to DNA is likely to occur and, therefore, undesirable mutagenic properties of the toxin may exist **(Frantivek *et al.*, 1969).**

The objectives of this study were to:

1- Study the cytogenetic effect of the bioinsecticide on different biological systems to identify its safety.

2- Identification of its mutagenicity using SDS-protein, isozyme and the existence of any mutation in P^{53} tumor suppressor gene.