the method described by Salama and Sharaby (1985) after investigated by Zies EM/10 electron microscopy at 60 KV.

Results and discussion

Table (1) shows the susceptibility of the 4th instars *S .littoralis* larvae towards Zinc sulfate concentration . There was direct correlation between the salt concentration and the percentage of larval mortality. Probit analysis (Tablr1) recorded the LC_{50} value as 2.805 mg/ml . Sell & Bodzinck (1971) reported that 0.2% concentration of Zinc sulfate had deterrent feeding effects on *Heliothis virescens* newly hatched larvae, also Salama & Sharaby (1973) explained that the mortality of *S .littoralis* newly larvae could be related to starvation when fed on diet supplemented with $ZnSO_4$ at 0.1 M or higher, as this lowered the rate of food intake. Insect nutrition regulates the development by activating and control neurosecretory cells in the brain and hormone secretion (Riddiford 1980).

Results in Table (2) showed that 4th instar larvae that was fed on Castor leaves treated with Zinc sulfate at the LC_{50} level had significantly longer larval and pupal durations. The delaying in development may be attributed to the amount of energy spent by the larvae in order to detoxify zinc sulfate. On the other hand,the mean pupal weight as 389 mg was significantly lowerd compared with 485 mg for the control. Percentage of pupation were 67 and 95 for fed and control larvae, respectively. The effect on fecundity and fertility of *S .littoralis* females that resulted from the treated larvae that fed on LC_{50} concentration of zinc sulfate is given in Table (3). The data showed that the lowest mean number of eggs laid per female was obtained form treated females mated with treated males (210 eggs /female) , followed by treated females mated with normal males(270 eggs/female), finally normal females mated with treated male(368eggs /female), as compared with control (1270 eggs / female). This may indicate that females were more sensitive to zinc sulfate feeding than males . This may be due to accumulation of zinc in females fat bodies . Salama and Sharaby (1973) recorded that the accumulation of Zinc in the tissues of the larvae seems to be the factor leading to the induction of sterility in the emerged moths., Sohal & Labs(1979) recorded that Zinc sulfate storage as exertion material in the fat bodies of adult housefly *Musca dosmestic.* Sell and Schmidt (1968) mentioned interference of a metallic ion with basic enzyme system such as cytochrome oxidase and catalase , , would certainly impair growth and development , and interference with the hormone ecdyson could cause moulting difficulties in *Tricoplusia ni.* The data also showed that in all mating combinations the egg hatch percent was decreased compared with control. Fertility followed the same pattern as fecundity. The lowest egg hatch was obtained on mating combination containing fed ones. Zinc may interfere with oogenesis and spermatogenesis. Ibrahim and Shebl (2002) suggested that reduced female fecundity could be a result of a low metabolic rate. The reproductive activity of the male insects is little affected by nutrition; but all kinds of nutritional factors may influence the production of eggs in females (Wigglesworth ,1972). From the foregoing results it could be concluded that Zinc sulfate has considerable toxic effect at highs concentrations and may be considered as disruptor to the endocrine system of the larvae and affect as growth regulator.

Ultrastrucutre changes of the endocrine glands:

Endocrine glands are secretory structures adapted exclusively for producing hormones and releasing them into the circulatory system (Wigglesworth,1965). Hormone is a chemical signal sent from cells in one part of an organism to cells in another part (or parts) of the same individual. They are often regarded as chemical messengers. They may cause profound changes in their target cells. Their effect may be stimulatory or inhibitory. Insects have several organs that produce hormones, controlling reproduction and metamorphosis. Present research described neurosecretory cells of *S .littoralis* larvae located in the dorsum of the brain . They send their axons to the corpus cardiacum from which the secretory material is discharged into the haemolymph. This hormone activates prothoracic gland to secret the hormone that stimulates growth and moulting . Immediately behind the corpus cardiacum is a small endocrine gland, the corpus allatum, which is supplied with nerves from the brain. The corpus allatum secrets the Juvenile hormone and so long as it is present in the blood the growing insect retain its larval characters. In the last larval stage the corpus allatum ceases to secrete this hormone and the insect undergoes metamorphosis to the adult. It then commonly begins once more to secrete the same hormone, which is now needed for the production of eggs in the ovaries. There are several neurosecretory centers in the brain. The largest being parce intercerebralis , consists of a group of connected secretory cells in variable size with big nucleus occupying most of the cell area as shown in Fig (1) of the normal neurosecretory cell of *S .littoralis* larvae. Nucleus is mostly spherical or oval in shape, however in active cells it being irregular in shape thus meeting the greater function demand by an increase in volume, dense cytoplasm containing mitochondria, many secretory granules noticed. Fig (1A) for the neurosecretory cells of the same age of fed larvae cleared small amounts of the secretory granules were observed, clumping in nuclear chromatins , cell cytoplasm appear as fragmented area, appearance of lysosomes as a sign of autolysis of the cell with disintegration of the mitochondria. Golgi apparatus in unactive state as its saccules appear empty of secretion. RER cisterna loss its continuity and appear as swollen vacuole or autophagic vacuoles. Corpora cardiaca are a pair of neuroglandular bodies that are found behind the larval brain and on either sides of the aorta. These not only produce their own neurohormones but they store and release other neurohormones including prothoraciccotropic hormone (PTTH) ,which stimulates the secretory activity of the prothoracic glands, playing an integral role in moulting (Gullan and Cranston,2005;Nation,2002). Fig (2) describes section from a portion of corpora cardiaca of normal *S .littoralis* larva. Many dendrites contains neurosecretory granules in variable size were observed. Golgi body between the nerve terminale, number of small mitochondria are present . On the other hand in (Fig .2A) there were enlargement of mitochondria. The cristae of mitochondria increased of the inner chamber of mitochondria, so numerous mitochondria are found in active cell ,great quantities of secretory granules, several dendrites in the area of synaptic terminals is expanded it contains mitochondria neurotubules and small synaptic vesicles. These vesicles contain the chemical transmitter hormones, gap junctions in the synaptic area decreased the transmission of chemicals or impulses in the corpus cardiacum cells of of *S. littoralis* fed larvae. Corpora allata are small, paired glandular bodies located on either side of the larval foregut . They secret the Juvenile hormone (J.V) ,which regulate reproduction and metamorphosis (Gullan&Cranston,2005; Triplehorn&Johnson,2005). Corpora allata of the normal *S .littoralis* larvae in (Fig.3) clearly presented a big nucleus in rough endoplasmic reticulum with small size mitochondria , no secretory granules were observed, while in Fig(3A) an obvious secretory granules or exocytosis of neurosecritiry material within the intracellular apaces were noticed, synaptic vesicles , clumping in nuclear chromatin , darkening and deformed mitochondria and autophagic vacuoles were observed in the corpora allatum of the fed larvae. Prothoracic glands in *S .littoralis* larvae are diffuse with paired glands located at the back of the head. These glands secrete an ecdysteroid called ecdysone, or the moulting hormone, which initiates the epidermal moulting process (Gullan&Cranston,2005;Bendeczky and Sehnal,1980). Additionally it plays a role in accessory reproductive glands in the female, differentiation of ovarioles and in