STUDIES ON SOME MITE SPECIES INFESTING SOME FRUIT TREES

BY

ASHRAF SAID HAGAG EL- HALAWANY

B. Sc. Agric., Faculty of Agric., Moshtohor
Zagazig Univ., Benha Branch 1996

A thesis submitted in partial fulfillment of

the requirements for the degree of

MASTER OF SCIENCE

in

Agricultural Zoology

(Acarology)

Plant Protection Department
Faculty of Agriculture, Moshtohor
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رسالة مقدمة من

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إستيفاء لمتطلبات الحصول على درجة التخصص

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INTRODUCTION

In Egypt, Productivity of fig and pear, fruit trees was disserved to be decreased both in quality and yield, during last few years, in spite of that fig trees area was greatly increased from 43285 to 55280 feddan in 1995 and 1999 years, respectively. However, area occupied by pear tree was gradually decreased from 13521 to 9925 feddan in 1995 and 1999, respectively. The total yield of both fig and pear fruit trees was 236915 and 54272 tons (5.47 and 4.01ton per feddan) in 1995, while the analogous yield was 203005 and 38336 tons (3.67 and 3.85 ton / feddan) in 1999, respectively.

The final goal of the agriculture policy is, generally aiming to increase production, the deciduous fruit trees by either horizontal or vertical extension. The vertical policy is generally concerned with the production and acclaiming some varieties of high yield (Quality and Quantity) and rather to extent the tolerance to the phytophagous pests. Large assemblages of mite species are generally seen inhabiting fig and pear trees. Among phytophagous mites, some species were usually seen causing moderate to sever damages to plants that may attract, result in low yield together with low quality of fruits. In some cases, mites may cause complete deterioration to the fruit trees.

The present work included the study of the following items: -

I. Occurrence of mites inhabiting fig and pear trees during two successive years 1998 and 1999.

II. Exploring the effect of the most important abiotic and biotic factors on the population dynamics of phytophagous mites infesting Sultani fig variety and

Lacont pear variety at Sinhera region (Qalubia Governorate).

III. The effect of different leaf varieties (Lacont and Hood Pear varieties) and (Black michen, Cadota, Sultani, Adsi, Doritto, Conadria and Gizi fig varieties., on the biology of the two-spotted spider mite *Tetranchus urticae* Koch.

IV. The effect of leaf of certain contents on the biology of *T. urticae* on different fig varieties.

For completion of such work for serving yield of fig and pear fruit trees from being decreased year after year, attention of the most intersecting research workers who are specialists in pest control, ought to be picked up and intensive controlling. It is suggested that the pest population management (IPM) is the preferred one for, preventing environment from pollution and returning Ecosystem to the desired level of natural balance.

Review of Literature

I-Occurrence of mites associated with some deciduous fruit trees

A-Phytophagous mites:-

Abou-Awad (1976) recorded *Eriophyes ficus* Cotté and *Rhyncaphytoptus ficifoliae* on fig trees, and *Diptilomious ficus* from sycamore and fig trees.

Heikal (1977) recorded *Tetranychus arabicus* Attiah on most deciduous fruit trees, *T. cucurbitaceurum* (Sayed) on almond, peach and quince fruit trees in King Maryout and Domiat governorate, *Cenopalpus pulcher* (C.&F.) on apple, quince, plum, grape, apricot and pear trees in upper and lower Egypt, *C. lanceolatisetae* (Attiah) on almond, plum, peach, apricot and pear fruit trees in upper and lower Egypt, *Brevipalpus obovatus* Donnadieu on pear, grape, apricot and apple fruit trees in upper and lower Egypt, and *B. phoenicis* (Banks) on peach fruit trees in Bin-Suef .

Weires et al. (1979) found that *Tetranychus urticae* and *Bryobia practiosa* on apple orchards in two areas of New York State. In Japan, Nemoto et al. (1980) recorded *Eriophyes ficus* on fig trees. In the same year, Plavisc and Milicic (1980) referred that intracellular changes in trees infected with fig mosaic virus transmissible by mite *Eriophyes ficus.*

El-Adl (1982) recorded *Eriophyes ficus* on fig *(Ficus carica* L.) trees. He also observed that this species was infested fruits, buds, and new and old leaves with high number in Alexandria and Qaluobia governorates. He also was found

Rhyncaphytoptus ficifoliae Keifer on fig trees and *Diptilomious ficus* Attiah from sycamore trees. In the next year, Kozlowski (1983) Studies were carried out in Poznan region of Poland in 1977-78 on the overwintering of eriophyid mites in orchards. *Epitrimerus pyri* Nalepa on pear. The overwintering mites used the natural shelters occurring on short shoots, such as buds and coarse areas of bark. Other mites found on shoots sampled were in the Phytoseiidae, Tarsonemidae, Tydidae, Tetranychidae, Acaridae and Oribatei. In the next year, Cranham (1984) recorded several species of red mites occur on fruit trees as *Tetranychus urticae* Koch. In the next year, Gonzalez (1985) found that during a survey of eriophid mites on apple and pear trees in commercial and abandoned orchards in Chile, the species found were *Epitrimerus pyri* Nal. on pear. In the next year, El-Halawany et al. (1986) recorded *Tetranychus urticae* on apple, pear, and grapevine; *Eutetranychus orientalis* Klein on apricot, pear and grapevine, *T. cucurbitacearum* Sayed, was found on apple, peach, and plum trees in Menoufia governorate; *Panonychus ulmi* (Koch) on pear and peach in Behera governorate, *Cenopalpus pulcher* (C. &F.) on apple trees in Behera governorate, *C. lanceolatisetae* Attiah on plum and apricot trees in Behera, *Brevipalpus obovatus* Donnadieu on Grape vine, apricot, and peach trees in Dakahlia and Menoufia governorate, *B. phoenicis* (Geijskes) on peach in Menoufia and BeniSuef governorate; *Rhyncaphytoptus ficifoliae* and *Eriophyes ficus* on fig trees in Alexandria governorate. They also found that *E. ficus* infested lower leaf surface, buds, fruits,

preferring the new leaves, and *Epitrimerus pyri* Nalepa on pear trees in Alexandria.

Injac et al. (1988) recorded *Epitrimerus pyri* Nalepa on pear orchards in Yugoslavia. In the next year, El-Halawany et al. (1989) recorded *Tetranychus urticae* on apple, *T. cucurbitacearum* (Sayed) on apple trees in Menoufia; *Panonychus ulmi* (Koch) on apple trees in Qalubia and Menoufia governorate, *Eutetranychus orientalis* (Klien) on apricot, and *Cenopalpus pulcher* (C. &F.) on apple and apricot fruit trees in Giza and Qalubia governorate. In the second year, El-Halawany et al. (1990b) recorded *Eriophyes ficus* Cotté on young and old leaves, *Tetranychus arabicus* Attiah, *Eutetranychus orintalis* Klein, *Bryobia practiosa* Koch on fig trees at Alexandria governorate. *Rhyncaphytoptus ficifoliae* Keifer and *Diptilomiopus ficus* Attiah on the fig trees at Sidye Krier (Alex.) and Toukh (Qalubiya). In the same year, Meyer and Ueckermann (1990) recorded 7 African species of Epitrimerus. Four new species, including the pear rust mite *E. pyri* on pear was defined . In the same year, Villabobos and Espinosa (1990) recorded during a survey was carried out on the eriophyid mites associated with fig trees in Mexico. *Eriophyes ficus* Cotté (*Aceria ficus*). In the next year, Ueckermann (1991) recorded that, the 10 African species of Aceria associated with the plant family Moraceae are described. These including *Aceria ficus* (*E. ficus*) an important vector of the fig mosaic virus.

Baillod et al. (1991) recorded pear rust mite *Epitrimerus pyri* Nalepa on pear trees in China.

Heikal et al. (1996) recorded three phytophagous mites, The two-spotted spider mite *Tetranychus arabicus* Attiah and the tenuipalpid mite, *Brevipalpus phoenicis* (Geijskes) was rarely captured, while the eriophyid mite *Eriophyes ficus* Cotté was an occasional pest, on fig trees in (Qaluobia Governorate)

Paternotte (1998) recorded the overwintering is described for potential insect pests in Belgian pear orchards. *Tetranychus urticae* Koch , and *Epitrimerus Pyri* Nal.

B-Predaceous Mites:

Rasmy and Abou-Awad (1972) recorded many species were predacious mites from fig trees; *Amblyseius swirskii* (Athias-Henriot), *Phytoseius plumifer*, (Phytoseiidae); *Agistemus exsertus* Gonzalze (stigmaeidae); *Saniosulus nudus* summers (Eupalopsellidae); *Cheyletogenes ornatus* (C. &F.) (Cheyletidae) *Hemisarcoptes malus* Shimer (Hemisarcoptidae); *Tydeus californicus* Banks (Tydeidae). The phytoseiids particularly *Phytoseius plumifer* was the most commonly encountered predators.

Nassar (1976) recorded the incidence of ten predaceous mite species deciduous fruit trees in North East of Delta. *A. swirskii* on fig trees; *Cheletogenes ornatus* on apricot, pomegranate and quince; A. *exsertus* on pear, peach, fig, grape, apricot and pomegranate; *Eupalopsellus olearius* Zaher and Gomaa on apple; *Saniosulus nudus P. plumifer* on pear fruit trees .In the second year, Heikal (1977) recorded the phytoseiid mites *A. swirskii* (Athias-Henriot) and *A. gossipii* El- Badry on most deciduous fruit trees in upper and lower Egypt, *P. plumifer*

(C. &F.) on fig trees in Alexandria, Fayoum, Burg El Arab and Giza, and the stigmaeidae mite *A. exsertus* Gonzalez on most deciduous fruit trees, and the cheyletidae mite *Cheletogenes ornatus* on almond and apple in upper and lower Egypt, and the *Eupalopsellus olearius* Gomaa (Eupalopasellidae) on apple, quince, almond and grape in Lower Egypt associated with scale insects.

El-Halawany *et al*. (1986) recorded *Amblyseius gossipi* El-Badry, *A. swirskii* on pear, apple, plum, quince, and grapevine trees; *Phytoseius plumifer* was recorded on fig trees; *Agistemus exsertus* was usually inhabiting most deciduous fruit trees; *Sanioslus nudus* Summers on pear and plum trees *and Cheletogenes ornatus* (C. &F); *Hemisarcoptes malus* Shimer; *Eupalopsellus olearius* were observed together with plant feeder mites and scale insects in moderate number on pear, apple, and plum trees in Qalubia and Menoufia governorates.

El-Halawany *et al*. (1989) recorded predacious mite's *Agistemus exsertus* Gonzlez Seemed to be the most important stigmaeid mite on apple in Lower Egypt governorates with high population, *Eupalopsellus olearius* Zaher &Gomaa on apple in lower Egypt governorate, *Cheletogenes ornatus* (C.&F.) on apple at Qalubia and Menoufia, and *Hemisarcoptes malus* Shimer on apple at Qalubia, Sharkia and Gharbia.

In the second year, El-Halawany and Abdel- Samad (1990b) recorded new species *Amblyseius ficus* collected from debris and leaves of fig trees (*Ficus carica*) in Qalubia and Alexandria. In the same year, El-Halawany et al. (1990a) recorded forty predaceous mite species belonging to 14 families

and 20 genera were registered; six species are considered new from fig orchards. The predator mite *Phytoseius finitimus* Ribaga is common predators on fig trees, *A. cydnodactylon* Shehata and Zaher in Qalubia, and *Agistemus exsertus* was collected.

Heikal *et al*. (1996) recorded four predaceous mites inhabiting fig trees. The phytoseiid mite *Amblyseius swirskii* (A. –H.) seemed to be the common acarine predator, and *Agistemus exsertus* Gonzalez were the most common predator mites, while the phytoseiid mite *Phytoseius finitimus* Ribaga and the Eupalopsellid mite, *Saniosulus nudus* Summers were observed in noticeable numbers on fig trees.

El-Lathy and Fouly (1998) found the predaceous mites *Phytoseius finitimus* and *Agistemus exsertus* Gonzalez were studied on apple trees in Egypt. This mite feeding on tenuipalpid,tetranychid and eriophyid mites .

C- Mites with miscellaneous feeding habits:

Wahba (1976) indicated that *Tarsonemus californicus* (Banks) and *Pronematus ubiquitus* (McGregor) did not feed on the plant sap, yet they developed successfully on fungi naturally inhabiting plant leaves. Adult of *T. californicus* preyed on adult and eggs of the eriophyid mite *Eriophyes ficus* and eggs of the tatranychoid mites *T. arabicus* and *Brevipalpus californicus* (Banks). *P. ubiguitus* adult female feed only on eggs of the previous mites. In Next year Heikal (1977) recorded *Tarsonemus smithi* Ewing on apple, pear and quince in lower Egypt, *T. setifer* Ewing on pear and fig trees in Garbia and

Fayoum governorate associated with fungal growths, *T. fusari* Cooreman on fig trees, also recorded oribatuides mite *Siculopata sp.* on apple, peach, grape, pear, apricot and plum, *Zygoribatula sp*.on pear trees, the acaride mite *Tyrophagous putrescentia* (Schrank) on apple, and *Tydeus californicus* (Banks) on grape, plum, apple almond and fig trees in upper and lower Egypt, *T. kochi* Oudem. on pear, apple and peach fruit trees associated with other pestes or spider mite, other free living. In second year, El-Bagoury (1978) recorded the mite *T. californicus* (Banks) was found associated with death mealy bugs and scale insects.

El-Halawany *et al*. (1986) recorded *Tarsonemus selifer* Ewing on apple and pear trees, *T. smithi* and *T. fusari* Gooreman *on fig trees, Tydius californicus* on apple, fig, and peach trees, *T. kochi* oudem. on pear and apple trees, and *Tyrophagous putrescentia* on apple trees. In second year, Momen (1987) indicated that, mite *Tydius californicus* was one of the most abundant species on the leaves twigs and buds on apple trees. El-Halawany et al. (1989) indicated that, *Tarsonemus setifer* Ewing, *T. smithi* Ewing, were recorded in moderate number on apple leaves in different localities of lower Egypt, *Tydeus californicus* Banks, was collected in high number on apple and apricot trees *Zygoribalua tadrosi* Pop., *Siculobata sicula* Grandjean (Oribatidae) were found on branches and soil under apricot and apple trees; *Tyrophagous putrescentia* (Schrank) on apple and apricot trees in all governorates. In the next year El-Halawany et al. (1990b) found that, *Tarsonemus*

setifer Ewing, *Tydeus californicus*, *Zygoribatula sp*., and on fig trees in Qalubia governorate.

Heikal *et al* (1996) recorded tydied mite *Tydeus californicus* Banks on fig trees associated with other pests and fungal growths; *Pronematus ubiquitus* McG. associated with *T. arabicus* eggs on fig trees. Also recorded *T. smithi* Ewing and *Siculobata sicula* Grandjean associated with fungal growths, and *T. putrescentia* on fig trees in Qalubia governorate.

II- Population dynamics of mites on some deciduous fruit trees: -

Zaher *et al.* (1969) considered *Phytoseius finitimus* Ribaga among the most important predator of phytophagous mites infesting fruit trees in Egypt. The considerable number of this predator encountered on fig at times of absence of *Eriophyes ficus* infestation suggested that food other than the eriophyid mite played an important role in the survival of this phytoseiid mite .In the next year (1970), Reis et al. found that *Aceria mangiferae* infested 46 mango cultivates in Barazil but damage was generally slight. Haden variety, had the greatest number of mites, but only minor damage . Augusta variety, presented the lowest number, but was heavily damaged.

Rasmy *et al*. (1971) showed that population abundance of *T. cinnibarinus* was affected by the prevailing climatic conditions, hot preferences, action of predators and leaf age. They found this mite species on apple and pear orchards at Alexandria. Population of this mite was correlated positively with the prevailing temperature while no significant correlation

was noted with the relative humidity. *Agistemus exsertus* semi to be an important factor checking this mite species. They also noticed a positive relation between the incidence of *T. cinnabarinus* and *A. swiriskii* on leaves. In the second year, Goksu and Atak (1972) found that *Tetranychus urticae* over wintered in the soil, among leaf-litter or on weeds, under optimum conditions, development was continuous throughout the winter. Population increased on weeds in spring and the mite later moved to vegetable crops.

Rasmy and El-Banhawy (1974a) mentioned that the fig leaves, which have plenty of glandular hairs, favored suitable conditions to the development of *P. finitimus* and a higher rate of oviposition and prey consumption. The need of this predator to gain contact explains its existence between the glandular hairs on the leaf surface. Rasmy and El-Banhawy (1974b) indicated that the eriophyid mite, *E. ficus* is a preferable prey for the predator mite *P. finitimus , T. urticae* is also a favorable prey for the predator but it seems to be a secondary prey. The capability of *P. finitimus* to survive on pollen favors this predator to exist in the field during the markedly suppressed the egg production of the predator. This would explain the frequent occurrence of this predatory mite on fruit trees during the absence of phytophagous mites. In the second year , Jeppson et al. (1975) stated that all stages of *Eriophyes ficus* are present in and around buds in winter. As buds break in spring the mites move to stems and leaves and begin laying eggs. Most eggs are deposited among lower leaf surface hairs. Development of this mite from egg to adult requires 5 to 7 days. Population of *E.*

ficus increases more rapidly on plants supplied with optimum nutrients than on plants deficient in nitrogen and phosphorus.

Nachev (1976) in the second year observed that *Eriophyes pyri* hibernating in the buds and in cracks of the bark the mite resumed their actively in late March or early April where they migrated to the leaves, increase singly slowly and reach a peak density of 120-150 mites per leaf only in August. During survey of mites associated with fig trees in Egypt by Abou-Awad (1976) showed that the phytoseiid predator, *Phytoseius finitimus* was prevalent and the eriophyid mite, *Eriopyes ficus* was the main acarine pest. Recent field of *P. finitimus* correlated positively with the population of *E. ficus* , *Which* reached a noxious level on fig trees. In the second year, El-Khatib (1977) found that nitrogen accelerated development of *T. urticae* and increased female fecundity while phosphorus prolonged duration of stages and decreased the number of deposited eggs per female. In the same year, Heikal (1977) indicated that, *T. arabicus* was generally infesting almond leaves from April to September, reaching its peak during summer months. He also found the population density of each *T. arabicus* and *C. lanceolatisetae* was positively affected with temperature, while relative humidity did not show any significant effect, the mixed population of *T.arabicus* and *T. neocalidonius* occurred in relatively low number on apple leaves during April and May. High density during August and September due to the activity of the predaceous mite *A. swirskii.* Rizk *et al.* (1983) observed that the most common predatory mites, *E. scutalis* and *Agistemus exsertus* Gonzalez (Acari:

Stigmaeidae), fed on *T. urticae*. Relationships between *T. urticae* and predator populations were significant only during peak populations, usually between July October. In the next year, Takafuji and Kamibayashi (1984) found that, the life – cycle of a non-–diapausing population of *T. urticae* was studied in a pear orchard in Honshu, Japan. The mite over wintered only on biennial weeds in the orchard without entering diapause , stated to increase in numbers in early spring on them , and then moved to other weeds as these emerged . Mites began to appear on pear early in May , several weeks after unfolding of the pear leaves, and migrants from weeds around the bases of the trees initiated populations on pear . The population on pear showed 2 distinct peaks, one in June and the other in mid autumn . The mite returned to biennial weeds for over wintering after the pear leaves dropped in autumn.

El-Halawany *et al.* (1986) observed that Sultani fig variety trees were highly infested with *E. ficus* while Adsi fig variety trees were moderately attacked. He also found that *E. ficus* infesting the lower leaf surface, buds and fruits, preferring the new leaves. In the same year, Sarkar and Somchovdhury (1986) stated that the population build up of *Tetranychus fijiensis Hirst* on coconut generally took place from January on water with the simultaneous increase in the atmospheric temperature .The peak periods of the population build up in the case of *T. fijiensis* were in the months of (June- October). The regressions of major a biotic factors temperature, relative humidity and rainfall on the population densities of the two species of mites were found to be non – significant except

temperature which showed a significant positive correlation with the densities of the mite populations. The cumulative effects of biotic factors on the population dynamics of mites were found to be non-–significant.

Jnjac *et al.* (1988) Observation in Pear orchards in the Belgrade area and 2 areas of the Vojvodina region of Yugoslavia in 1987 showed that deutogyne female of *Epitrimerus pyri* emerged at commencement of flowering and oviposited at the base of the rosettes, after which the protogyne forms stetted on the fruits, where they fed below the calyx. Maximum number occurred on the fruit in May – June. Later, these forms followed the growth of the annual shoots, causing defoliation in young orchards. In the case of varieties ripening in August and later, resetting of the fruits occurred.

El-Halawany *et al.* (1989) Showed that, nearly spring, with the development of new shoots and buds, the number of egg and moving stages began to increase reaching its maximum in June. The mite had two annual peaks of seasonal abundance, one in June and the other in October during the period from August 1985 to June 1986 the population of *T. urticae* was remarkably less. This decrease was attributed to the appearance of the two predaceous mite species *Agistemus exsertus* and *Amblyseius enab,* which clearly reduced the number of *T. urticae*.

Hergstom and Niall (1989) in Australia found that , sampling plan was developed for rapidly assessing of *T. urticae* in pear orchards in Victoria. To estimate the mean number of mite per leaf in 4- ha block of pears, a sample of leaves taken

from the inner –base area of the 10 randomly chosen trees was checked for the presence –absence of the pest on each leaf. Conservation –action thresholds to premature leaf drop were derived as 2.1 mite / leaf (32 % of leaves infested) and 1.2 mite /leaf (22% of leaves infested), res., for the pear varieties "packhams 's Triump and Williams "Bonchretien.

El-Halawany and Abdel–Samad (1990b) indicated that the seasonal abundance of *Tetranychus arabicus* Attiah and its predatory mite *Phytosieus finitimus* Ribaga was studied on Sultani and Adsi fig varieties during two successive years from September 1984 to August 1986. Each of *T. urticae* and *P. finitimus* had one annual peak occurred in June on young and old leaves for the former and in July for the latte. Sultani variety harbored more predaceous mite than Adsi variety. The predacious greatly inhabited young leave. In the same year, El-Halawany et al. (1990a) indicated that the Sultani variety was more susceptible to *E. ficus* and *T. urticae* infestation than Adsi variety during the two successive year (July 1984 to June1986) . The total number of *E. ficus* and *T. arabicus* per 100 leaves during the two successive year were 240284, 63626 and 98436, 24631 individuals for Sultani and Adsi fig varieties, respectively. In the same year, El-Halawany et al. (1990c) found that the population dynamics of the eriophyid mite *Eriophyes ficus* Cotté associated predaceous mite *Phytoseius finitimus* Ribaga in fig orchards near Alexandria was investigated. *E. Ficus* proved to be the main acarine pest infesting the two fig varieties Sultani and Adsi, and had two annual peaks of seasonal

abundance in October and June on young leaves. On old leaves, it had one annual peak of seasonal abundance in May on Adsi fig while on Sultani variety two peaks were indicated in June and October during the successive years. In buds, it had only one annual peak during January. The predator mite *P. finitimus* appeared on both young and old leaves of Sultani and Adsi varieties in May, then increased in number from May to August during the two successive years of study. The predator mite appears to play a considerable role in controlling the eriophyid mite. Also indicated that *T. urticae* appeared in few number on old leaves of apple trees in winter months.

Baillod *et al.* (1991) found that, Pear russet, caused by feeding by *Epitrimerus pyri*, was studied in Switzerland during 1989-90. In the most serious cases, 90 % of fruit were downgraded because of mite damage. Population of > 100 mites /pear were observed on young fruit. At this time population were greater on fruit than on leaves.

Dhooria (1994) found that, an outbreak of *Tetranychus urticae* occurred in pear orchards during May- June 1993 in Jalandhar, Punjab, India. Excessive leaf fall, burning of flower buds and falling off of newly formed fruits were commonly observed in infested orchards. Mite infestation was commonly observed in orchards having poor soil and lower in frequently irrigated orchards with rich soil and regular irrigation. (43° C) even for a few days during June proved lethal for mites and their eggs.

Haikal *et al.* (1996) found that, the two spotted spider mite *T. arabicus* seemed to be the most prevalent phytophagaus

mite pest on fig trees at Barrage district. Then, in early spring , the mite infested the new fig leaves . The main peak of this species occurred in June at average temperature 24.9°C and 66.1% R.H. The eriophyid mite *E. ficus* occupied the second rank as a Phytophagous mite on fig trees at Barrage district after *T. arabicus*. Two relatively small peak were recorded, the first during May and the second during November.

Gotoh (1997) found that the annual life cycles of *T. urticae* populations pear orchards in Ibaraki Prefecture, Japan. Some mites over wintered on weeds in the orchards without entering diapause, and others entered diapause and passed through winter in bark crevices of pear trunks and within the strands of vinyl binding ropes used to bind the branches to a trellis. The seasonal prevalence of mite population in the four pear orchards was similar, but their abundance's varied greatly. Population peaks appeared in July and from September to early October. Mites that migrated from ground cover vegetation onto the pear trees in spring formed the population peak in July. There after, mite densities remained at low levels throughout the summer, and a second peak occurred in autumn, few or no mites appeared on pear leaves during the period of the preceding to summer, suggesting that the autumn mites were immigrants from other places, such as neigh boring pear orchards. At 18°C and 10 h of light, the incidence of diapause varied from 15.6 to 67.7 % among the four populations. In winter the number of females decreased, this decrease may be because some females came out of diapause in response to occasional warm days in

winter and in migrated onto the ground cover vegetation and /or died from starvation during subsequent cold and dry periods.

Adam and Mohamed (1998) showed that, the two –spotted spider mite, *Tetranychus arabicus* Attiah and its predatory mite, *Phytoseius finitimus* Ribaga were studied on Sultani fig variety in Sohage Governorate under the prevailing weather condition for two successive years (1995- 1996). *T. arabicus* had one annual peak in July 1995 and in June 1996, while the predator mite, *P. finitimus* had one annual peak in August in the two studies years. The average minimum temperature and the mean temperature had a highly significant correlation with *T. arabicus*, while the average maximum temperature had a negative correlation in this respect. However, a negative correlation with relative humidity was recorded. *P. finitimus* had a highly positive correlation with *T. arabicus* .

Li-Daluan *et al.* (1998) studies the biology of *T. viennesis* was studies in orchards in Hebi, China, over 15 –year period. One population peak was observed per year. The peak occurred mainly from late June to mid –July in pear. The demarcation index of the temperature and relative humidity of the peak was an average of 10 days at 26.14 ± 2.11° C and 61.67 ± 8.92 %, respectively.

III- Effect of some factors on the biology of two spotted spider mite.

Farrag (1975) studies the biology of *Tetranychus arabicus* Attiah under laboratory condition, in which the life history at 13, 18, 23 and 27°C, and 60% R.H., he found the

incubation period of *T. arabicus* averaged 3.2 and 3.1 days at 27°C. And 19.7 and 18.9 days at 13°C., for fertilized and unfertilized eggs, respectively. The immature stages of *T. arabicus* lasted from 5.6 days in female and male at 27°C and 18.5 days at 13°C.The pre-oviposition period average 1.5 days at 27°Cand 3.9 day at 13°C, while the female longevity varied from 11.9 to 24.5days at 27 and 13°C res., the total egg deposited per female average 80.2 egg at 13°Cand 129.7 eggs at 27°C, maximum average at 27°C. The daily rate egg deposited per female /day average 4.1 to 13.0 egg at 13 and 27°C respectively.

Ibrahim (1980) observed the effect of different host plant (ullayg, pear, eggplant, cotton, sweet potato, edible fig and kidney beans) were evaluated for their effects on the developmental rats of all stages and the fecundity of female. The experiments showed a minimum on sweet potato. The tested hosts could arranged in a descending order of preference as follows: egg plant, cotton, kidney beans, ullayg, edible fig, pear and sweet potato.

Mohamed (1982) found that, the total Nitrogen of the host plant (sweet –potato, cotton, castor and mango) had a considerable role in the developmental rate of both female and male individuals. It was found, also in the same study, that Phosphorus contents was positively correlated with survival percentage and fecundity of mite individuals .In addition, the low level of immature stages and longevity. Further more, the sodium contents in plant leaves showed no significant effect on the biological aspects of *T. arabicus,* except that a slightly

positive correlation with female fecundity was observed. She also found that, the host plant obviously influenced the sex ratio of the mite individuals (it takes male /female). The ratio of males to female was 1:1.6 on sweet potato, 1: 2.4 on young Citrus, 1:4.6 on castor oil plant, 1:4.8 on peppermint, 1:8 on malvaviscus and 1:10 on cotton. The number of the produced female differed greatly according to host plant. She also found the total nitrogen, phosphorus and potassium does not effect on sex ratio.

Rishi and Rather (1983) found that, the life cycle of *Tetranychus urticae* Koch was studied under laboratory and field conditions in Kashmir, India. Egg production, the incubation and oviposition periods and overall population build-up were higher at 20-23°C and 80-90% RH than at 25-32°C and 60-70% R.H. The optimum temperature for survival of all developmental stages was 19-28°C however, the duration of the stages increased at low temperatures and decreased at high ones. During the growing season of various crops, 10-12 generations of the pest were recorded in Kashmir.

El-Halawany *et al*. (1989) studies that , correlation between the effect of Nitrogen, phosphorus and potassium in apple and apricot leaves on abundance of *Tetranychus arabicus* was investigated. Population of *T. arabicus* and *P. ulmi* positively correlated with phosphorus concentration in apple leaves. In the field apple trees were highly infested with *T. arabicus*, in contrast to apricot trees which were not infested. This might be attributed to decreased contents of nitrogen and phosphorus, and increased potassium contents in leaf apricot.

They also found that, the effect of two apple varieties, Burkher and Anna on the biology of *T. urticae*. It was shown that Burkher leaves was suitable for *T. urticae* development and fecundity than Anna leaves . Burkher leaves Highly prolonged the mite oviposition period, longevity and enhanced the female fecundity.

This can be attributed to the differences in nutritional values of the two used apple varieties and this ex plan the fact that Burkher apple variety was more susceptible to the infestation by *T. urticae* than Anna apple variety.

Tsai *et al.* (1989) studied that, the developmental duration of *Tetranychus kanzawai* Kishida, reared with flowing tea leaves, were studied at 15, 20, 25 and 30° C. The longest duration were found to be at 15°C, the shortest at 30 ° C. The lower developmental threshold and thermal unit accumulation were calculated from the linear regression of the developmental rates set at different temperatures. The fecundates per female at 15, 20, 25, and 30 ° C were 27.8 ±4.6, 45. 7 ±5.6, 74.9± 9.2 and 76.0 ± 5.4 eggs respectively, at 15, 20, 25, and 30° C , intrinsic rates of increase (r_m) were 0.0443, 0.1079, 0.2149 and 0.2764.

El-Halawany *et al.* (1990a) found that the leaves of Sultani were more susceptible to infestation with phytophagous mites, than leaves of Adsi variety. This may be due to the long and large numbers of hair on the on the lower surface of macro –and micronutrients. Also found that leaves of Sultani variety were more favorable to *T. arabicus* development and fecundity than leaves of Adsi variety. Sultani leaves highly prolonged Oviposition period and female

longevity and increased fecundity . The Adult female lived for 14.0 ± 3.45, and deposited 86.9 ±28.59 egg during 11.44 ± 3.23 days on average when fed on Sultani variety, while on Adsi variety it lived for 10.86 ± 0.89 day and laid 66.0 ± 8.43 egg in 8.28 ±0.9 day. The difference in Oviposition, female longevity, and fecundity were highly significant. This might be due to difference in leaf epidermal hairs and chemical constituents. Leaves of Sultani variety had long and large numbers of hairs on the lower surface. The leaves were also characterized by higher percentage of total nitrogen, phosphorus compared with leaves of Adsi variety.

Wermelinger and Delucchi (1990) found that, spider mite (*Tetranychus urticae*) were reared individually on leaf discs of apple trees fertilized with three different N levels. Leaf nitrogen, female fecundity and mortality as well as offspring sex – ratio was determined. The sex –ratio and fecundity in the three treatments showed a slight increase at high leaf N . The correlation between sex –ratio and respective leaf N contents proved significant. In a range of 1.8 – 3.0% N, sex–ratio increased from 0.64 to 0.76. Relationship between increasing fecundity and higher sex –ratio was found. Mortality and was not affected. Assessing these results from population dynamics poit of view, the intrinsic rate of natural increase (r m) was raised at high leaf N by 29%.

Wermelinger *et al*. (1990) indicated that ،The literature of the past 20 years on the effects of temperature on spider-mite development is reviewed and the results are presented of laboratory studies on temperature as a key element in the life

system of *Tetranychus urticae* on apple. Life tables were constructed at 5 constant temperatures between 15 and 35ºC. Development rates were linearly related to temperature, and the proportion of quiescent stages declined with increasing temperatures. With increasing temperature, the adult life span became shorter, oviposition rate increased, generation time decreased (linearly) and doubling decreased accordingly.

Kim, *et al.* (1993) showed that, the tea red mite *Tetranychus kanzawai* Kishida was recorded under constant temperature of 15,20, 25 and 30°C, the egg periods averaged 15.1, 8.9, 4.4 and 2.3 days, respectively, while the larval periods 6.4 , 3.5 , 1.9 and 1.2 days, protonymphal periods were 5.6, 2.8, 1.7 and 1.0 days at 15, 20, 25 and 30°C respectively, while developmental periods of deutonymphs were 7.5, 4.0, 2.1 and 1.3 days. Longevity of female adults were 33.3, 16.8, 15.5 and 13.4 days, and average numbers of eggs laid per female 37.5, 59.4, 100.6 and 103.3.at the degree of temperature, respectively. The intrinsic rates of increase were 0.062, 0.134, 0.252 and 0.371 under 15, 20, 25 and 30°C, respectively.

Lewis (1994) in Australia, studied the suitability of cotton for development and reproduction of the two-spotted spider mite *T. urticae* Koch, and found that the mite developmental time was negatively related to nitrogen contents, while fecundity was positively related.

Heikal *et al.* (1996) Showed that Black michen variety harbored the greatest *T. Arabicus* density followed by Conadria variety, while Doritto was the least sensitive variety. Black michen variety highly favored the mite Oviposition and

fecundity than did Doritto variety. It was also found that the three fig varieties significant differed in their susceptibility to *T. arabicus* .

In the same year, Taha and El- Raies (1996) showed that, the increasing of salinity levels increased sodium and decreased Nitrogen as a consequence, mite infestation was decreased.

In the second year, Taha *et al.* (1997) found negative correlated between mite density and potassium content of the leaf .In contrast, positive correlation as observed between mite density and N content of leaves.

In the second year, Cao *et al.* (1998) reported that development period, hatch rate, survival and fecundity of *Tetranychus kanzawai* were investigated under different temperature and relative humidity (RH) regimes (15°C + 80% RH; 20°C + 75% RH ; 25°C + 70% RH ; 30°C + 65 RH and 35 °C + 60 RH).The shortest generation (6.23±0.44 days) occurred at 35 °C +60 %RH . The average number of eggs laid per day was 7.18± 1.56, with a peak of 13.95 ±3.72 , and the shortest oviposition period was 9.65±1.53 days. Under this condition, the hatch rate of eggs and survival rate of young mites was 72.4 and 84.5%, respectively. The longest generation (27.49 ±0.55 days) occurred at 15°C + 80% RH . The mean number of eggs laid per day was 2.04 ±0.55, with the highest of 5 ±1.21, and the longest oviposition period was 28.4±4.06 days. The hatch rate of eggs and survival rate of young mites was 85.6 and 97.0%, respectively. The optimal temperature for development is 25-30°C.

In the second year, Liu and Tasi (1998) studies the development, survivorship, and reproduction of (*Tetranychus tumidus* Banks) on Coconut palm were evaluated at 6 constant temperatures (10, 15 ,20, 25,30 and 35°c) . The developmental periods of immature stages ranged from 39.6 d at 15 °c to 7.4 d at 30°c .The mite failed to developed beyond the larval stage at 10° c .The lower temperature developmental thresholds for egg, larva, protonymph, deutonymph and the combined immature stages were estimated at 11.1,12.9, 12.1, 11.1 and 11.9 °c, respectively . The upper temperature thresholds of 25.9, 35.9° c for development of immature stages determined from anon linear biophysical model. The percentage of survival of immature stages varied from 56.4 to 93.7 % within 15- 35°C. The average longevity of adult female ranged from 48.7d at 15°C to 7.9 days at 35 °C. The average Oviposition per female life span varied from 86.02 to 61.75egg within the temperature range of 20-30°C. However, oviposition was greatly reduced to 19.44 and 20.54 eggs at 15°C and 35°C, respectively. It was evident that temperatures significantly affected the development, survivorship and reproduction of *T. tumidius* . The optimal temperature for *T. tumidius* population growth was 30°C .

In the second year, Azouz (1999) found that, negative correlation between leaf contents of nitrogen, phosphorus, reducing-, non-reducing-, total–sugars and protein and each of the incubation period and different periods of the developmental stages of the *T. urticae* were, significantly observed. He also found positive correlation, on the contrary, were, significantly observed between leaf contents of nitrogen,

phosphorus, reducing-, non-reducing -, total –sugars and the whole life span, oviposition and post- ovipostion periods and female longevity. About similar trend was, also shown with female fecundity. Also found positive correlation between leaf contents of potassium and each of the periods of egg incubation different development stages, life cycle and pre-oviposition, were detected. Also found negative correlation were obtained between leaf contents of potassium and each of life span, ovipostion, post-oviposition periods, female longevity and fecundity.

In the same year, Bonato (1999) studied the effect of four temperatures (20, 26, 31and 36°C) on biology (survival and duration of developmental stages, fecundity and longevity of female and sex ratio) and demographic parameters (Ro, G, r_m and λ) of *Tetranychus evansi* Baker & Pritchard in laboratory under controlled conditions: 75± 10% R.H. The lower thermal threshold was 10.3°C. The shortest developmental time (6.3 days) was obtained at 36°C. Maximum fecundity was recorded at 31°C with 123.3 eggs per female. The highest intrinsic rate of increases (r_m) (0.355) was obtained at 31°C, the optimal temperature for population growth seems to be 34°C.

MATERIAL AND METHODS

A. Occurrence: -

Occurrence of mites inhabiting fig and pear trees were studied in different governorates of Lower Egypt, during the successive years namely 1998 and 1999. Samples representing several habitats were randomly taken, and the collected samples, which generally resemble plant vegetation's such as buds, shoots, old branches and leaves, were put in tightly-closed polyethylene bags and transported to the laboratory. Mites were inspected under a stereoscopic microscope, cleared in Nesbitt's clearing agent and mounted on glass slides in droplets of Hoyer's media. Necessary taxonomically and ecological informations were provided to each slide, then microscopically examined for identification. The mounted species were added to the collection of the Plant protection Research Institute Dokki Egypt. Several trips expeditions and excursion to several localities in different provinces of were made, along two years.

B. Population dynamics of mites:-

Population dynamics of mites inhabiting Sultani fig variety was recorded during two successive years, 1998, and 1999. One feddan fig orchard of about ten years old at Sinhera region (Qaluobia Governorate) was used for such item. The experimental area received neither acaricides nor fertilizers during this study. Fig area was generally represented by 100 trees, which were divided into four groups of 25 trees, each. Samples were, randomly taken every month from January 1998 to December 1999. They were put in polyethylene bags and directly transported to the laboratory. Each sample was,

generally composed of 20 young leaves, 20 old leaves and 12 cuttings of 10 cm., long and with top bud each. The upper and lower surface of leaves were inspected (inspect unite of *Eriophyes ficus* Cotté = 3 inch per leaf, inspect unite of *Tetranychus urticae* Koch and *Phytoseius finitimus* Ribaga = all leaf). The motile stages of *T. urticae*, *E. ficus* and *P. finitimus* were recorded. Studying population fluctuation of the two-spotted spider mite *T. urticae*, Pear rust mite *Epitrimerus pyri* Nalepa and phytoseiid mite *Amblyseius swirskii (*A.&H.) were recorded during two successive years. Area of feddan, was generally represented by 80 trees of Lacont pear of about 15 years old, was selected at Sinhera district (Qaluobia Governorate). Trees were divided into four groups of 20 trees each. Samples were, randomly taken every month and directly transported to the laboratory. Each sample was generally composed of 40 leaves and 12 cuttings of 10 cm. The upper and lower surfaces of leaves were inspected. Motile stages of *T. urticae*, *E. pyri* and *A. swiriskii,* were counted. The monthly average temperature (C˚) and relative humidity (R.H.%) prevailing in Qaluobia Governorate, during the experiment, were obtained from the meteorological department at Shebin El-Knater. Simple correlation was used to differentiate between weather factors. Also, with the total count of predatory mite (Steel and Torrie 1980), El-Halawany *et al*. (1990) and Heikal *et al.* (1996).

C. Biological studies:

Rearing of *Tetranychus urticae* Koch

A pure culture of *T. urticae* was propagated on seven fig seedlings and two pear varieties. Seedlings were kept at green house in the Plant Protection Research Institute. One leaf of each variety of fig (*Ficus carica* L.)[Sultani, Adsi, Black Michen, Doritto, Gizi, Cadota, Conadria] also of the two varieties of pear trees *Pyrus communis* L. [Lacont and Hood], was taken.

Testing the effect of host plant on the biology of *T. urticae,* the method proposed by Mohamed (1982) and Azouz (1999) was used with some modifications, as one leaflet from the first fully expanding leaf at the top per plant of each variety, was taken and then it was well washed with running water to remove any possible residuals or mites, which may be found on these leaves. Leaf discs of about one-inch in diameter were made and surrounded by tangle foot, which acts as a barrier to prevent mite individuals from escaping. These discs were placed on pieces of moisten cotton wool in petri dishes of 10-cm diameter and two couple (male and female) was placed on each disc, on the lower surface of the leaf, for each variety. These petri dishes were kept at four different temperatures (30, 25, 20 and 15 °C ±2°C and 70 ± 5% R.H.), for24 hours to allow the existence of mating process between male and female, thereafter, males were removed, while female served as a source for known-age eggs, which in turn produce known-age larvae. The moisture was kept constant by adding few drops of water to the cotton wool. About 60 hatching larvae were Trans and kept singly to a leaf of each variety and left to continue their life span. Newly emerged females were

copulated and left to deposit their eggs. Examination was made twice daily, early in the morning, and before sunset. Essential records were noted. To examine sex ratio of *T. urticae*, Ten newly emerged female were placed and males were transferred and kept under the same condition of temperature and R. H.%. From the deposited eggs of each female, 50 eggs (25eggs after two days and 25 eggs after one week) were during female oviposition. Eggs were left to develop until the second generation, then count the number of males and females were counted for different temperatures and different hosts .

D. Statistic analysis: -

Life table parameters calculation:-

During developmental period, mortalities of different stages and sex ratio of progeny were determined. Oviposition by resultant females was recorded daily for each female. Life table parameters were estimated using the Life48, BASIC Computer programmed (Abou-Setta et al. 1986). Parameters were determined by the following formula:

$$\sum_{0}^{max} L_x m_x / \exp. r_m{}^x = 1$$

Where; "m_x is the number of daughters produced per female during the interval "x". "L_x" is the fraction of alive females at age "x". The values of "r_m" is a natural logarithm of the intrinsic rate of increase and indicates the number of times of population multiplication in a of time unit. The net reproductive rate (R_o) is the mean for female multi-placation in one generation. "T" is the mean length of generation period,

expressed in days. These definitions were presented by Birch (1948).

E. Chemical analysis:-

Plant leaves samples were collected from each variety (pear and fig trees) in August 1999. Samples were washed with distilled water and dried in the oven at 70°C for 24 hours, then the dry weights were determined. Total nitrogen was determined by using a method suggested by Pregl (1945). For phosphorus contents evaluation the method suggested by Murphy and Riely (1962) was used. Also was estimated, potassium content using the method described by Dewis and Freites (1970) and sugar content reduced and non-reduced were calculated the method described by Nagiub (1963).

RSULTS AND DISCUSSION

I – Occurrence of mites on fig and pear trees.

A. Phytophagous mites: -

Phytophagous mites which frequently occurred on fig and pear trees were observed to cause sever harms to leaves, buds and fruits. Mite feeding produces variable symptoms such as rusting, surface browning, bud blasting, leaf chlorosis and malformation of fruit. Severe infestation can be defoliation of leaves and deteriorate the orchard. Phytophagous mites included thirteen species representing 4 families (Tetranychidae, Tenuipalpidae, Eriophyidae and Rhyncaphytoptidae), that are recorded in Table (1).

1-Family: Tetranychidae Donnadieu:

Member of family Tetranychidae usually infests leaves especially lower surfaces. In severe infestation, drop and poor yield of small fruits was obtained. The incidence of two-spotted spider mite *Tetranychus urticae* Koch was observed in high numbers on Sultani fig variety and Lacont pear variety in governorates of Lower Egypt. The *Tetranychus cucurbitacearum* (Sayed) was frequently found in moderate numbers on pear trees leaves in Menoufia Governorate during August, September and October. The brown citrus mite *Eutetranychus orientalis* (Klein) was found in few numbers on Sultani fig and Lacont pear varieties in Qalubia and Menoufia governorates. This species preferred inhabiting leaf upper surface. The European red mite *Panonychus ulmi* (Kock) was found on Lacont leaves, preferring the lea upper f surface in few

numbers in governorates of Lower Egypt. The mite species *Bryobia practiosa* Koch was recorded from Sinhera district, Qalubia governorates; which was collected from weeds under Sultani fig variety trees but with low numbers. Results are in agreement with Heikal (1977), Weires *et al*. (1979), Cranham (1984), El-Halawany *et al.* (1986), El-Halawany *et al.* (1990 b), Heikal *et al.* (1996), and Partenotte (1998).

2- Family: Tenuipalpidae Berlese:

Members of this family comprise some species, which were mostly infesting Pear and Fig trees, causing serious damage. *Cenopalpus pulcher* (C. & F.) was recorded on Pear at Qalubia and Governorate, in few numbers, This mite preferring the lower surface of leaves during warm months and buds in cold months. *C. lanceolatisetae* Attiah was als recorded in few numbers. Individuals preferred inhabiting lower leaf surface.

Members of genus *Brevipalpus* Donnadieu, were occasionally found without causing obvious damage. *Brevipalpus obovatus* Donnadieu was recorded on Pear in Lower Egypt governorates. *B. phoenicis* (Geijskes) was collected from fig trees at Sinhera district, Qalubia Governorate. Such findings coincide with that was found by Hiekal (1977), El- Halawany *et al*. (1986), El- Halawany *et al*. (1989), and Heikal *et al*. (1996).

3. Family: Eriophyidae Nalepa:

Two species of eriophyid mites were recorded inhabiting Fig and Pear fruit trees of which *Eriophyes ficus* Cotté was

recorded in higher numbers on lower surface of young leaves than on old leaves on Sultani Fig variety at Sinhera

districts Qalubia Governorate. Also all stages of *E. ficus* was found in and around buds and under apical fruit scales. The pear rust mite *Epitrimerus pyri* Nalepa was found with high numbers on pear trees at Qalubia and Menufia governorates. These results proved to agree with Nemoto *et al*. (1980), Plavisc (1980), and El- Adl (1982), Kozlowski (1983), Gonzalez (1985), El-Halawany *et al*. (1986), Jnioc *et al*. (1988), El- Halawany *et al*. (1990b), Meyer and Ueckerman (1990), Villabobs and Espinosa (1990), Baillod *et al*. (1991), Ueckerman (1991), Heikal *et al*. (1996), and Patertrnotte (1998).

4- Family: Rhyncaphtoptidae Keifer:

This family was represented by two mite species, the first species, *Rhyncaphytoptus ficifoliae* Keifer which was found on lower surface of the old leaves of Sultani Fig variety with moderate numbers in Qalubia governorate. The other species *Diptilomipus ficus* Attiah was recorded on lower surface of Sultani Fig variety with few numbers in El- Behera governorate. These results are in accordance with those of El-Adl (1982), El- Halawany *et al*. (1986), El- Halawany *et al*. (1990).

B- Predaceous mites:-

Twelve predaceous mite species of families, phytoseiidae, Stigmaeidae, Cheyletidae and Eupalopsellidae were found on fig and Pear fruit trees (Table 2). Scantly work was done dealing with mite occurrence (Rasmy and Abou-Awad, 1972), Nassar (1976), Heikal (1977), El- Borolossy (1979), El-Halawany and Abdel-Samad (1990), El- Halawany

et al. (1990b), Heikal *et al*. (1996), and El- Lathy and Fauly (1998).

1. Family: Phytoseiidae Berlese:

In general, mites of the Phytoseiidae are, actively predaceous upon species of the plant feeding, belonging to families; Tetranychidae, Tenuipalpidae, Eriophyidae and Rhyncaphytoptidae. Many species of the phytoseiids are, possibly ranked among the most effective predators of these phytophagous mites including a number of serious pests of agricultural crops The predator mite, *Phytoseius fintimus* Ribaga is, actively predaceous upon the phytophagous mites and reduce their numbers. This mite was recorded in high numbers on leaves of Sultani Fig variety in Sinhera district, Qalubia, and Menoufia governorates. The species, *Amblyseius swiriski* Athias- Henriot and *Euseius scutalis* A.-H. were recorded on Fig and Pear trees at governorates of Lower Egypt, *A. swiriski* was recorded in high numbers on leaves of Sultani Fig variety and Lacont Pear variety trees, and moderate number on buds, *E. scutalis* found on Fig and Pear bud attacking tetranychid and Tenuipalpid mites. *Amblyseius cydnodactylon* S.& Z., was found in debris under Sultani Fig variety with few numbers in Qalubia and Menofia governorates. Also it was found with low number on leaves of Pear trees. *Ambylseius ficus* El- Halawany & Abdel Samad was recorded on leaves of Sultani Fig variety at Sinhera district, Qalubia Governorate.

The predator mite *Typhlodromus pyr*i Scheuten was recorded in few numbers on pear trees at Qalubia Governorate, associated with tetranychid and Tenuipalpid mites.

2- Family: Stigmaeidae Oudemans:

A single Stigmaeid mite *Agistemus exsertus* Gonzalez was observed with moderate numbers on leaves and few number on buds of Sultani fig variety and Lacont Pear variety at governorates of Lower Egypt, usually associated with tetranychid, tenupalpid, eriophyid mites and Scale insects.

3- Family Eupalpsellidae Willman:

This family was represented by two species *Eupalopsellus olearius* Zaher & Gomaa, which was recorded in few numbers on Pear trees in governorates of Lower Egypt. The other mite species *Saniosulus nudus* Summars was observed in moderate numbers on Pear leaves, usually in association with the scale insects.

4-Family: Cheylitidae Leach:

A single cheyletid mite, *Cheletogenes ornatus* (C.&F.) was found in moderate number on leaves of fig and Pear trees and few numbers on buds at Qalubia and Menoufia governorates.

5- Family Hemisarcoptes Oudemans:

The single species, *Hemisarcoptes malus* Shimer, was usually recorded in low numbers in association with scale insects infesting Pear trees in Qalubia Governorate.

C- Mites with miscellaneous feeding habits

This group of mites is unknown feeding behavior. It needs the further studies to estimate their role. Mites of uncertain food were collected inhabiting Fig and Pear orchards. Scantly work was done dealing with mite occurrence Wahba (1976), Heikal (1977), El-Halawany *et al*. (1986), Momen (1987), El- Halawany *et al*. (1989), El-Halawany *et al.* (1990b), and Heikal *et al.* (1996). Table (3) illustrated that 9 species belonging to 6 genera and 4 families were collected

1-Family Tarsonemidae Kramer:

Three species were recorded in association with Pear and Fig trees. *Tarsonemus setifer* Ewing was recorded with moderate numbers on Fig and Pear trees at governorates of Lower Egypt. *T. smithi* Ewing was found on Fig and Pear trees in moderate numbers in lower Egypt governorates. *T. fusari* Cooreman was collected from Fig trees in few numbers at Damietta Governorate. Individuals species were usually found in association with fungal growth.

2-Family Tydeidae Kramer:

Three species of this family was recorded, *Tydieus californicus* Banks was found with moderate number on leaves of sultani fig variety and Lacont Pear variety at governorates of Lower Egypt. *T. Kochi* Oudemans was found in relatively moderate numbers on leaves, usually associated with tetranychid and tenuipalpids on Pear trees at Qalubia and Menofia governorates. *Pronematus ubiguitus* Mc G. was recorded in

moderate numbers on Fig trees at Qalubia Governorate. Individuals of this species were seen moving quickly on both sides of leaves and branches, usually in association with the tetranychid and tenuipapid mites.

3-Family Oribatidae Jacot:

The family Oribatidae was represented by two species *Siculobata sicula* Grandjean and *Zygoribatula sayedi* El Badry &Nasr. The former species was generally observed on leaves, branches with low numbers on Pear and Fig trees in Qalubia Governorate, while the latter species was rarely found in soil under Pear trees and rare found on buds and branches on Fig trees in governorates of Lower Egypt.

4-family Acaridae Leach:

The family Acaridae was represented by a single species *Tyrophagous putresentiae* (Schrank), which was rarely found feeding on fungi.

II – Population dynamics of mites :-

A) Seasonal abundance of phytophagous and predaceous mites occurring on trees of Sultani fig variety and Lacont pear variety: -

1. Seasonal abundance of the fig bud mite, *Eriophyes ficus* Cotté, on trees of Sultani fig variety: -

Individuals of Fig bud mite, were found with high numbers on young leaves. Table (4& 5) and Fig. (1&2), clearly demonstrate that *E. ficus* has two peaks of seasonal abundance, One in June and the other in November 1998. The total numbers were 1303 and 1892 individuals at temperatures of 27.0, 25.9°C and relative humidities 55.5, 59.5% respectively. In the second year, *E. ficus* has two peaks of seasonal abundance, One in June and October 1999. The total numbers were 12880 and 3091 individuals at temperatures 23.95, 23.6°C and relative humidity of 59.95, 59.0 %, respectively. The total numbers were 20; 183; 525; 1303; 774; 305; 567; 1514; 1892 and 830 individuals at average temperatures of 14.65; 21.60; 24.95; 27.0; 28.85; 29.50; 28.05; 25.10; 25.9 and 16.85°C and relative humidity were 59.0; 57.0; 55.50; 55.5; 57.5; 58.5; 56.5; 57.5; 59.5 and 58.5% in March; April; May; June; July; August; September; October; November and December, respectively in the first year, While in the second year these number were 176; 1381; 3302; 12880; 8184; 1972; 1763; 3091; 2156 and 61 individuals at temperatures of 13.4; 20.1; 23.5; 23.95; 28.25; 28.5; 23.5; 23.6; 18.2 and 17.0°C and relative humidity of 59.5; 52.3; 54.25; 59.95; 55.95; 58.35; 59.05; 59.0; 56.3 and 60.2% in January; April; May; June; July; August; September; October; November and December, respectively.

This species appeared with few numbers in March on young leaves in the first year and in April in the second year, then increased in number until June and gradually decreased from July to September, then increased again in November in the first year and in October in the second year

but gradually decreased in December in the first year and November in the second year.

On old leaves, (Table 4&5) and Fig. (1&2) illustrated that *E. ficus* has two peaks were recorded in July and November during two successive years with total numbers 655, 615 and 2405, 1102 individuals at temperatures 28.85, 25.9 and 28.25, 18.2°C and relative humidity 57.5, 59.50 and 55.95, 56.3%, respectively. The total numbers were 157; 306; 553; 655; 173; 280; 301; 615 and 595 individuals at temperatures of 21.60; 24.95; 27.0; 28.85; 29.50; 28.05; 25.10; 25.9 and 16.85°C and relative humidity of 57.0; 55.5; 55.5; 57.5; 58.5; 56.5; 57.5; 59.5 and 58.5% in April; May; June; July; August; September; October; November and December respectively in the first year, While in the second year these number were 144; 721; 1089; 2405; 985; 764; 806; 1102 and 65 individuals at temperatures of 20.1; 23.5; 23.95; 28.25; 28.5; 23.5; 23.6; 18.2 and 17.0°C and relative humidity of 52.3; 54.25; 59.95; 55.95; 58.35; 59.05; 559.0;59.0; 56.3 and 60.2% in January; April; May; June; July; August; September; October; November and December respectively. On old leaves, of Sultani fig variety ***E. ficus*** has two peaks, which were recorded in July and November during the two successive years. The eriophyid bud mite appeared with little numbers on old leaves in April and increased until July and decreased in number from August to October, till it disappeared from January to march during the two successive years. Individuals of *E. ficus* were found with higher numbers on young leaves than on old leaves, during the two successive years, where *E. ficus* preferred young leaves.

Statistical analysis present in table (4&5) showed that, temperature was significant positive correlation with density of the population of *E. ficus* on young and old leaves, during the two successive years. However, Relative humidity had non-significant correlation with the mite population but in the first year it was negative, and in the second year it was positive, on both young and old leaves.

Table (4) The monthly total number collected *Eriophyes ficus* Cotté, on Sultani fig variety trees at Sinhera, Qalubia Governorate, from January 1998 to December 1998.

Date of sampling	Total number of moving stages of *E. ficus*			Average temp. C°	Average R.H. %
	Young leaves/60 unite	Old leaves/60 unite	12 buds		
January	**0**	**0**	**131**	**13.05**	**64.50**
February	**0**	**0**	**242**	**14.25**	**64.0**
March	**20**	**0**	**143**	**14.65**	**59.0**
April	**183**	**157**	**0**	**21.60**	**57.0**
May	**525**	**306**	**0**	**24.95**	**55.50**
June	**1303**	**553**	**0**	**27.0**	**55.50**
July	**774**	**655**	**0**	**28.85**	**57.50**
August	**305**	**173**	**0**	**29.50**	**58.50**
September	**567**	**280**	**0**	**28.05**	**56.50**
October	**1514**	**301**	**0**	**25.10**	**57.50**
November	**1892**	**615**	**9**	**25.90**	**59.50**
December	**830**	**595**	**135**	**16.85**	**58.50**

Correlation coefficient

Moving stages of *E. ficus* on young leaves	0.54	-0.32
Moving stages of *E. ficus* on old leaves	0.57*	-0.39
Moving stages of *E. ficus* on buds	-0.84**	0.78**

* Significant at 5% level

60 unite = 20 leaves

Table (5) The monthly total number collected *Eriophyes ficus* Cotté, on Sultani fig variety at Sinhera, Qalubia Governorate, from January 1999 to December 1999.

Date of sampling	Total number of moving stages of *E. ficus*			Average temp. C°	Average R.H. %
	Young leaves/60 unite	Old leaves/60 unite	12 buds		
January	**176**	**0**	**835**	**13.4**	**59.5**
February	**0**	**0**	**557**	**14.5**	**59.4**
March	**0**	**0**	**270**	**17.0**	**55.7**
April	**1381**	**144**	**97**	**20.1**	**52.3**
May	**3302**	**721**	**0**	**23.5**	**54.25**
June	**12880**	**1089**	**0**	**23.95**	**59.95**
July	**8184**	**2405**	**0**	**28.25**	**55.95**
August	**1972**	**985**	**0**	**28.5**	**58.35**
September	**1763**	**764**	**0**	**23.5**	**59.05**
October	**3091**	**806**	**0**	**23.6**	**59.0**
November	**2156**	**1102**	**13**	**18.2**	**56.3**
December	**61**	**65**	**118**	**17.0**	**60.2**

Correlation coefficient

Moving stages of *E.ficus* on young leaves	0.63*	0.04
Moving stages of *E.ficus* on old leaves	0.79**	0.10
Moving stages of *E.ficus* on buds	-0.077	0.31

* Significant at 5% level

60 unite = 20 leaves

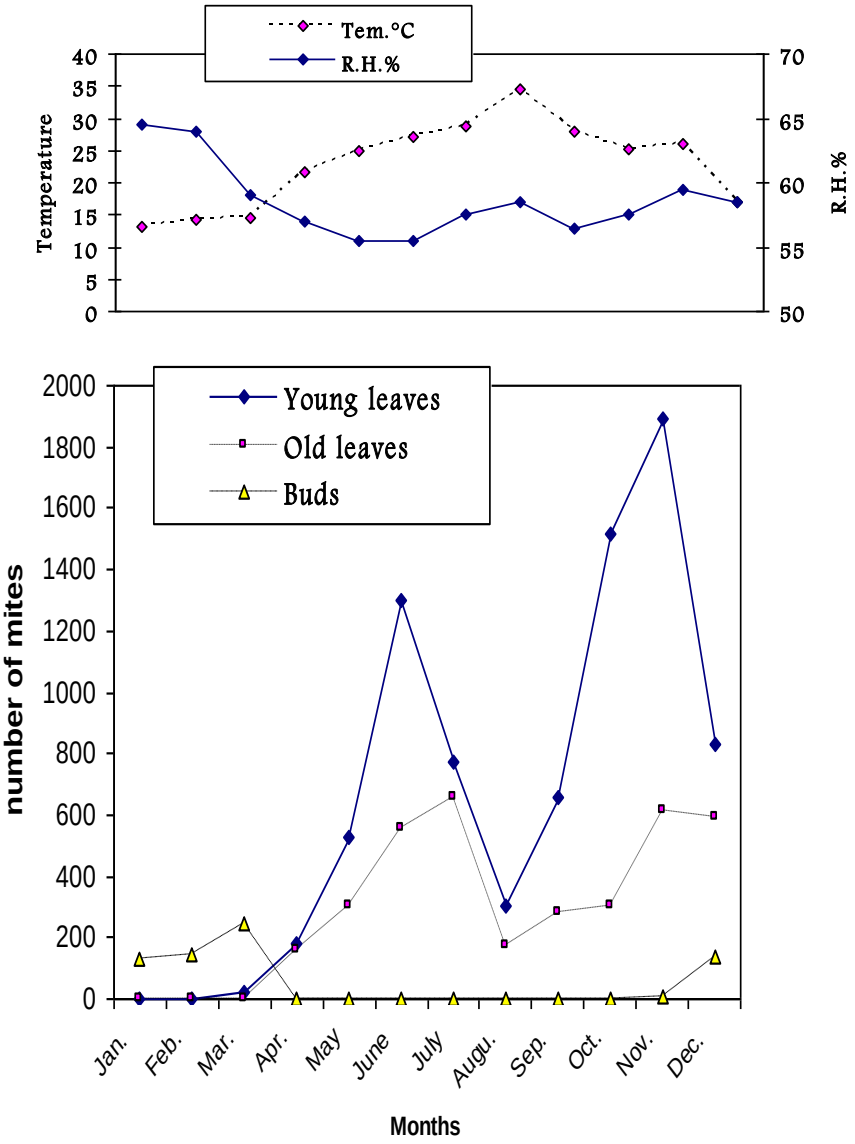

Fig. (1) Population dynamics of *Eriophyes ficus* Cotté , on Sultani fig variety trees at Sinhera, Qalubia governorate, From January 1998 to December 1998.

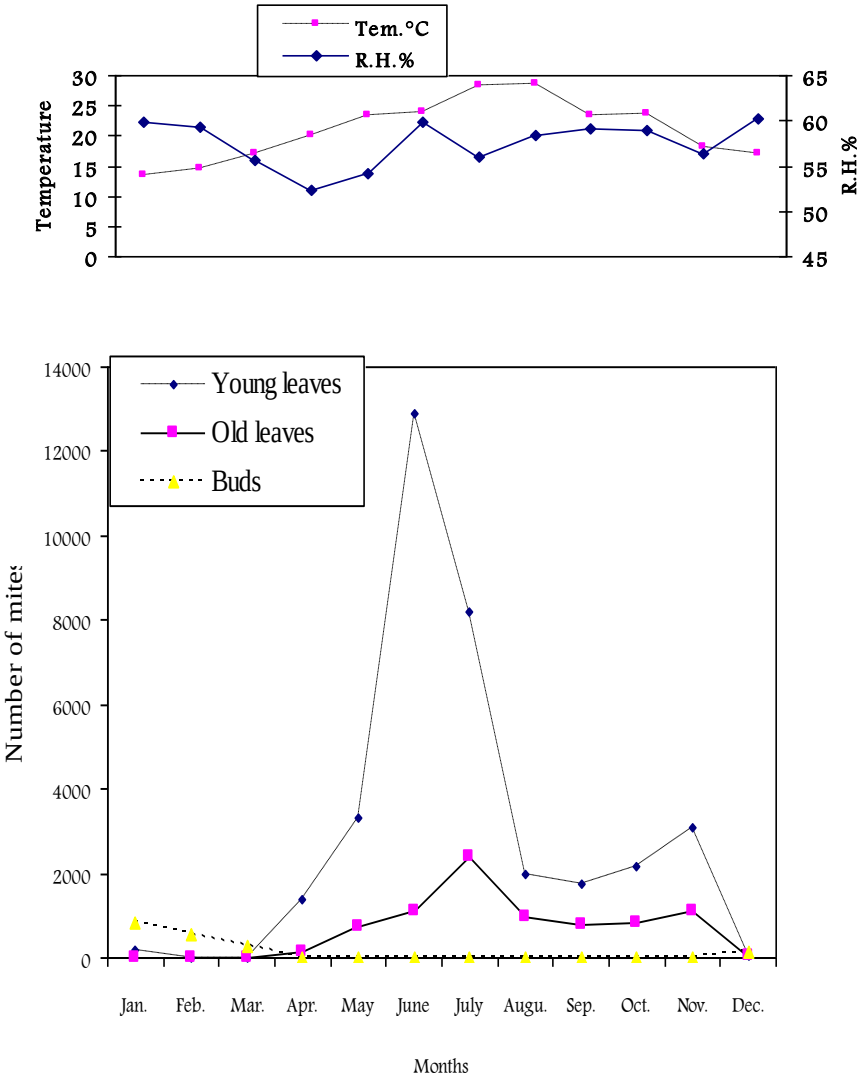

Fig. (2) Population dynamics of *Eriophyes ficus* Cotté, on Sultanifig varietytrees at Sinhera, Qalubia governorate, From January 1999 to Decer

In buds, (Table 4&5) and Fig. (1&2), clearly demonstrate that, *E. ficus* has one peak of seasonal abundance in February 1998, in the first year and another peak in January 1999 in the second year. The total number of collected mites, were 242 and 835 moving stages at the monthly average Temperature of 14.25and 13.4°C, while the relative humidity were 64.5 and 59.9% in the first and second year respectively. The total number were 131; 242; 143; 9 and 135 individuals at temperatures of 13.05; 14.25; 14.65; 25.90 and 16.85°C and relative humidity of 64.50; 64.0; 59.0; 59.5 and 58.5% in January; February; March; November and December 1998 respectively, but these numbers were 835; 557; 270; 97; 13 and 118 individuals at temperatures of 13.4; 14.5; 17.0; 20.1; 18.2 and 17.0°C and relative humidity of 59.5; 59.4; 55.7; 52.3; 56.3 and 60.2% in January; February; March; April; November and December 1999, respectively.

Individuals of *E. ficus, were* found in considerable numbers in buds through January and February, then began to decrease in March in the first year and from March to April in the second year, then individuals of *E. ficus* tended to disappear in buds until October in first and second years. This could be attributed to that individuals of mites tended to migrate from buds to stems and young leaves. Similar results were also obtained by Jeppson *et al.* (1975); Nachev (1976); El- Halawany et al. (1990a,c) and Heikal *et al*. (1996) .

Statistical analysis of proved that, a significant negative correlation existed between density of *E. ficus* population and temperature in the first year but non-significant in the second year, In contrast, relative humidity had highly positive significance correlation with density of population, in the first year but non-significant in the second year.

2.Seasonal abundance of the two spotted spider mite, *Tetranychus urticae* Koch on Sultani fig variety trees:-

On young leaves, the obtained data from Table (6&7) and Fig. (3&4), clearly showed that *T. urticae* has two annual peaks

of seasonal abundance in June and in October, during the two successive years. The monthly total numbers of collected mites were 356 and 206 individuals at temperature varied from 27.0 to 25.1°C and relative humidity varied from 55.5 and 57.5 % in June and October 1998, respectively. In the second year these numbers of *T. urticae* were 226 and 132 individuals at the monthly average temperature of 23.95 and 23.6°C and the monthly average relative humidity 59.95 and 59.0% respectively. The total number were 65; 103; 356; 188; 174; 164; 206; 144 and 78 individuals at temperatures 21.6; 24.95; 27.0; 28.85; 29.5; 28.05; 25.10; 25.90; and 16.85°C and relative humidity 57.0; 55.5; 55.5; 57.5; 58.5; 56.5; 57.5; 59.5 and 58.5% in April; May; June; July; August; September; October; November and December respectively, on young leaves in the first year.

The total numbers were 23; 55; 193; 226; 165; 73; 67; 132; 45 and 21 individuals at temperatures 13.4; 20.1; 23.5; 23.95; 28.25; 28.5; 23.5; 23.6; 18.2 and 17.0°C and relative humidity of 59.5; 52.3; 54.25; 59.95; 55.95; 58.35; 59.05; 59.0; 56.3; 60.2% in January; April; May; June; July; August; September; October; November and December1999.

On old leaves, Table (6&7) and Fig. (3&4), clearly illustrate that *T. urticae* has two annual peaks of the seasonal abundance during 1998 one in June and the other in October with the monthly total numbers of collected mites which, were 200 and 226 individuals at monthly average temperatures 27.0 and 25.1 °C and the monthly average relative humidity 55.5 and 557.5% respectively. In the second year, *T. urticae* has one annual peak of the seasonal abundance in June 1999 with the monthly total number of collected mites 552 individuals at monthly average temperature 23.95°C and relative humidity 59.95%. The total numbers were 55; 122; 200; 108; 93; 75; 226; 104 and 66 individuals at temperatures 21.6; 24.95; 27.0; 28.85; 29.5; 28.05; 25.10; 25.90; and 16.85°C and relative humidity 57.0; 55.5; 55.5; 57.5; 58.5; 56.5; 57.5; 59.5 and 58.5% in April; May; June; July; August; September; October; November and

December respectively in the first year. But these values were 181; 488; 552; 208; 120; 86; 74; 69 and 58 individuals at average temperatures 20.1; 23.5; 23.95; 28.25; 28.5; 23.5; 23.6; 18.2 and 17.0°C and relative humidity 52.3; 54.25; 59.95; 55.95; 58.35; 59.05; 59.0; 56.3; 60.2% in April; May; June; July; August; September; October; November and December in the second year.

The mite appeared with few numbers in spring, then increased and reached a maximum number in June and October, and began to disappear until March then, not observed in January to March during the two successive years.

Generally, Population density of *T. urticae* was positively correlated with temperature during the two successive years, but in the first year it was highly significant and in the second year it was non-significant However, non-significant negative correlation between density of population and relative humidity on young and old leaves, during the two successive years. Similar results were obtained also by Rasmy et al. (1971); Goksu and Atak (1972); Heikal (1977); Sarker and Somchovdhury (1986); El-Halawany *et al*. (1989); El-Halawany and Abdel-Samad(1990b); El-Halawany *et al*. (1990a); Heikal *et al*. (1996); Adam and Mohamed (1998) and Li-Daluan *et al*. (1998).

Table (6) The monthly total number collected *Tetranychus urticae Koch*, on Sultani fig variety trees at Sinhera, Qalubia Governorate, from January 1998 to December 1998.

Date of sampling	**Total number of moving stages of *T.urticae***		Average temp. C°	Average R.H. %
	20 Young leaves	**20 Old leaves**		
January	**0**	**0**	**13.05**	**64.50**
February	**0**	**0**	**14.25**	**64.0**
March	**0**	**0**	**14.65**	**59.0**
April	**65**	**55**	**21.60**	**57.0**
May	**103**	**122**	**24.95**	**55.50**
June	**356**	**200**	**27.0**	**55.50**
July	**188**	**108**	**28.85**	**57.50**
August	**174**	**93**	**29.50**	**58.50**
September	**164**	**75**	**28.05**	**56.50**
October	**206**	**226**	**25.10**	**57.50**
November	**114**	**104**	**25.90**	**59.50**
December	**78**	**66**	**16.85**	**58.50**

Correlation coefficient

Moving stages of *T.urticae* on young leaves	0.79**	-0.37
Moving stages of *T.urticae* on old leaves	0.71**	-0.39

* Significant at 5% level

Table(7) The monthly total number collected *Tetranychus urticae Koch*, on Sultani fig variety trees at Sinhera, Qalubia Governorate, from January 1999 to December 1999.

Date of sampling	**Total number of moving stages of *T.urticae***		Average temp. C°	Average R.H. %
	20 Young leaves	**20 Old leaves**		
January	**23**	**0**	**13.4**	**59.5**
February	**0**	**0**	**14.5**	**59.4**
March	**0**	**0**	**17.0**	**55.7**
April	**55**	**181**	**20.1**	**52.3**
May	**193**	**488**	**23.5**	**54.25**
June	**226**	**552**	**23.95**	**59.95**
July	**165**	**208**	**28.25**	**55.95**
August	**73**	**120**	**28.5**	**58.35**
September	**67**	**86**	**23.5**	**59.05**
October	**132**	**74**	**23.6**	**59.0**
November	**45**	**69**	**18.2**	**56.3**
December	**21**	**58**	**17.0**	**60.2**

Correlation coefficient

Moving stages of *T.urticae* on young leaves	0.23	-0.42
Moving stages of *T.urticae* on old leaves	0.42	-0.22

* Significant at 5% level

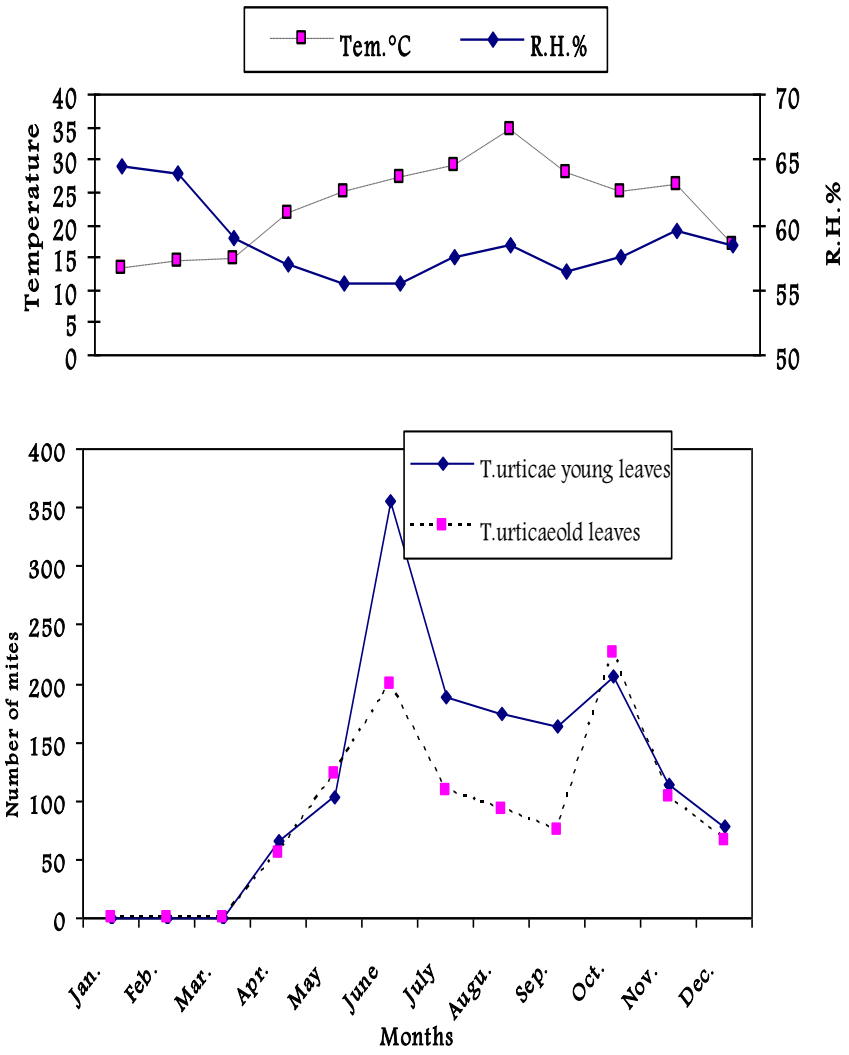

Fig. (3) Population dynamics of *Tetranychus urticae* Koch, on Sultani Fig variety trees at Sinhera, Qalubia governorate, from january 1998 toDecember1998.

3. Seasonal abundance of the predator mite. *Phytoseius finitimus* Ribaga on trees of Sultani fig variety:-

The predator mite *P. finitimus* was recorded with high number during the two successive years, on lower surface of young and old leaves of fig trees.

On young leaves, (Table 8&9) and Fig. (5&6), clearly demonstrated that, *P. finitimus* has two annual peaks of seasonal abundance, were it was collected, in June and October 1998 and in June and November in the second year1999. The monthly total numbers in the first year were 210 and 216 individuals at temperatures 27.0and 25.10°C and relative humidity 55.5 and 57.5% respectively while, in the second year these values were 276 and 216 individuals at temperature 23.95 and 18.2°C and relative humidity 59.95 and 56.3% in June and November 1999.

The total number in the first year were 15; 45; 210; 120; 70; 85; 216; 150 and 55 individuals at average temperatures 21.6; 24.95; 27.0; 28.85; 29.5; 28.05; 25.10; 25.90 and 16.85°C and relative humidity of 57.0; 55.5; 55.5; 57.5; 58.5; 56.5; 57.5; 59.5 and 58.5% in April; May; June; July; August; September; October; November and December respectively. These values were 52; 124; 276; 220; 112; 53; 209; 216 and 56 individuals at average temperatures 20.1; 23.5; 23.95; 28.25; 28.5; 23.5; 23.6; 18.2 and 17.0°C and relative humidity of 52.3; 54.25; 59.95; 55.95; 58.35; 59.05; 59.0; 56.3 and 60.2% respectively in the second year.

On old leaves, (Table 8&9) and Fig. (5&6), clearly showed, that the predator mite has two annual peaks of seasonal abundance, collected in July and October during the two successive years. The total numbers were 48; 72; 78; 127; 118; 39; 105; 63 and 21 individuals at temperature 21.6; 24.95; 27.0; 28.85; 29.5; 28.05; 25.10; 25.90 and 16.85°C at relative humidity 57.0; 55.5; 55.5; 57.5; 58.5; 56.5; 57.5; 59.5 and 58.5% in April; May; June; July; August; September;

October; November and December respectively, in the first year. While these values were 123; 120; 138; 117; 66; 183; 174 and 33 individuals at temperatures 23.5; 23.95; 28.25; 28.5; 23.5; 23.6; 18.2 and 17.0°C and relative humidity 54.25; 59.95; 55.95; 58.35; 59.05; 59.0; 56.3 and 60.2% in May; June; July; August; September; October; November and December respectively, in the second year respectively.

The phytoseiid mite appeared on both young and old leaves in April, in the first year, while in the second year it appeared in April on young leaves and in May on old leaves, then increased in number during June and October on young leaves while on old leaves it reached maximum number in July and October during the two successive year. The predator mite disappeared until March on young leaves during the two successive year, but in old leaves it was disappeared until March and April in the first and second year respectively.

Statistical analysis data obtained from (Table 8&9) showed that, density the predator mite had highly significant positive correlation with temperature but non-significant between the mite population relative humidity, and negatively correlated on young leaves and positively correlated on old leaves during the two successive years. Similar results were agreement with Zaher *et al.* (1969); Abou-Awad (1976); Rasmy and El-Banhawy (1974a,b); El-Halawany and Abdel-Samad (1990b); El-Halawany *et al.* (1990c) and Adam and Mohamed (1998), agree with the present ones.

Table (8) The monthly total number collected *Phytoseius finitimus* Ribaga, on Sultani fig variety trees at Sinhera, Qalubia Governorate, from January 1998 to December 1998.

Date of sampling	**Total number of moving stages of *P. finitimus***		Average temp. C°	Average R.H. %
	20 Young leaves	**20 Old leaves**		
January	**0**	**0**	**13.05**	**64.50**
February	**0**	**0**	**14.25**	**64.0**
March	**0**	**0**	**14.65**	**59.0**
April	**15**	**48**	**21.60**	**57.0**
May	**45**	**72**	**24.95**	**55.50**
June	**210**	**78**	**27.0**	**55.50**
July	**120**	**127**	**28.85**	**57.50**
August	**70**	**118**	**29.50**	**58.50**
September	**85**	**39**	**28.05**	**56.50**
October	**216**	**105**	**25.10**	**57.50**
November	**150**	**63**	**25.90**	**59.50**
December	**55**	**21**	**16.85**	**58.50**

Correlation coefficient

Moving stages of *P. fitnitimus* on young leaves	0.73**	-0.35
Moving stages of *P. fitnitimus* on old leaves	0.86**	0.01

* Significant at 5% level

Table (9) The monthly total number collected *Phytoseius finitimus* Ribaga, on Sultani fig variety trees at Sinhera, Qalubia Governorate, from January 1999 to December 1999.

Date of sampling	**Total number of moving stages of *P. finitimus***		Average temp. C°	Average R.H. %
	20 Young leaves	**20 Old leaves**		
January	**0**	**0**	**13.4**	**59.5**
February	**0**	**0**	**14.5**	**59.4**
March	**0**	**0**	**17.0**	**55.7**
April	**52**	**0**	**20.1**	**52.3**
May	**124**	**123**	**23.5**	**54.25**
June	**276**	**120**	**23.95**	**59.95**
July	**220**	**138**	**28.25**	**55.95**
August	**112**	**117**	**28.5**	**58.35**
September	**53**	**66**	**23.5**	**59.05**
October	**209**	**183**	**23.6**	**59.0**
November	**216**	**174**	**18.2**	**56.3**
December	**56**	**33**	**17.0**	**60.2**

Correlation coefficient

Moving stages of *P. fitnitimus* on young leaves	0.68*	-0.07
Moving stages of *P. fitnitimus* on old leaves	0.66*	0.26

* Significant at 5% level

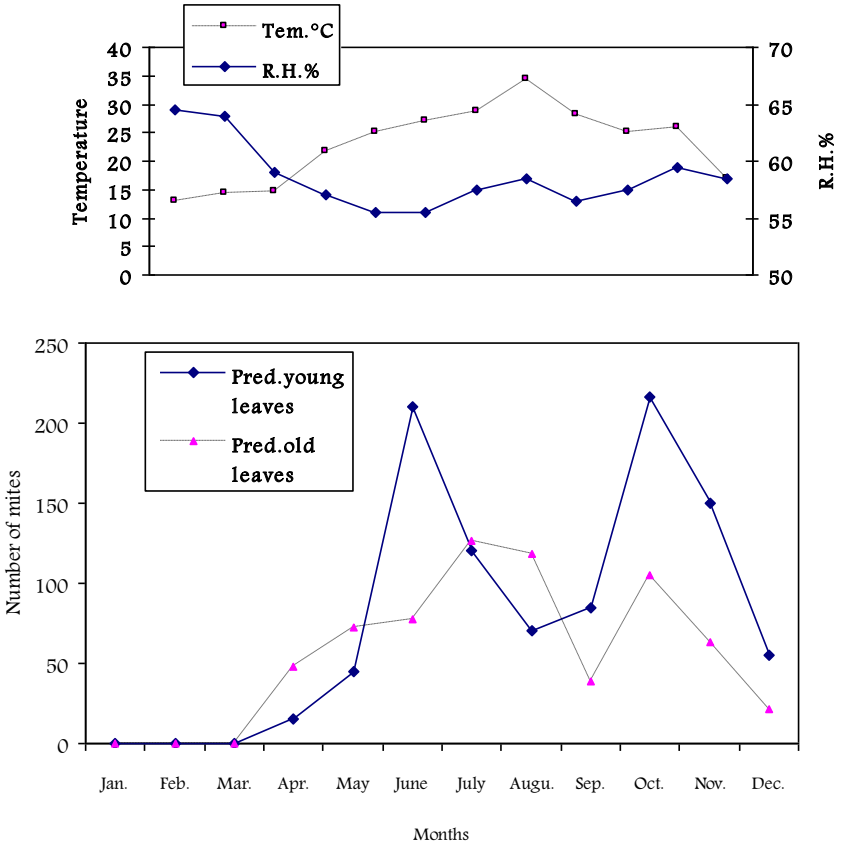

Fig. (5) Population dynamics of *Phytoseius fintimus* s Ribaga on S ultani fig variety trees, at S inhera, Qalubia Governorate, from january 1998 to December

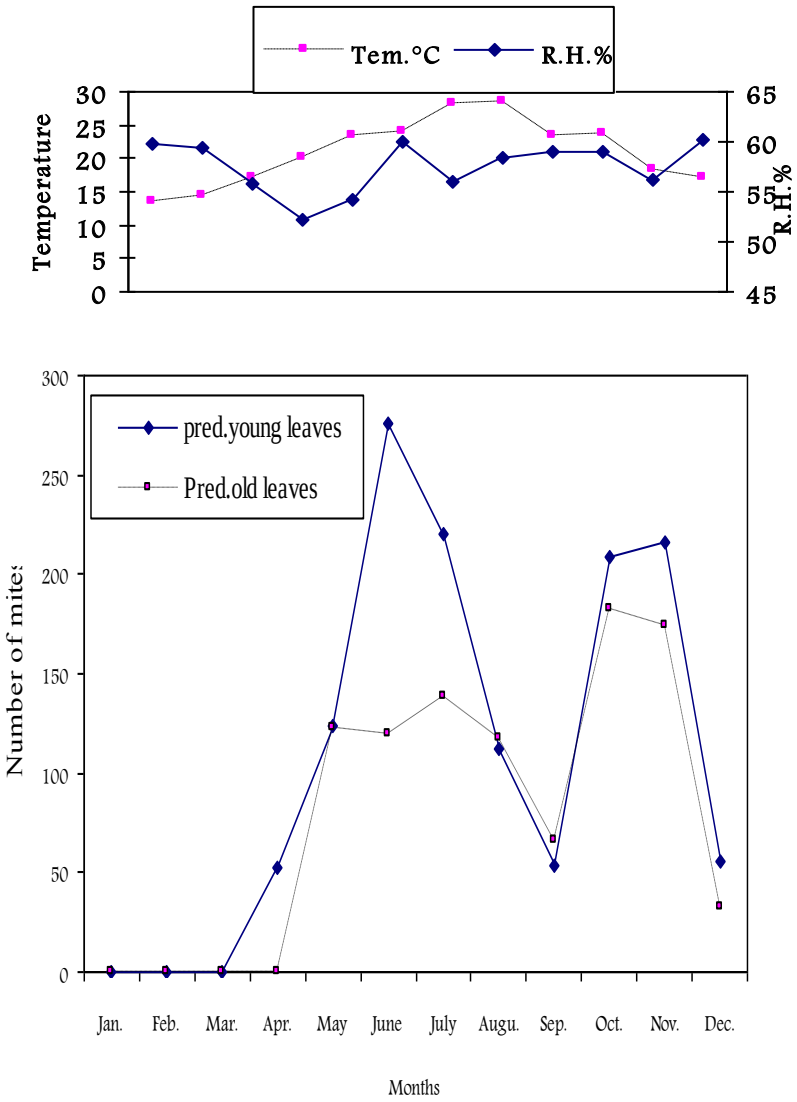

Fig. (6) Population dynamics of Predator mite *Phytoseius finitimus* Ribaga, on Sultani fig variety trees at Sinhera, Qlubia governorate, from January 1998 to December 1999.

4. Seasonal abundance of the two spotted spider mite *Tetranychus urticae* Koch on trees of Lacont pear variety:-

The two-spotted spider mite *T. urticae* was recorded with high numbers on lower surface of Lacont pear variety. Data present in (Table 10&11) and Fig. (7) clearly illustrated that *T. urticae* has two annual peaks of seasonal abundance in July and October in the first year and in June and November in the second year. The monthly total numbers were 219 and 214 individuals when the monthly average temperatures were 28.85 and 25.10°C while the relative humidity were 57.50 in July and October 1998. In the second year the monthly total number were 178 and 413 individuals at temperatures 23.95 and 18.2°C and the relative humidity 59.95 and 56.3% respectively. Generally, the two-spotted spider mite appeared on leaves in May in the first year and in April in the second year, then increased in numbers during summer and autumn months. The mite species disappeared in January to April in the first year and from January to March in the second year. In the first year the monthly total numbers were 101; 117; 219; 156; 182; 214; 135 and 32 individuals at temperatures 24.95; 27.0; 28.85; 29.50; 28.05; 25.10; 25.9 and 16.83°C and relative humidity 55.5; 57.5; 58.5; 56.5; 57.5; 59.5 and 58.5% in May; June; July; August; September; October; November and December respectively in the first year, While in the second year these numbers were 37; 100; 178; 129; 62; 46; 169; 413 and 264 individuals at temperatures of 20.1; 23.5; 23.95; 28.25; 28.5; 23.5; 23.6; 18.2 and 17.0°C and the average

Table (10) The monthly total number collected, *Tetranychus urticae* Koch on Lacont pear variety trees at Sinhera, Qalubia Governorate, from January 1998 to December 1998.

Date of sampling	**Total number of moving stages of *T.urticae*** **40 leaves**	Average temp. C°	Average R.H. %
January	**0**	**13.05**	**64.50**
February	**0**	**14.25**	**64.0**
March	**0**	**14.65**	**59.0**
April	**0**	**21.60**	**57.0**
May	**101**	**24.95**	**55.50**
June	**117**	**27.0**	**55.50**
July	**219**	**28.85**	**57.50**
August	**156**	**29.50**	**58.50**
September	**182**	**28.05**	**56.50**
October	**214**	**25.10**	**57.50**
November	**135**	**25.90**	**59.50**
December	**32**	**16.85**	**58.50**

Correlation coefficient

Moving stages of *T.urticae* on leaves 0.87*** -0.35

* Significant at 5% level

Table (11) The monthly total number collected, *Tetranychus urticae* Koch on Lacont pear variety trees at Sinhera, Qalubia Governorate, from January 1999 to December 1999.

Date of sampling	**Total number of moving stages of *T.urticae*** **40 leaves**	Average temp. C°	Average R.H. %
January	**0**	**13.4**	**59.5**
February	**0**	**14.5**	**59.4**
March	**0**	**17.0**	**55.7**
April	**37**	**20.1**	**52.3**
May	**100**	**23.5**	**54.25**
June	**178**	**23.95**	**59.95**
July	**129**	**28.25**	**55.95**
August	**62**	**28.5**	**58.35**
September	**46**	**23.5**	**59.05**
October	**169**	**23.6**	**59.0**
November	**413**	**18.2**	**56.3**
December	**264**	**17.0**	**60.2**

Correlation coefficient

Moving stages of *T.urticae* on leaves 0.07 0.09

* Significant at 5% level

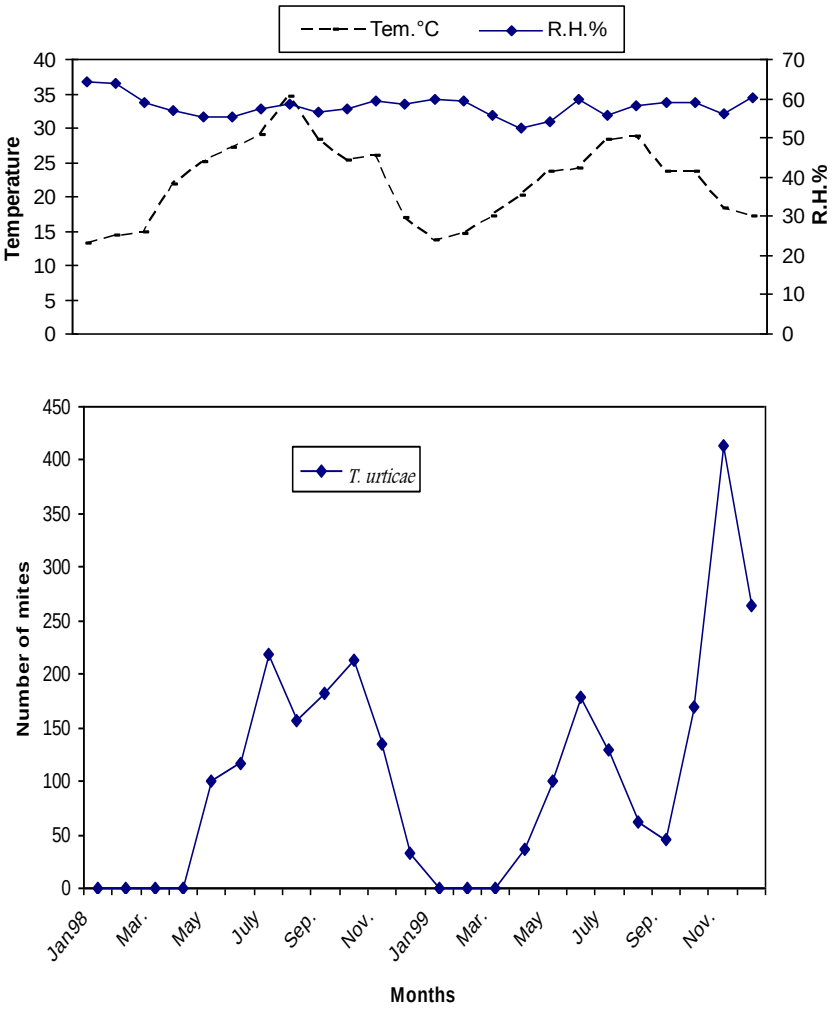

Fig. (7) Population dynamics of *Tetranychus urticae* Koch on Lacont Pear variety trees at Sinhera, Qalubia governorate, from January 1998 to December 1999.

relative humidity were 52.3; 54.25; 59.95; 55.95; 58.35; 59.05; 59.0; 56.3 and 60.2%, respectively.

Statistical data obtained from Table (10&11) showed that the mite population of *T. urticae* had, highly significant positive correlation with temperature in the first year, while in the second year it was significant. The relative humidity was non-significant, but negatively correlated in the first year and positively correlated in the second year. These results agree with Rasmy *et al*. (1971); Gosks and Atak (1972); Heikal (1977); Takafuji and Kamibayashi (1984); Sarkar and Somchoudhury (1986); Hergstom and Niall (1989); Dohooria (1994); Gotoh (1997) and Li-Daluan *et al*. (1998).

5. Seasonal abundance of *Epitrimerus pyri* Nalepa on Lacont pear variety trees:-

The pear rust mite *E. pyri* it was recorded on lower and upper surface leaves of Lacont pear variety with highly number. (Table 12&13) and Fig. (8), clearly showed that *E. pyri* has one annual peak of seasonal abundance in June in the first year and July in the second year.

The total number were 2198 individuals at average temperature 27.0°C and average relative humidity 55.50%, while in the second year the monthly total number of acarine pest was 2370 individuals at average temperature 28.25°C and average relative humidity 55.95% in July 1999. The eriophyid mite *E. pyri* was appeared on leaves in May then increased in number and reach maximum number in June in the first year and in July in the second year. Then the mite decreased in number until December, during the two successive years.

Table (12) The monthly total number collected, *Epitrimerus pyri* Nalepa on Lacont pear variety trees at Sinhera, Qalubia Governorate, from January 1998 to December 1998.

Date of sampling	**Total number of moving stages of *E. pyri* on 40 leaves**	Average temp. C°	Average R.H. %
January	**0**	**13.05**	**64.50**
February	**0**	**14.25**	**64.0**
March	**0**	**14.65**	**59.0**
April	**0**	**21.60**	**57.0**
May	**167**	**24.95**	**55.50**
June	**2198**	**27.0**	**55.50**
July	**660**	**28.85**	**57.50**
August	**580**	**29.50**	**58.50**
September	**135**	**28.05**	**56.50**
October	**78**	**25.10**	**57.50**
November	**61**	**25.90**	**59.50**
December	**24**	**16.85**	**58.50**

Correlation coefficient

Moving stages of *E. pyri* on leaves 0.45 -0.17

* Significant at 5% level

Table (13) The monthly total number collected, *Epitrimerus pyri* Nalepa on Lacont pear variety trees at Sinhera, Qalubia Governorate, from January 1999 to December 1999.

Date of sampling	**Total number of moving stages of *E. pyri* on 40 leaves**	Average temp. C°	Average R.H. %
January	**0**	**13.4**	**59.5**
February	**0**	**14.5**	**59.4**
March	**0**	**17.0**	**55.7**
April	**0**	**20.1**	**52.3**
May	**175**	**23.5**	**54.25**
June	**2254**	**23.95**	**59.95**
July	**2370**	**28.25**	**55.95**
August	**1364**	**28.5**	**58.35**
September	**286**	**23.5**	**59.05**
October	**209**	**23.6**	**59.0**
November	**206**	**18.2**	**56.3**
December	**197**	**17.0**	**60.2**

Correlation coefficient

Moving stages of *E. pyri* on leaves 0.75** 0.14

* Significant at 5% level

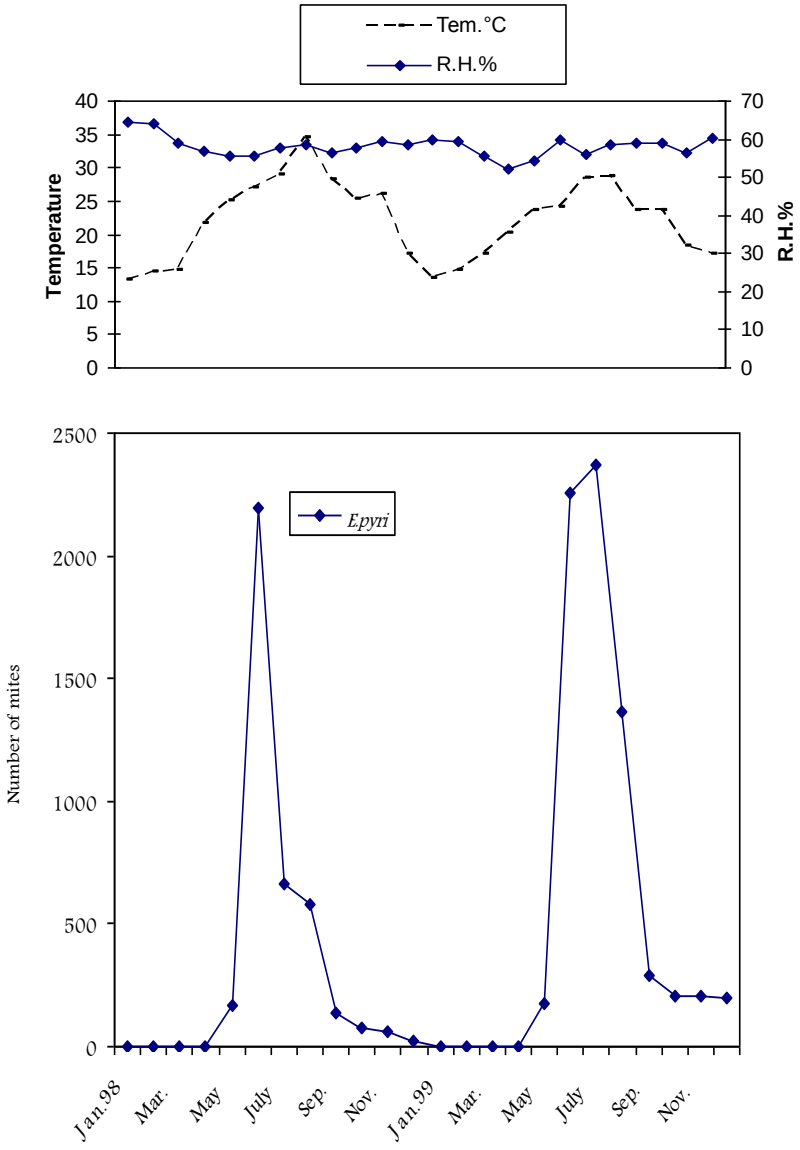

Fig.(8) Population dynamics of *Epitrimus pyri* Nalepa on Lacont Pear variety trees at Sinhera, Qalubia Governorate, from January1998 to December 1999.

The mite individuals disappeared from January to April during the two successive years, The monthly total numbers, were 167 and 175; 2198 and 2254; 660 and 2370; 580 and 1364; 135 and 286; 78 and 209; 61 and 206; 24 and 197 individuals, at average temperatures of 24.95 and 23.5; 27.0 and 23.95; 28.85 and 28.25; 29.5 and 28.5; 28.05 and 23.5; 25.10 and 23.6; 25.90 and 18.2; 16.85 and 17.0°C and average humidity of 55.50 and 54.25; 55.5 and 59.95; 57.5 and 55.95; 58.5 and 58.35; 56.5 and 59.05; 57.50 and 59.0; 59.5 and 56.3; 58.5 and 60.2% in May; June; July; August; September; October; November and December, during the two successive years, respectively.

Statistical analysis of data proved that a highly significant positive correlation occurred between mite population and temperature in the second year but non-significant in the first year. It was non-significant between mite population and the relative humidity during the two successive years. Nochev (1976) obtained similar results Jnjac *et al*. (1988) and Baillod *et al*. (1991).

6. Seasonal abundance of the predator mite, *Amblyseius swirskii* A. H. on trees of Lacont pear variety:-

The predator *A. swirskii* was recorded with high numbers on Lacont pear variety during the two successive years. Table (14&15) and Fig. (9), showed that the predator mite *A. swirskii* has one annual peak of seasonal abundance which was recorded in July during the two successive years. The monthly total numbers of the predator mites, were 156 and 198 individuals with the monthly average temperatures of 28.85 and

Table (14) The monthly total number collected *Amblyseius swirskii* Athias-Henriot, on Lacont pear variety trees at Sinhera, Qalubia Governorate, from January 1998 to December 1998.

Date of sampling	Total number of moving stages of *A. swirskii* on 40 leaves	Average temp. C°	Average R.H. %
January	**0**	**13.05**	**64.50**
February	**0**	**14.25**	**64.0**
March	**0**	**14.65**	**59.0**
April	**0**	**21.60**	**57.0**
May	**24**	**24.95**	**55.50**
June	**124**	**27.0**	**55.50**
July	**156**	**28.85**	**57.50**
August	**116**	**29.50**	**58.50**
September	**108**	**28.05**	**56.50**
October	**68**	**25.10**	**57.50**
November	**48**	**25.90**	**59.50**
December	**44**	**16.85**	**58.50**

Correlation coefficient

Moving stages of *A. swirskii* on leaves 0.76** 0.33

* Significant at 5% level

Table (15) The monthly total number collected *Amblyseius swirskii* Athias-Henriot, on Lacont pear variety trees at Sinhera, Qalubia Governorate, from January 1999 to December 1999.

Date of sampling	**Total number of moving stages of *A. swirskii* on40 leaves**	Average temp. C°	Average R.H. %
January	**0**	**13.4**	**59.9**
February	**0**	**14.5**	**59.4**
March	**0**	**17.0**	**55.7**
April	**18**	**20.1**	**52.3**
May	**18**	**23.5**	**54.25**
June	**99**	**23.95**	**59.95**
July	**198**	**28.25**	**55.59**
August	**144**	**28.5**	**58.35**
September	**126**	**23.5**	**59.05**
October	**77**	**23.6**	**59.0**
November	**60**	**18.2**	**56.3**
December	**24**	**17.0**	**60.2**

Correlation coefficient

Moving stages of *A.swirskii* on leaves 0.82*** -0.51

* Significant at 5% level

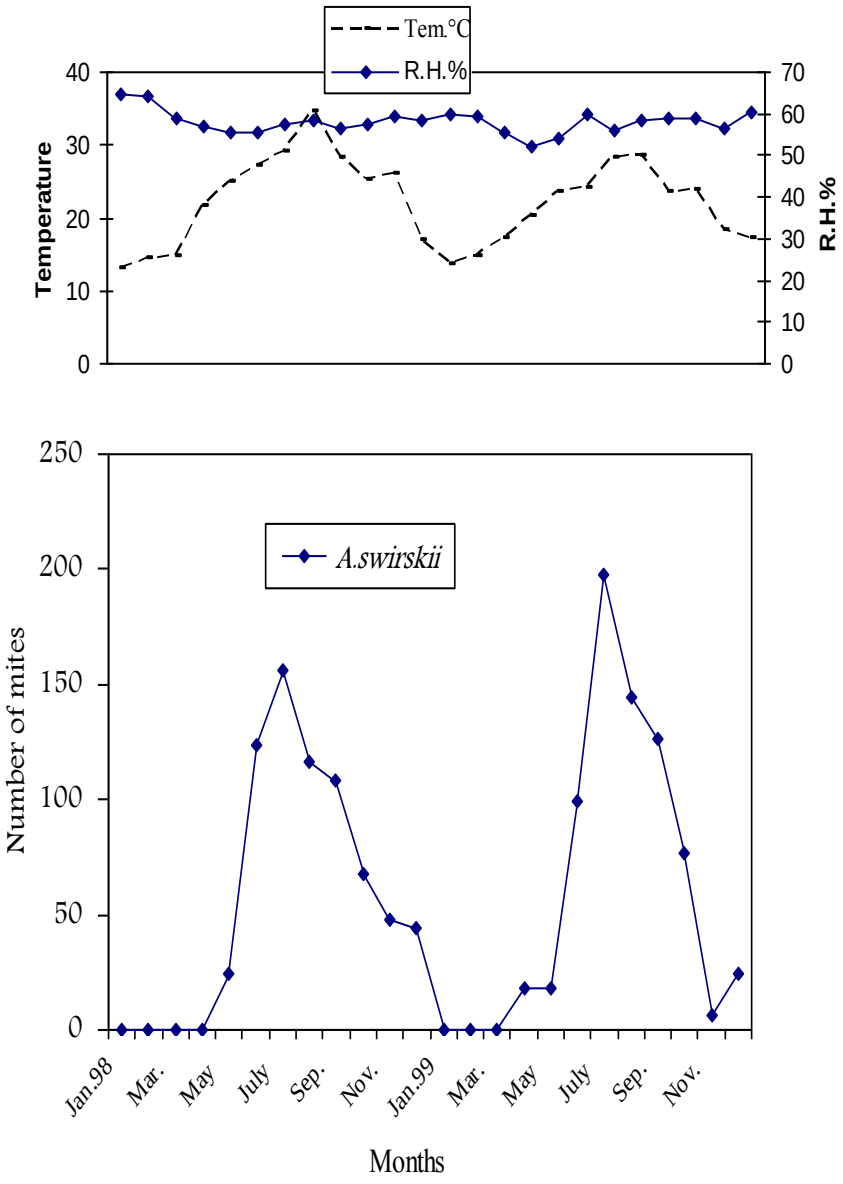

Fig. (9) Population dynamics of predator mite *Ambylseius swirskii* A- H. , on Lacont pear variety trees, at Sinhera, Qalubia Governorate, from January 1998 to December 1999.

28.25°C, while the monthly average relative humidity were 57.5 and 55.59% in July during the two successive years, respectively. The total numbers were 24; 124; 156; 116; 108; 68; 48 and 44 individuals at average temperatures 24.95; 27.0; 28.85; 29.50; 28.05; 25.10; 25.90 and 16.85 °C and average relative humidity 55.5; 55.5; 57.5; 58.5; 56.5; 57.5; 59.5 and 58.8% in May; June; July; August; September; October; November and December 1998 respectively, while these numbers were 18; 18; 99; 198; 144; 126; 77; 60 and 24 individuals at average temperatures 20.1; 23.5; 23.95; 28.25; 28.5; 23.5; 23.6; 18.2 and 17.0°C and average relative humidity 52.3; 54.25; 59.95; 55.59; 58.35; 59.05; 59.0; 56.3 and 60.2 in the second year.

The phytoseiid mite *A. swirskii* appeared on Lacont pear variety trees in May in the first year and in April in the second year. The predator mite disappeared from January to April in the first year while, from January to March in the second year. Statistical data obtained from Table (14&15) showed that the predator mite individuals were highly positive significant correlated with temperature and non-significant between the population density of the predator and the relative humidity during the two successive years. These results were agreement with Rasmy (1971); Rizk *et al*. (1983); El-Halawany *et al*. (1989); El-Halawany and Abdel-Samad (1990b) and El-Halawany *et al*. (1990c).

B) Effect of predaceous mites on phytophagous mites

1) Effect of the predator mite *Phytoseius finitimus* Ribaga on *Tetranychus urticae* Koch and *Eriophyes ficus* Cotté populations on Sultani fig variety:-

On young leaves, the predator mite *P. finitimus* has two annual peaks of seasonal abundance in June and October in the first year and in June and November in the second year. Table (16&17) and Fig. (10), showed that a highly significant positive effect existed on population density of *E. ficus* acted by the predator mite as, values (0.88***) and (0.79**) were detected in the first and second year, respectively. The statistically analyzed data, obtained from table (16&17) illustrated that the phytoseiid mite populations had positive effect on the population of *Tetranychus urticae* during January 1998 to December 1999.Correlation coefficient values (+0.89***), clearly showed that, a highly significant positive correlation between population density of *T. urticae* and its predator mite in the first year. Then the relationship between density of phytoseiid mite population and hat of the phytophagous mites (a mixed population of *E. ficus* and *T. urticae* individuals) during the two successive years (Table 16&17) and Fig. (10), had highly significant positive effect (+0.92*** and 0.80**) during the two successive years respectively. The total numbers of phytophagous mites were 20; 248; 628; 1659; 962; 479; 731; 1720; 2006 and 908 individuals and the total numbers of predator mite were 0; 15; 45; 210; 120; 70; 85; 216; 150 and 55 individuals in March; April; May; June; July; August; September; October; November and December 1998, respectively, and, These values were correlated on the tetranychid mite. Also the same results between density of the phytophagous mites and the population density of the phytoseiid mite *P. finitimus* was significant positive correlated (0.75**) during the two successive years, respectively.

Table (16) The monthly total number collected Phytophagous mites (*E.ficus* Cotté, *T.urticae* Koch) and the predator (*P.finitimus* Ribaga) at Sinhera, Qalubia Governorate, from January 1998 to December 1998, on young leaves of Sultani fig variety trees.

Date of sampling	*The monthly total number on Young leaves*			
	E.ficus	***T.urticae***	Total Phytophagous	***P.finitimus***
January	**0**	**0**	**0**	**0**
February	**0**	**0**	**0**	**0**
March	**20**	**0**	**20**	**0**
April	**183**	**65**	**248**	**15**
May	**525**	**103**	**628**	**45**
June	**1303**	**356**	**1659**	**210**
July	**774**	**188**	**962**	**120**
August	**305**	**174**	**479**	**70**
September	**567**	**164**	**731**	**85**
October	**1514**	**206**	**1720**	**216**
November	**1892**	**114**	**2006**	**150**
December	**830**	**78**	**908**	**55**

Correlation coefficient

Moving stages of *E.ficus* on young leaves 0.88***

Moving stages of *T.urticae* on young leaves 0.89***

Total Phytophagous mites on young leaves 0.92***

* Significant at 5% level

Table (17) The monthly total number collected Phytophagous mites (*E.ficus* Cotté, *T.urticae* Koch) and the predator (*P.finitimus* Ribaga) at Sinhera, Qalubia Governorate, from January 1999 to December 1999, on **young** leaves of Sultani fig variety trees.

Date of sampling	*The monthly total number on Young leaves*			
	E.ficus	***T. urticae***	Total Phytophagous	***P.finitimus***
January	**176**	**23**	**199**	**0**
February	**0**	**0**	**0**	**0**
March	**0**	**0**	**0**	**0**
April	**1381**	**55**	**1436**	**52**
May	**3302**	**193**	**3495**	**124**
June	**12880**	**226**	**13106**	**276**
July	**8184**	**165**	**8349**	**220**
August	**1972**	**73**	**2045**	**112**
September	**1763**	**67**	**1830**	**53**
October	**3091**	**132**	**3223**	**209**
November	**2156**	**45**	**2201**	**216**
December	**61**	**21**	**82**	**56**

Correlation coefficient

Moving stages of *E.ficus* on young leaves 0.79**

Moving stages of *T.urticae* on young leaves 0.23

Total Phytophagous mites on young leaves 0.80**

* Significant at 5% level

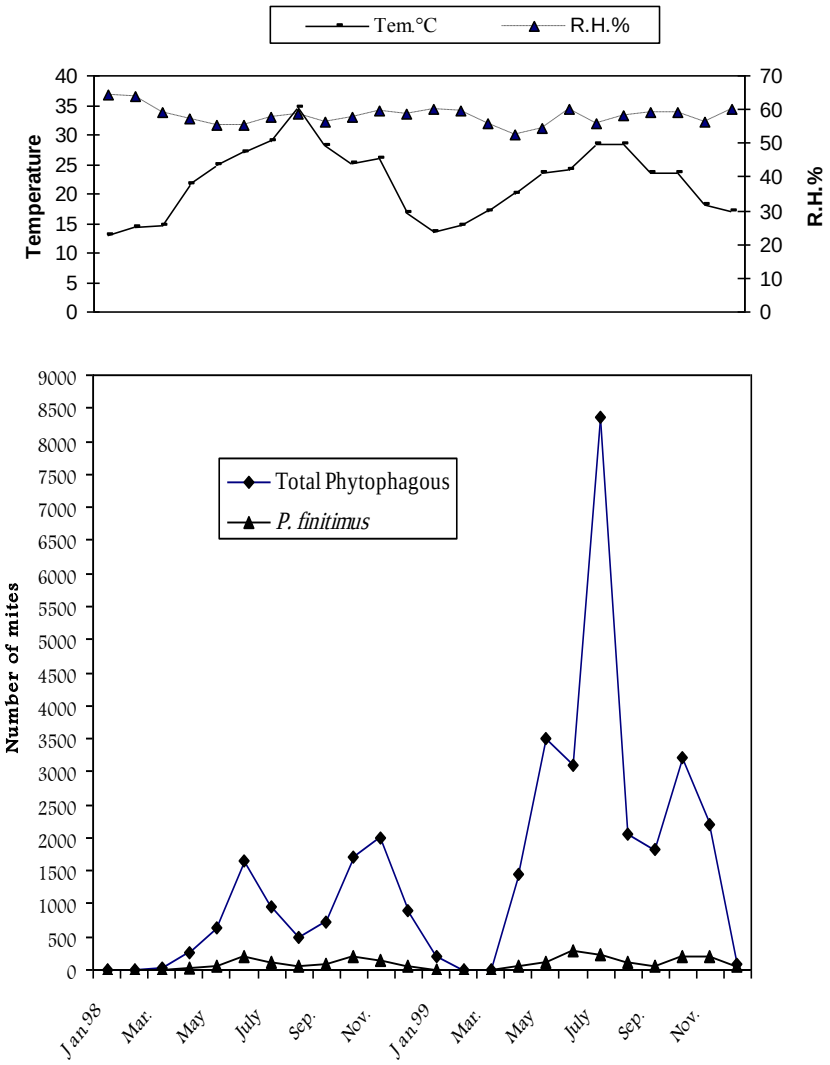

Fig. (10) Population dynamics of total phytophagous mites(*E. ficus* Cotte, and *T. urticae* Koch) and the predator mite *(P. finitimus* Ribaga) at Sinhera, Qalubia Governorate, from January 1998 to December 1999, On young leaves of Sultani fig variety trees.

Total numbers were 199; 0; 0; 1436; 3495; 3106; 8349; 2045; 1830; 3223; 2201 and 82 individuals, and the total predator mite number were 0; 0; 0; 52; 124; 276; 220; 112; 53; 209; 216 and 55 individuals in January; February; March; April; May; June; July; August; September; October; November and December 1999 respectively. The predator mite *P. finitimus* seemed important in suppressing the population density of phytophagous mite *T. urticae* and *E. ficus*, during the two successive year.

On old leaves, the predator mite *P. finitimus* population has two annual peaks of seasonal abundance were collected in July and October during the two successive years 1998 and 1999. Statistical analysis of data obtained from table (18&19) and Fig (11), clearly demonstrated that the relation ship between the predator mite population and density of the eriophyid bud mite *E. ficus* was positive correlated in the first year (+0.56) but in the second year it was highly significant positively affected on the *E. ficus*. However, the relation ship between the phytoseiid mite population and the *T. urticae* was highly significant positively affected (0.78**) in the first year, but in the second year, the correlation coefficient value (0.42) was non-significant positive numbers of Phytophagous mites were 212; 428; 753; 763; 266; 355; 527; 719 and 661 individuals and the total predator mite numbers were 48; 72; 78; 127; 118; 39; 105; 63 and 21 individuals in April; May; June; July; August; September; October; November and December 1998 respectively. While these values were 325; 1209; 1641; 2613; 1105; 850; 880; 1171and 123 individuals and the total predator

mite numbers were 0; 123; 120; 138; 117; 66; 183; 174 and 33 individuals in the second year in April; May; June; July; August; September; October; November and December 1999, respectively.

The predator mite *P. finitimus* seemed to be an important predator to suppress the density of population of the *T. urticae* and *E. ficus* population. Generally, these results mentioned that the predator mite *P. finitimus* is the main important predator for suppressing population density of both the two phytophagous mites *T. urticae* and *E. ficus* on young and old leaves especially on young leaves during the two successive years. The population density of the total Phytophagous mites decreased in numbers in the first year than in the second year this may be due to increased population of the predator mite.

Similar results was obtained by Zaher et al. (1969); Rasmy et al. (1971); Abou-Awad (1976); Rasmy and El-Banhawy (1974a,b); Rizk *et al.* (1983); El-Halawany *et al.* (1989); El-Halawany and Abdel-Samad (1990b,c) and Adam and Mohamed (1998).

Table (18) The monthly total number collected Phytophagous mites (*E.ficus* Cotté, *T.urticae* Koch) and the predator (*P.finitimus* Ribaga) at Sinhera, Qalubia Governorate, from January 1998 to December 1998, on **Old** leaves of Sultani fig variety trees.

Date of sampling	*The monthly total number on Old leaves*			
	E.ficus	***T.urticae***	Total Phytophagous	***P. finitimus***
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	157	55	212	48
May	306	122	428	72
June	553	200	753	78
July	655	108	763	127
August	173	93	266	118
September	280	75	355	39
October	301	226	527	105
November	615	104	719	63
December	595	66	661	21

Correlation coefficient

Moving stages of *E.ficus* on old leaves 0.56

Moving stages of *T.urticae* on old leaves 0.78**

Total Phytophagous mites on old leaves 0.66*

* Significant at 5% level

Table (19) The monthly total number collected Phytophagous mites (*E.ficus* Cotté, *T.urticae* Koch) and the predator (*P.finitimus* Ribaga) at Sinhera, Qalubia Governorate, from January 1999 to December 1999, on Old leaves of Sultani fig variety trees.

Date of sampling	*The monthly total number on Old leaves*			
	E.ficus	***T.urticae***	Total Phytophagous	***P.finitimus***
January	**0**	**0**	**0**	**0**
February	**0**	**0**	**0**	**0**
March	**0**	**0**	**0**	**0**
April	**144**	**181**	**325**	**0**
May	**721**	**488**	**1209**	**123**
June	**1089**	**552**	**1641**	**120**
July	**2405**	**208**	**2613**	**138**
August	**985**	**120**	**1105**	**117**
September	**764**	**86**	**850**	**66**
October	**806**	**74**	**880**	**183**
November	**1102**	**69**	**1171**	**174**
December	**65**	**58**	**123**	**33**

Correlation coefficient

Moving stages of *E.ficus* on old leaves	0.78**
Moving stages of *T.urticae* on old leaves	0.42
Total Phytophagous mites on old leaves	0.75**

* Significant at 5% level

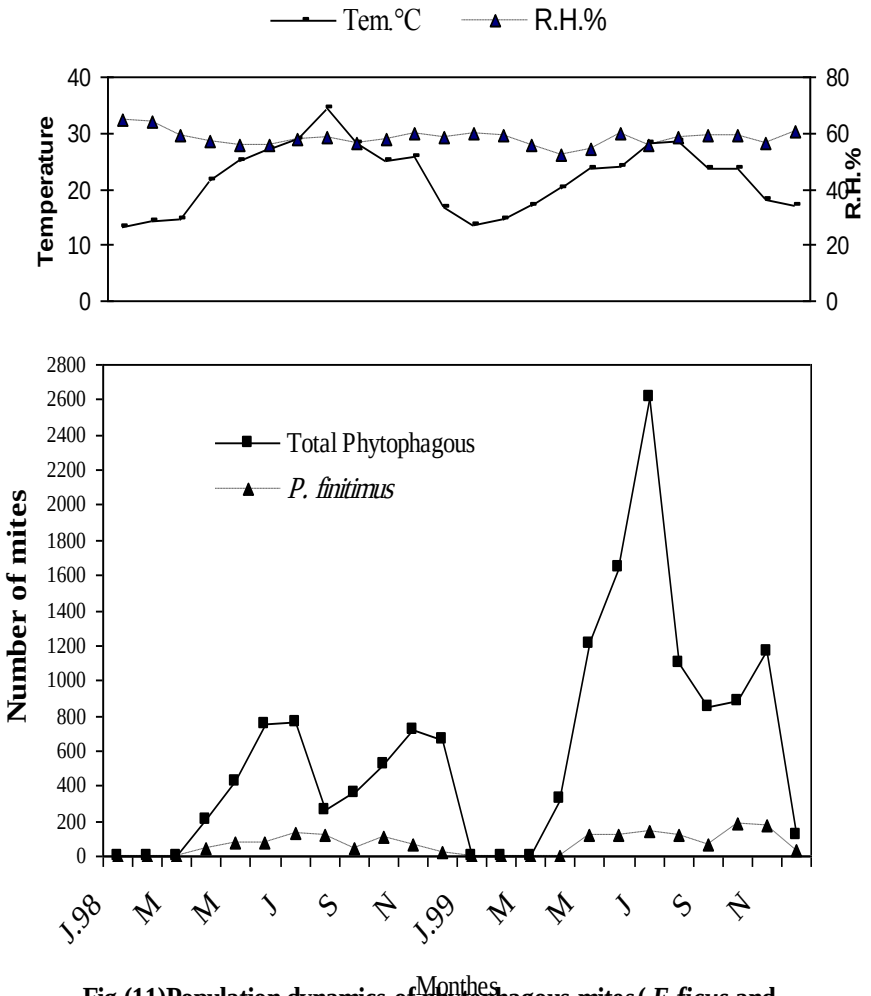

Fig.(11)Population dynamics of phytophagous mites(*E.ficus* and *T. urticae*) and the predator mite (*P. finitimus*) at Sinhera, Qalubia governorate, From January 1998 to December1999, On Old Leaves of Sultani fig variety trees.

2) Effect of the predator mite *Amblyseius swirskii* A.-H. on *Tetranychus urticae* Koch and *Epitrimerus pyri* Nalepa population on Lacont pear variety.

The predator mite ***A. swirskii*** has one annual peak of seasonal abundance, which was recorded in July during the two successive years from January 1988 to December 1999. Table (20&21) and Fig. (12), illustrated that a highly significant positive correlation existed between the predator mite population and the two spotted spider mite ***T. urticae*** in the first year (0.83**), while in the second year, these value was (0.18). Such findings showed that, the predator mite positively affected the ***T. urticae***.

Concerning, statistical data obtained that, it was found the phytoseiid mite population were significant positive (0.61* and 0.78**) affected on the population density of the pear rust mite ***Epitrimerus pyri*** in the first and second year, respectively. (Table 20&21) and Fig (12).

Also, the relationship between the phytoseiid mite population density and the population density of total phytophagous mites (*T.urticae* and *E. pyri*) were highly significant positively affected (0.72**and 0.79**) during the two successive years. The total number of the phytophagous and the predator mites were 268&24; 2315&124; 879&156; 736&116; 317&108; 292&86; 196&48 and 56&44 individuals in May; June; July; August; September; October; November and December1998, respectively. In the second year, However these numbers were 37&18; 275&18; 2432&99; 2599&198;

1426&144; 332&126; 378&77; 619&60 and 416&24 individuals for April; May; June; July; August; September; October; November and December, respectively.

The predator mite, ***A.swirskii*** A.-H. was important for controlling the population density of ***T. urticae*** Koch and ***E. pyri*** Nalepa during the two successive years on Lacont pear variety trees.

Also, similar results were obtained by Rasmy *et al*. (1971); Heikal (1977); Rizk *et al*. (1983); El-Halawany *et al*. (1989) and El-Halawany *et al*. (1990c).

Table (20) The monthly total number collected Phytophagous mites (*T. urticae* Koch, *E.pyri* Nalpa) and the predator mite *A.swirskii* Athias-Henriot at Sinhera, Qalubia Governorate, from January 1998 to December 1998, on leaves of Lacont pear variety trees.

Date of sampling	The monthly total number on 40 leaves of			
	T. urticae	***E. pyri***	**Total Phytophagous**	***A. swirskii***
January	**0**	**0**	**0**	**0**
February	**0**	**0**	**0**	**0**
March	**0**	**0**	**0**	**0**
April	**0**	**0**	**0**	**0**
May	**101**	**167**	**268**	**24**
June	**117**	**2198**	**2315**	**124**
July	**219**	**660**	**879**	**156**
August	**156**	**580**	**736**	**116**
September	**182**	**135**	**317**	**108**
October	**214**	**78**	**292**	**68**
November	**135**	**61**	**196**	**48**
December	**32**	**24**	**56**	**44**

Correlation coefficient

Moving stages of *E. pyri*	0.61*
Moving stages of *T. urticae*	0.83 **
Total Phytophagous mites	0.72**

* Significant at 5% level

Table (21) The monthly total number collected Phytophagous mites (*T.urticae* Koch, *E.pyri* Nalpa) and the predator mite *A. swirskii* Athias-Henriot at Sinhera, Qalubia Governorate, from January 1999 to December 1999, on leaves of Lacont pear variety trees.

Date of sampling	The monthly total number on 40 leaves of			
	T. urticae	***E. pyri***	**Total Phytophagous**	***A.swirskii***
January	**0**	**0**	**0**	**0**
February	**0**	**0**	**0**	**0**
March	**0**	**0**	**0**	**0**
April	**37**	**0**	**37**	**18**
May	**100**	**175**	**275**	**18**
June	**178**	**2254**	**2432**	**99**
July	**129**	**2370**	**2599**	**198**
August	**62**	**1364**	**1426**	**144**
September	**46**	**286**	**332**	**126**
October	**169**	**209**	**378**	**77**
November	**413**	**206**	**619**	**60**
December	**264**	**197**	**461**	**24**

Correlation coefficient

Moving stages of *E. pyri*	0.78**
Moving stages of *T. urticae*	0.18
Total Phytophagous mites	0.79**

* Significant at 5% level

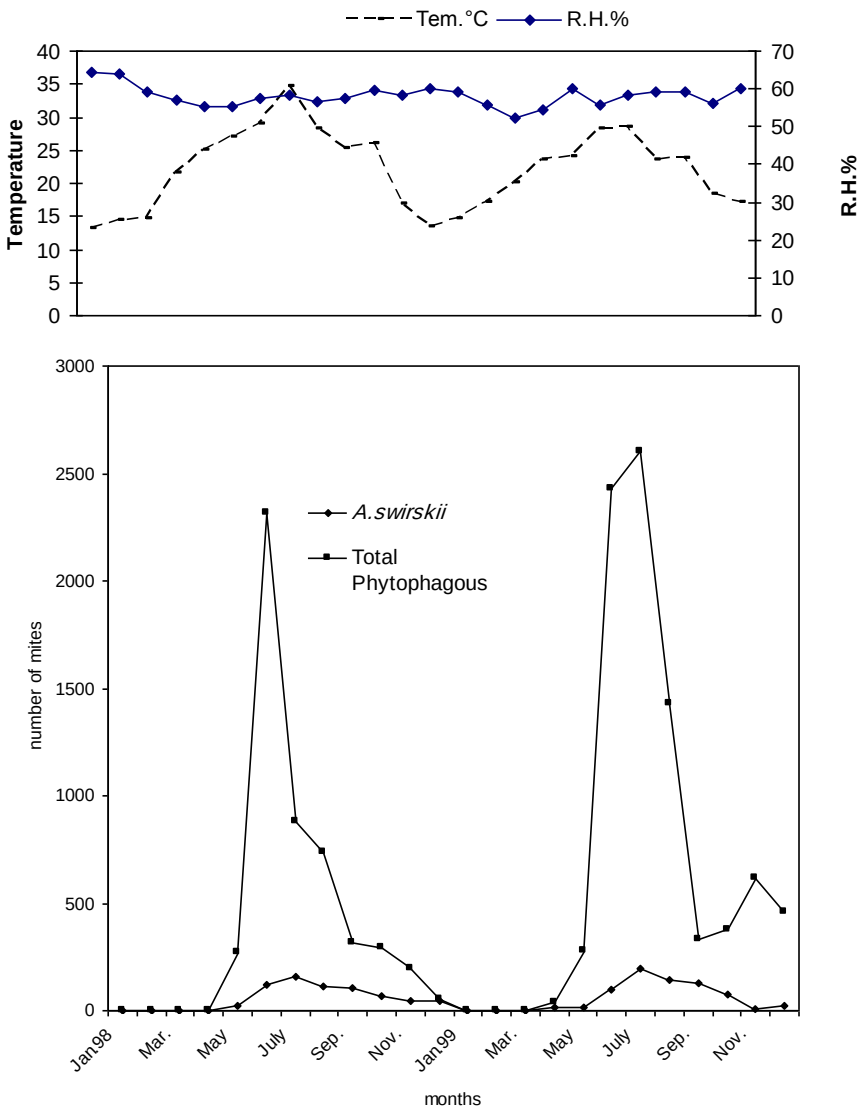

Fig (12) Population dynamics of phytophagous mites (*T.urticae* and *E.pyri*) and the predator mite (*A.swirskii*) at Sinhera, Qalubia governorate, from January 1998 to December 1999, on Lacont pear variety trees.

III. Biological studies

i. <u>Biology and life table of *Tetranychus urticae* Koch was studied on different fig varieties:</u>

To study the effect of temperature on the biology of the two-spotted spider mite ***T. urticae***, it was reared at 15,20,25 and 30˚C and 70% R.H. on Black michen, Cadota, Sultani, Adsi, Doritto, Conadria and Gizi fig varieties, which are presented in the following:-

A. <u>Biology and Life table of *T. urticae* Koch on Black michen fig variety: -</u>

1) Developmental period (life cycle):-

Data presented in table (22) showed that the average female egg incubation period of ***T. urticae*** was decreased as the temperature increased, as it was 12.04, 8.74, 4.83 and 2.54 days at 15,20,25and 30˚C, respectively. For male, it averaged 12.09, 8.56, 4.66 and 2.53days at the same degree of temperature, respectively.

Temperature affected the duration of the developmental stages, the period of immature stages increased when the temperature decreased. Data in table (22) illustrated that, the duration of female larval stages averaged 7.28, 3.22, 1.82 and 1.48 days; protonymph durated 5.17, 3.13, 1.44 and 1.37 days and Deutonymph averaged 6.18, 3.35, 1.65 and 1.37 days at 15,20,25 and 30˚C, respectively.

The developmental Time (life cycle) of ***T. urticae*** averaged 30.67, 18.44, 9.74 and 6.76 days at temperatures of 15, 20, 25 and 30˚C, respectively.

Table (22) Duration (days) of *Tetranychus urticae* Koch on Fig (Black mechin) at constant temperature and relative humidity 70 % ± 5 %

Temp. (°C)	Female			Male		
	Min.	Max.	Mean ±S.D.	Min.	Max.	Mean ±S.D.
Egg						
15	11	13	12.04±0.37	11	13	12.09±0.38
20	8.5	9	8.74±0.25	8.5	9	8.56±0.17
25	4.5	5.2	4.83±0.24	4.5	5	4.66±0.24
30	2.5	2.7	2.54±0.06	2.5	2.7	2.53±0.07
Larva						
15	7	7.5	7.28±0.25	6.5	7.5	6.95±0.35
20	3	3.5	3.22±0.22	2.0	3.5	2.88±0.40
25	1.3	2	1.82±0.24	1.5	2	1.74±0.24
30	1.2	1.7	1.48±0.18	1.2	1.5	1.31±0.1
Protonymph						
15	5	5.5	5.17±0.24	5	5.5	5.09±0.20
20	3	3.5	3.13±0.21	2.7	3.5	2.98±0.20
25	1.2	2	1.44±0.23	1	1.5	1.31±0.24
30	1.2	1.5	1.37±0.11	1	1.3	1.15±0.14
Deutonymph						
15	6	7	6.18±0.32	4.5	6.5	5.82±0.75
20	2.5	3.5	3.35±0.25	2.5	3.5	3.18±0.30
25	1.2	2	1.65±0.26	1.5	2	1.70±0.25
30	1.2	2	1.37±0.43	1.2	1.5	1.28±0.15
Life cycle						
15	29.50	32.0	30.67±1.56	27.0	31.5	29.95±1.43
20	17.50	19.50	18.44±0.63	16.50	18.50	17.62±0.58
25	8.50	10.50	9.74±0.71	9.0	10.5	9.40±0.43
30	6.30	7.40	6.76±0.21	6.0	7.0	6.27±0.31

Male followed similar trend, but having shorter periods. The male larval stage average 6.95, 2.85, 1.74 and 1.31 days; Protonymph average 5.09, 2.98, 1.31 and 1.15 days while, Deutonymph lasted 5.82, 3.18, 1.7 and 1.28 days at 15,20,25 and 30˚C, respectively.

1) Reproduction and life table parameters:-

The used temperature affected on adult female longevity (Table 23 and Fig.13). Maximum duration of female survival was obtained at 15˚C but the minimum female longevity was recorded at 30˚C. The average female longevity was 27.29, 22.1, 17.57 and 13.57 days at 15, 20, 25 and 30˚C, respectively. The pre-oviposition period was 4.34, 1.92, 1.1 and 1.01 days; while the oviposition period averaged 19.0, 16.2, 14.79 and 10.9 days at 15, 20, 25 and 30˚C, respectively. The total mean fecundity increased as the temperature increased it averaged 40.96, 91.45, 109.35 and 128.05 eggs/ female at 15, 20, 25 and 30˚C, respectively. Sex ratio of female per total was 0.56, 0.5, 0.6 and 0.76 at 15, 20, 25 and 30˚C, respectively. The percentage 50% mortality of the population of *T. urticae* increased as the temperature decreased the highest mortality was 32.56days at 15 ˚C and the least mortality was 16.5 days at 30˚C.

Data presented in table (23) indicated that the following results:

Maximum value of intrinsic rate of nature increases (r_m) was obtained at 30˚C as 0.29 and the minimum at 15˚C as 0.053. The corresponding values of finite rate of increased ($expr_m$) were 1.05, 1.10, 1.22 and 1.34 at 15, 20, 25 and 30˚C, respectively.

Table (23) Effect of temperature on the life table parameters of *Tetranychus urticae* Koch on Black michen fig variety

Parameters	Temperature (C°)			
	15	20	25	30
Developmental time (days)	30.67	18.44	9.74	6.76
Pre-Ovipostion period (days)	4.34	1.92	1.10	1.01
Ovipostion period (days)	19.0	16.2	14.79	10.9
Generation time (days)	35.01	20.36	10.84	7.77
Longevity (days)	27.29	22.10	17.57	13.57
Total mean fecundity rate (egg/♀)	40.96	91.45	109.35	128.05
50% mortality (days)	32.56	19.83	22.0	16.50
Sex ratio(female/ total)	0.56	0.50	0.60	0.76
Intrinsic rate of increases (r_m)	0.0535	0.10	0.20	0.29
Finite rate of increases (exp r_m)	1.05	1.10	1.22	1.34
Net reproductive rate (R_o)	10.42	17.79	30.44	35.63
Time for population double	12.95	6.93	3.46	2.39

Net reproductive rate (R_o) was highest at 30˚C as 35.63 at mean generation time (T) 7.77 days. The least value of (R_o) was obtained at 15˚C as 10.42 at mean generation time (T) 35.01 days.

The time for population doubling increased, as the temperature decreased the longest time was 12.95 days at 15˚C and the shortest time was 2.39 days at 30˚C (Table23).

In conclusion, the above mentioned results, clearly demonstrated that, the shortest developmental time (6.76 days) and the high fecundity (128.05 eggs/female) were recorded at 30˚C. Also the shortest generation time (7.77 days) and the highest intrinsic rate of nature increases (r_m) (0.29) were obtained at 30˚C.

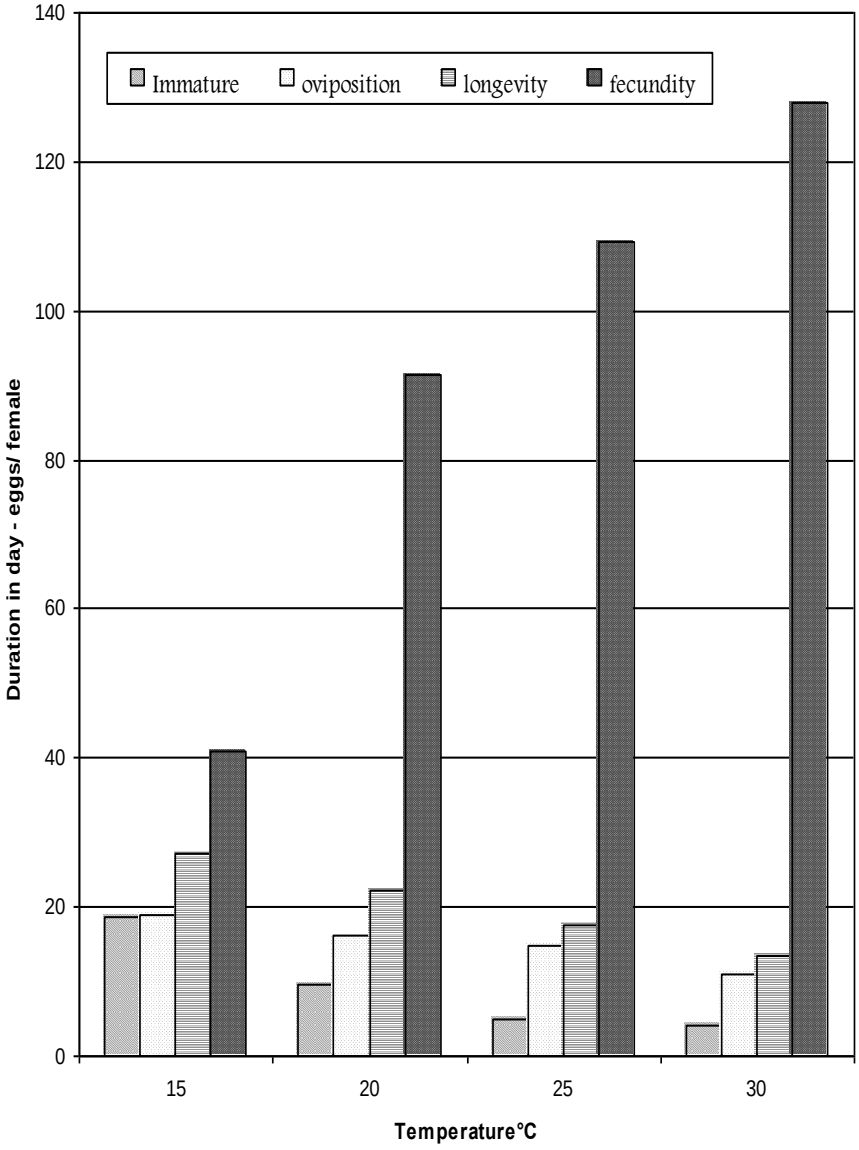

Fig (13) Effect of temperature on female *T.urticae* Koch immature stages, oviposition, longevity and fecundity on Black michen fig variety.

B. **Biology and Life table of *T. urticae* Koch on Cadota fig variety: -**

1. developmental time (life cycle):-

Data in table (24) demonstrated that mean of female and male egg incubation period were 13.02& 12.68 days at 15˚C; 9.01&8.79days at 20˚C; 4.80&4.71 days at 25˚C and 2.88 & 2.80 days at 30˚C. The temperature affected the duration of developmental time stages of female ***T. urticae,*** the larval stage deurated 7.28, 3.33, 2.0 and 1.64 days; the protonymphal averaged 6.21, 3.11, 1.74 and 1.26 and the Deutonymph alone lasted 6.22, 3.46, 2.15 and 1.45 days at 15, 20, 25 and 30˚C, respectively.

Male larva stage averaged 7.18, 3.04, 2.0 and 1.46 days; Protonymphal lasted 5.25, 3.04, 1.46 and 1.28 days and the deutonymphal alone durated 6.28, 3.25, 2.04 and 1.34 days at 15, 20, 25 and 30˚C, respectively.

In accordance with results obtained on the duration of egg incubation period, total immature stages and life cycle of ***T. urticae*** differed according to temperature used, the shortest period of life cycle was 7.23 days at 30˚C; while the longest one was 32.73 days at 15˚C for female. For male the shortest duration was 6.88 days and the longest one was 31.39 days at temperatures of 30 and 15˚C, respectively.

2.Reproduction and life table parameters: -

Data in (Table 25& fig. 14) indicated that, the used temperature affected the adult female longevity. The averages of female longevity were 26.45, 20.31, 17.21

Table (24) Duration (days) of *Tetranychus urticae* Koch on Fig (Cadota) at constant temperature and relative humidity 70 % ± 5 %

Temp. (C°)	Female			Male		
	Min.	Max.	Mean ±S.D.	Min.	Max.	Mean ±S.D.
Egg						
15	12.5	13.5	13.02±0.33	12.5	13	12.68±0.25
20	8.5	9.5	9.01±0.2	8.5	9	8.79±0.25
25	4.5	5	4.80±0.23	4.5	55	4.71±0.25
30	2.5	3	2.88±0.14	2.5	3	2.80±0.23
Larva						
15	7	8	7.28±0.37	7	8	7.18±0.37
20	3	4	3.33±0.39	2.5	3.5	3.04±0.39
25	1.5	2.5	2.0±0.31	1.5	2	2.0±0.33
30	1.5	2	1.64±0.17	1.3	1.7	1.46±0.09
Protonymph						
15	5	7	6.21±0.69	5	5.5	5.25±0.26
20	3	3.5	3.11±0.21	2.5	3.5	3.04±0.39
25	1.5	2	1.74±0.23	1	2	1.46±0.31
30	1.0	1.5	1.26±0.17	1	1.5	1.28±0.15
Deutonymph						
15	5.5	7	6.22±0.49	6.0	6.5	6.28±0.25
20	3	4	3.46±0.36	2.5	4	3.25±0.54
25	1.5	3	2.15±0.39	1.5	3	2.04±0.45
30	1.0	2	1.45±0.24	1	1.5	1.34±0.21
Life cycle						
15	31.0	34.50	32.73±0.97	31.0	32.3	31.39±0.70
20	18.0	20.0	18.91±0.49	17.0	19.0	18.12±0.52
25	9.50	11.70	10.69±0.57	9.50	11.0	10.21±0.56
30	6.50	8.0	7.23±0.38	6.10	7.50	6.88±0.43

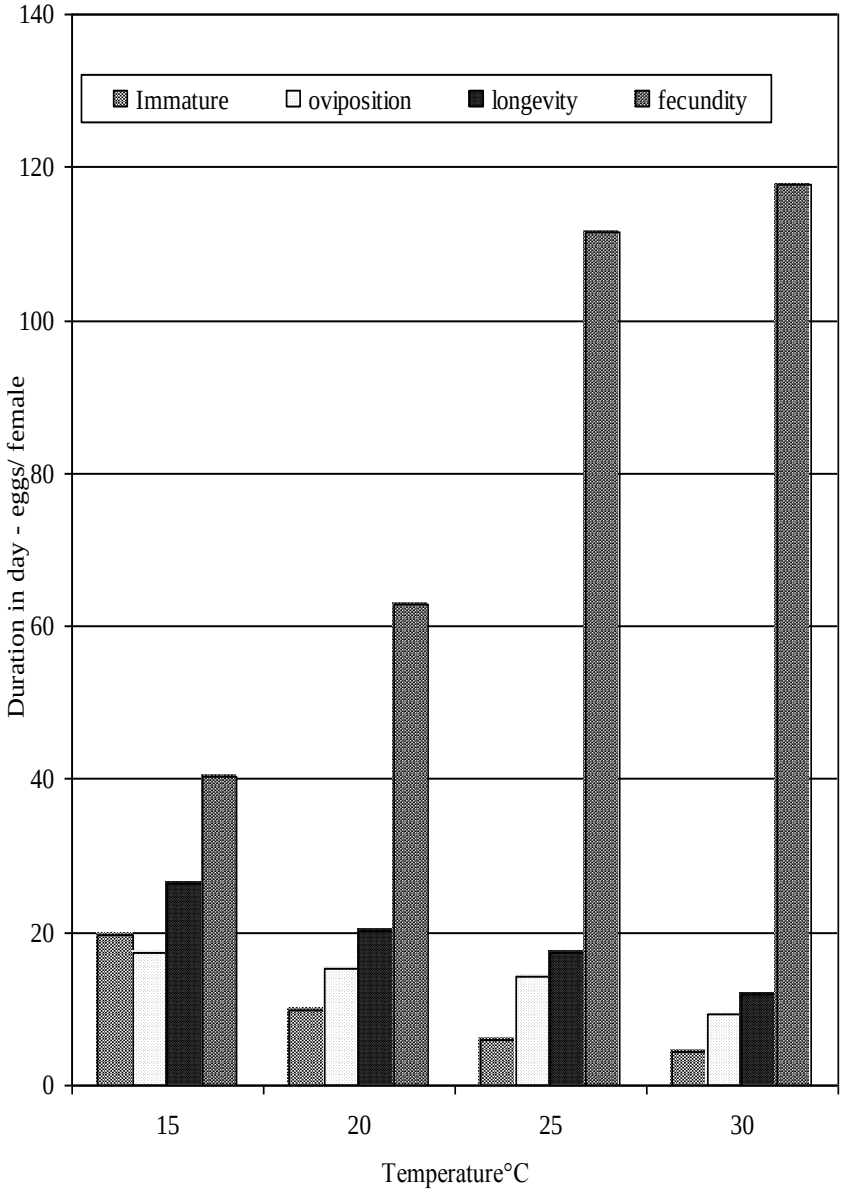

Fig (14) Effect of temperature on female *T. urticae* Koch immature stages, oviposition, longevity and fecundity on Cadota fig variety.

Table (25) Effect of temperature on the life table parameters of *Tetranychus urticae* Koch on Cadota fig variety

Parameter	Temperature (C°)			
	15	**20**	**25**	**30**
Developmental time (days)	32.73	18.91	10.69	7.23
Pre-Ovipostion period (days)	5.32	2.13	1.48	1.25
Ovipostion period (days)	17.25	15.27	14.2	9.28
Generation time (days)	38.05	21.04	12.17	8.48
Longevity (days)	26.45	20.31	17.21	11.83
Total mean fecundity rate (egg/♀)	40.28	62.95	111.66	117.73
50% mortality (days)	30.50	32.0	21.0	14.0
Sex ratio(female/ total)	0.58	0.60	0.70	0.74
Intrinsic rate of increases (r_m)	0.045	0.10	0.18	0.26
Finite rate of increases (exp r_m)	1.04	1.10	1.20	1.29
Net reproductive rate (R_o)	8.09	17.85	31.10	24.73
Time for population double	15.40	5.77	3.46	3.22

and 11.83 days at 15, 20, 25 and 30 ˚C, respectively. The Pre-oviposition period was 5.32, 2.13, 1.48 and 1.25 days at 15, 20, 25 and 30 ˚C, respectively. Oviposition period decreased as temperature increased, as it averaged 17.25, 15.27, 14.2 and 9.28 days at 15, 20, 25 and 30 ˚C, respectively. Maximum number of eggs produced by females was observed at 25 and 30˚C as 111.66 and 117.73 eggs per female, respectively. The minimum number of eggs per female was recorded at 15&20˚C as 40.28&62.95 eggs/ female, respectively (fig.14).

The percentage 50% mortality of the population of ***T. urticae*** was at 30.5, 32.0, 21.0 and 14 days and sex ratio of female per total population was 0.58, 0.6, 0.7 and 0.74 at 15, 20, 25 and 30 ˚C, respectively.

Maximum value of intrinsic rate of increase ($\mathbf{r_m}$) was obtained at 30˚C as 0.26 but the minimum was at 15˚C as 0.045.

The corresponding values of finite rate of increase ($\mathbf{expr_m}$) were 1.04, 1.10, 1.20 and 1.29 at 15, 20, 25 and 30 ˚C, respectively.

Net reproductive rate **(R_o)** was increased as the temperature increased. These value was 8.09, 17.85, 31.10 and 24.73 at the mean generation time of 38.05, 21.04, 12.17 and 8.48 days at 15, 20, 25 and 30 ˚C, respectively.

The time for population doubling increased as temperature decreased. The shortest time was 3.22 days at 30˚C and the longest time was 15.40 days at 15˚C.

In conclusion, the above mentioned results, clearly illustrated that, the shortest developmental time (7.23days) was obtained at 30˚C. Maximum fecundity was recorded at 30˚C,with 128.05 eggs per female.

The shortest generation time (8.48days) was at 30˚C and the highest intrinsic rate of increase ($\mathbf{r_m}$) (0.26) was obtained at 30˚Cand the longest period for population doubling (15.40 days) was at 15˚C.

C. **Biology and Life table of *T. urticae* Koch on Sultani fig variety: -**

1. developmental time (life cycle):-

Data in table (26) indicated that, The mean of female incubation period was 14.75, 9.8, 5.2 and 3.06 days while the male was 14.5, 9.30, 5.11 and 2.78 days at 15, 20, 25 and 30˚C, respectively. The developmental time period increased as the temperature decreased, the female larval stage averaged 7.09, 3.41, 2.05 and 1.74 days; Protonymphal averaged 6.09, 3.14, 2.02 and 1.47 days and deutonymph averaged 6.73, 3.43, 2.19 and 1.69days at 15, 20, 25 and 30˚C, respectively. Male larval stage averaged 7.6, 3.3, 2.12 and 1.69 days; Protonymphal averaged 5.5, 3.23, 1.16 and 1.34 days and deutonymphal averaged 6.3, 3.3, 2.17 and 1.53 days at the same degree of temperature, respectively.

Female and male ***T. urticae,*** life cycle was affected by temperature. The longest period was (34.66& 33.9 days) at 15˚C; while the shortest period as (7.95& 7.34 days) at 30˚C, for female and male, respectively.

2. Reproduction and life table parameters: -

Data in (Table 27 & Fig.15) demonstrated that, adult female longevity was decreased as the temperature increased, the female longevity averaged 26.57, 20.05, 15.86 and 12.11 days at 15, 20, 25 and 30˚C, respectively. Pre-Oviposition period lasted 5.47, 2.77, 1.56 and 1.55 days at 15, 20, 25 and 30˚C, respectively.

Table (26) Duration (days) of *Tetranychus urticae* Koch on Fig Sultani at constant temperature and relative humidity 70 % ± 5 %

Temp. (C°)	Female			Male		
	Min.	Max.	Mean ±S.D.	Min.	Max.	Mean ±S.D.
Egg						
15	14	15.5	14.75±0.41	13.5	15	14.5±0.57
20	9.5	10	9.80±0.25	9	9.5	9.30±0.25
25	5	6	5.20±0.31	5	5.5	5.11±0.22
30	2.5	3.5	3.06±0.26	2.5	3	2.78±0.20
Larva						
15	7	8	7.09±0.20	7	8	7.60±0.41
20	3	4	3.41±0.33	3	3.5	3.30±0.25
25	1.5	2.5	2.05±0.28	1.5	2.5	2.12±0.46
30	1.5	2	1.74±0.24	1.5	2	1.69±0.24
Protonymph						
15	5.5	7.5	6.09±0.56	5.5	6.0	5.5±0.35
20	3	3.5	3.14±0.23	3.0	3.5	3.23±0.25
25	1.5	2.5	2.02±0.28	1.0	2.5	1.16±0.46
30	1.0	2.0	1.47±0.21	1.0	1.5	1.34±0.23
Deutonymph						
15	5.5	8	6.73±0.95	5.5	7.0	6.3±0.67
20	3.0	4	3.43±0.35	3.0	3.5	3.30±0.25
25	1.5	2.5	2.19±0.30	1.5	2.5	2.17±0.37
30	1.5	2	1.69±0.22	1.0	2.0	1.53±0.24
Life cycle						
15	33.5	37.0	34.66±1.13	33.5	34.5	33.90±0.32
20	19.0	20.50	19.78±0.39	18.0	20.0	19.13±0.43
25	11.0	12.50	11.46±0.53	9.5	12.0	10.56±0.64
30	7.0	9.50	7.95±0.49	6.5	8.0	7.34±0.48

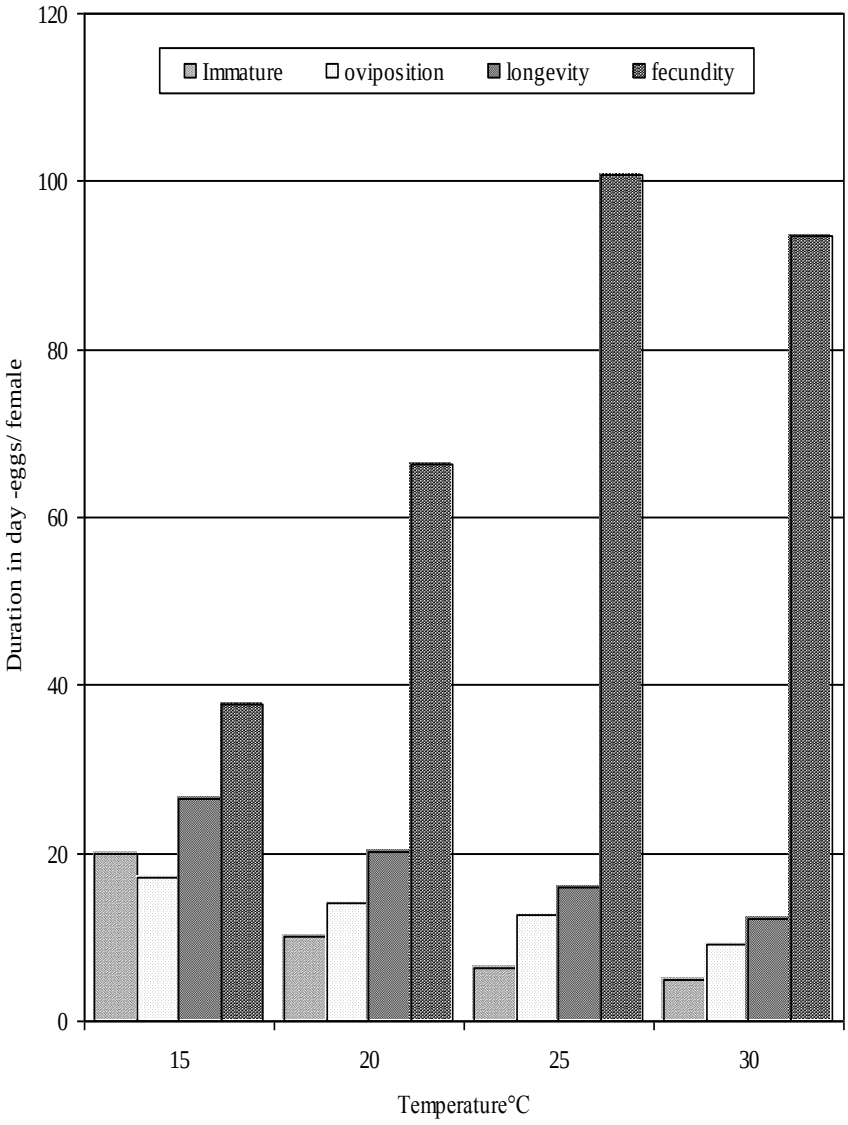

Fig (15)Effect of temperature on female *T. urticae* Koch immature stages, oviposition, longevity and fecundity on Sultani fig variety.

Table (27) Effect of temperature on the life table parameters of *Tetranychus urticae* Koch on Sultani fig variety

Parameter	Temperature (C°)			
	15	20	25	30
Developmental time (days)	34.66	19.78	11.46	7.96
Pre-Ovipostion period (days)	5.47	2.77	1.56	1.55
Ovipostion period (days)	17.0	14.1	12.68	9.23
Generation time (days)	40.13	22.55	13.02	9.51
Longevity (days)	26.57	20.05	15.86	12.11
Total mean fecundity rate (egg/♀)	37.85	66.41	100.8	93.46
50% mortality (days)	35.35	22.25	21.0	17.0
Sex ratio(female/ total)	0.50	0.72	0.60	0.80
Intrinsic rate of increases (r_m)	0.038	0.10	0.16	0.24
Finite rate of increases (exp r_m)	1.03	1.10	1.18	1.27
Net reproductive rate (R_o)	6.24	19.10	23.31	25.86
Time for population double	18.24	6.93	4.33	2.88

The mean fecundity rate (egg per female) was 37.85, 66.41, 100.8 and 93.46 eggs per female at 15, 20, 25 and 30˚C, respectively. Oviposition period decreased as temperature increased, as it averaged 17.0, 14.1, 12.68 and 9.23 days at 15, 20, 25 and 30˚C, respectively. The generation time increased as temperature decreased since it averaged 40.13, 22.55, 13.02 and 9.51 days at 15, 20, 25 and 30˚C, respectively.

The percentage 50% mortality decreased as the temperature increased where it averaged 35.35, 22.25, 21 and 17 days, while the sex ratio of female per total was 0.5, 0.72, 0.6 and 0.8 at 15, 20, 25 and 30˚C, respectively.

The intrinsic rate of increase (**r_m**) was increased as the temperature increased as it reached 0.038, 0.10, 0.16 and 0.24; the corresponding values of finite rate of increase (**$expr_m$**) were 1.03, 1.1, 1.18 and 1.27 at 15, 20, 25 and 30 ˚C, respectively.

Net reproductive rate **(R_o)** was increased as the temperature increased. These values were 6.24, 19.10, 23.31 and 25.86 at 15, 20, 25 and 30 ˚C, respectively.

The time for population doubling increased as the temperature decreased. It durated 18.2, 6.93, 4.33 and 2.88 days at 15, 20, 25 and 30 ˚C, respectively.

In conclusion, our results showed that, the longest developmental time (34.66 days) was obtained at 15˚C. Maximum fecundity was found at 25˚C as 100.8 eggs per female. The highest generation time (40.13 days) was at 15˚C, but the highest intrinsic rate of increase (**r_m**) was 0.24 at 30˚C. The net reproductive rate **(R_o)** was highest at 30˚C as 25.86 at mean generation time was 9.51 days.

D. **Biology and Life table of *T. urticae* Koch on Doritto fig variety: -**

1. Developmental time (life cycle):-

Data represented in table (28) illustrated the following results: -

The average female incubation period was 14.64, 9.59, 5.24 and 3.47 days at 15, 20, 25 and 30 ˚C, while the male values were 14.2, 9.28, 5.2 and 3.25 days at the same degree of temperature respectively. The developmental period was affected by temperature, female larval stage durated 7.68, 3.64, 2.33 and 2.14 days; Protonymph averaged 6.5, 3.32, 1.9 and 1.67 days and deutonymph lasted 6.92, 3.90, 2.35 and 1.78 days at 15, 20, 25 and 30 ˚C, respectively.

Male followed similar trend, but having shorter periods, as the larval average 7.7, 3.56, 2.16 and 1.79 days, Protonymph averaged 5.7, 3.5, 1.76 and 1.54 days and deutonymphal period averaged 6.7, 3.47, 2.2 and 1.62 days at 15, 20, 25 and 30 ˚C, respectively.

The developmental period for female and male were 35.74& 34.3 days at 15˚C; 20.45& 19.81 days at 20˚C; 11.82 & 11.32 days at 25˚C and 9.06 & 8.2 days at 30˚C for female and male, respectively.

2. Reproduction and life table parameters: -

Results in (Table 29 & Fig. 16), clearly showed that, as adult female longevity decreased as the temperature increased it average 24.55, 18.45, 14.56 and 10.5 days at 15, 20, 25 and 30 ˚C, respectively. Also the Pre-Oviposition period increased as

Table (28) Duration (days) of *Tetranychus urticae* Koch on Fig (Doritto) at constant temperature and relative humidity 70 % ± 5 %

Temp. (C°)	Female			Male		
	Min.	Max.	Mean ±S.D.	Min.	Max.	Mean ±S.D.
Egg						
15	14	15.5	14.64±0.52	13	15	14.20±0.83
20	9	10	9.59±0.37	9	10	9.28±0.31
25	5	5.5	5.24±0.25	5	5.5	5.20±0.25
30	3	4	3.47±0.27	3	3.5	3.25±0.26
Larva						
15	7	8	7.68±0.44	7.5	8	7.7±0.44
20	3	4	3.64±0.29	3	4	3.56±0.35
25	2	3	2.33±0.31	2	2.5	2.16±0.24
30	1.5	3	2.14±0.40	1.5	2	1.79±0.26
Protonymph						
15	6	7	6.5±0.55	5.5	6	5.7±0.27
20	3	4	3.32±0.31	3	4	3.5±0.31
25	1.5	2.5	1.90±0.27	1.5	2.5	1.76±0.37
30	1.5	2	1.67±0.24	1	2	1.54±0.25
Deutonymph						
15	6	8	6.92±0.50	6	7.5	6.7±0.57
20	3	4.5	3.90±0.55	3	4	3.47±0.41
25	1.5	3	2.35±0.38	2	2.5	2.2±0.25
30	1.0	2	1.78±0.28	1	2	1.62±0.37
Life cycle						
15	34.0	37.5	35.74±0.82	34.0	34.5	34.3±0.27
20	19.0	21.5	20.45±0.64	18.5	22.0	19.81±0.98
25	10.5	13.5	11.82±0.72	10.5	12.0	11.32±0.47
30	7.5	10.0	9.06±0.71	7.0	9.0	8.20±0.58

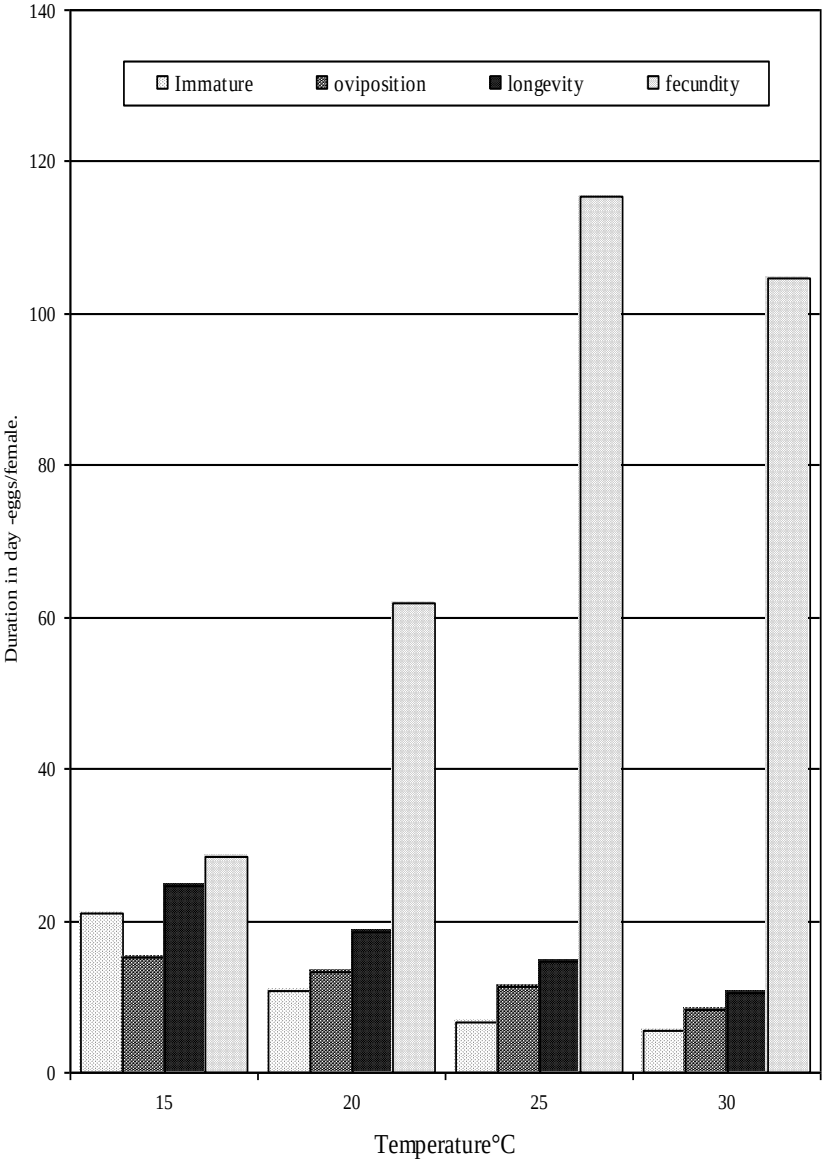

Fig (16) Effect of temperature on female *T. urticae* Koch immature stages, oviposition, longevity and fecundity on Doritto fig variety.

Table (29) Effect of temperature on the life table parameters of *Tetranychus urticae* Koch on Doritto fig variety

Parameter	Temperature (C°)			
	15	20	25	30
Developmental time (days)	35.74	20.45	11.82	9.06
Pre-Ovipostion period (days)	4.50	2.80	1.56	1.31
Ovipostion period (days)	15.11	13.20	11.44	8.25
Generation time (days)	40.24	23.25	13.38	10.37
Longevity (days)	24.55	18.45	14.56	10.50
Total mean fecundity rate (egg/♀)	28.50	61.93	115.5	104.66
50% mortality (days)	35.19	21.7	11.90	15.0
Sex ratio(female/ total)	0.52	0.68	0.72	0.60
Intrinsic rate of increases (r_m)	0.034	0.093	0.16	0.19
Finite rate of increases ($expr_m$)	1.03	1.09	1.17	1.21
Net reproductive rate (R_o)	5.26	15.83	20.95	15.02
Time for population double	20.03	7.37	4.33	3.64

the temperature decreased it average 4.5, 2.8, 1.56 and 1.31 days at the same degree of temperature, respectively.

Oviposition period increased as temperature decreased as it averaged 15.11, 13.2, 11.44 and 8.25 days at 15, 20, 25 and 30 ˚C, respectively.

The longest generation time was 40.24 days at 15˚C, while the shortest one was 10.37 days at 30˚C.

The total means fecundity rate (egg per female) was 28.5, 61.93, 115.5 and 104.66 eggs per female at 15, 20, 25 and 30 ˚C, respectively. Sex ratio of female per total was 0.52, 0.68, 0.72 and 0.6 at 15, 20, 25 and 30 ˚C, respectively. While, the 50% mortality percentage increased as the temperature decreased, as it was 35.19, 21.7, 11.9 and 15.0 days at 15, 20, 25 and 30 ˚C, respectively.

The intrinsic rate of increase (**r_m**) was 0.034, 0.093, 0.16 and 0.19 at 15, 20, 25 and 30 ˚C, respectively. The corresponding values of finite rate of increase (**$expr_m$**) were 1.03, 1.09, 1.17 and 1.21, respectively.

Net reproductive rate **(R_o),** was the highest at 25˚C as it was 20.95 at mean generation time of 13.38 days. The least value of **(R_o)** was obtained at 15˚C as 5.26 at mean generation time of 40.24 days.

The time for population doubling of ***T. urticae*** decreased as the temperature increased as it was 20.03, 7.37, 4.33 and 3.64 days at 15, 20, 25 and 30 ˚C, respectively.

The above mentioned results concluded that, the longest developmental time (35.74 days) was at 15˚C and the shortest one (9.06 days) at 30˚C. The longest Oviposition period was observed at 15˚C as 15.11 days, while, the highest intrinsic rate of increase ($\mathbf{r_m}$) was obtained at 30˚C as 0.19 at mean generation time of 10.37 days. The lowest one ($\mathbf{r_m}$), was obtained at 15˚C as 0.034 at mean generation time 40.24days. The highest total mean of fecundity rate was found at 25˚C as 115.5 eggs per female, while the lowest one was found at 15˚C as 28.5 eggs per female.

E. Biology and Life table of *T. urticae* Koch on Adsi fig variety:-

1. Developmental time (life cycle):-

Results in table (30) showed that, the incubation period of egg stage for female and male were 15.12 & 14.41 days at 15˚C; 9.56 & 9.64 days at 20˚C; 5.16& 5.0 days at 25˚C and 3.51 & 3.19 days at 30˚C for female and male, respectively.

Duration of larval stage for female and male were 7.97 & 7.95; 3.98& 3.9; 3.08 & 2.05 and 2.39 & 1.84 days at 15, 20, 25 and 30˚C, respectively.

The protonympal periods for female and male were 6.31 & 6.16; 3.58 & 3.7; 1.93 & 1.98 and 2.1 & 1.5 days at 15, 20, 25 and 30˚C, respectively.

The deutonymphal periods for female and male were 7.27 &7.08 days; 4.1& 3.8 days; 2.22& 2.45 days and 2.15& 1.76 days at 15, 20, 25 and 30˚C, respectively.

The period required for the life cycle of ***T. urticae*** was observed to be affected by the different temperature degrees, the life cycle lasted 36.67 &35.60 days; 21.22 &21.04 days; 12.39& 12.08 days and 10.15& 8.29 days for female and male at 15, 20, 25 and 30˚C, respectively, when the ***T. urticae*** was fed on Adsi fig variety.

2. Reproduction and life table parameters:-

From the obtained results presented in Table (31&Fig 17), it can be shown that, the maximum period for longevity of adult female was observed, when the two-spotted spider mite ***T. urticae*** was reared on Adsi fig trees at 15˚C as 20.6 days, while,

Table (30) Duration (days) of *Tetranychus urticae* Koch on Fig (Adsi) at constant temperature and relative humidity 70 % ± 5 %

Temp. (C°)	Female			Male		
	Min.	Max.	Mean ±S.D.	Min.	Max.	Mean ±S.D.
Egg						
15	14.5	16	15.12±0.42	14	14.5	14.41±0.2
20	9	10.5	9.56±0.36	9	10	9.64±0.49
25	4.5	5.5	5.16±0.36	4.55	5.5	5.0±0.40
30	3	4	3.51±0.26	3	3.5	3.19±0.25
Larva						
15	7.5	8.5	7.97±0.34	7	8.5	7.95±0.55
20	3	4.5	3.98±0.44	3.5	4	3.90±0.20
25	2.5	3.5	3.08±0.30	1.5	2.5	2.05±0.49
30	2.0	2.5	2.39±0.20	1.5	2	1.84±0.24
Protonymph						
15	6	7	6.31±0.38	5.5	7	6.16±0.51
20	3	4	3.58±0.40	3	4	3.7±0.45
25	1.5	2.5	1.93±0.34	1.5	2.5	1.98±0.33
30	1.0	2.5	2.10±0.36	1	2	1.5±0.35
Deutonymph						
15	7	7.5	7.27±0.25	7	7.5	7.08±0.20
20	3.5	4.5	4.1±0.28	3.5	4	3.8±0.25
25	1.5	3	2.22±0.36	2.0	3	2.45±0.28
30	2	3	2.15±0.29	1.5	2	1.76±0.26
Life cycle						
15	36.0	37.5	36.67±0.61	34.5	37.5	35.60±1.17
20	20.5	22.5	21.22±0.47	19.0	22.0	21.04±0.82
25	11.0	14.0	12.39±0.77	10.5	12.5	12.08±0.70
30	8.5	11.0	10.15±0.74	7.5	9.0	8.29±0.43

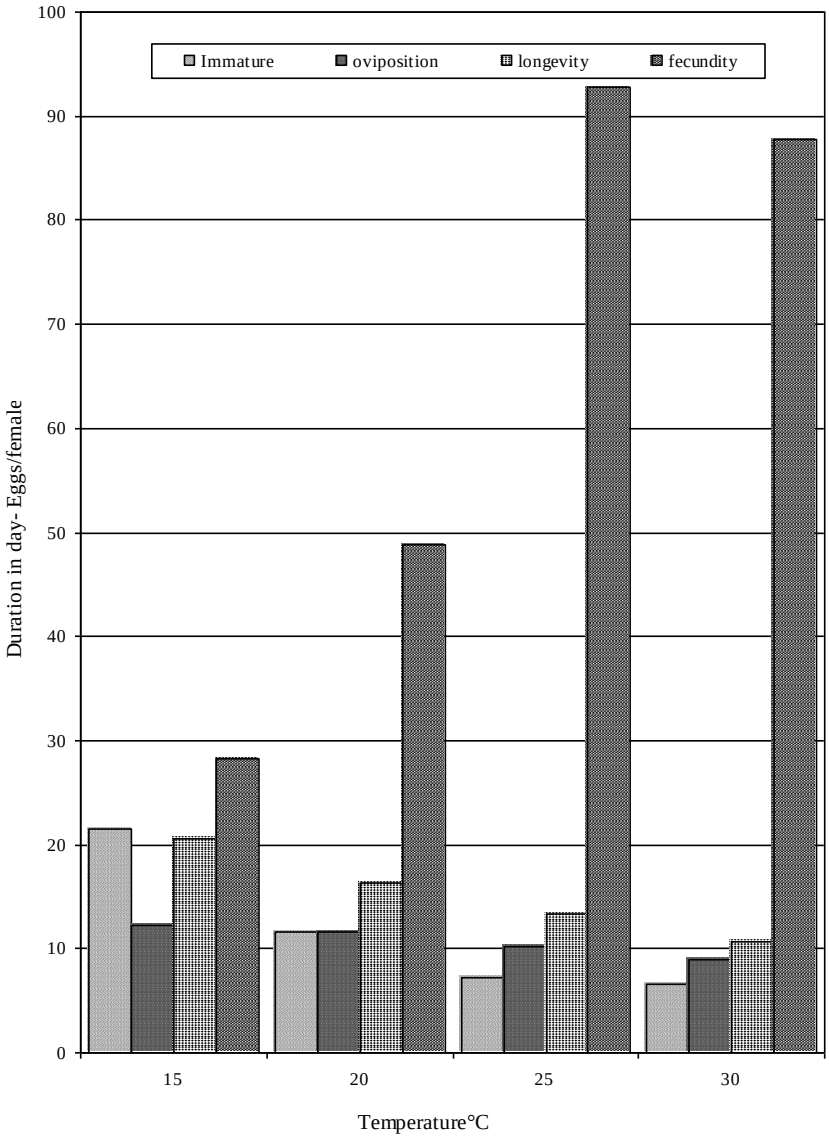

Fig (17) Effect of Temperature on Female *T. urticae* Koch immature stages, oviposition, longevity and fecundity on Adsi fig variety .

Table (31) Effect of temperature on the life table parameters of *Tetranychus urticae* Koch on Adsi fig variety

Parameter	Temperature (C°)			
	15	20	25	30
Developmental time (days)	36.67	21.22	12.39	10.15
Pre-Ovipostion period (days)	5.95	2.82	1.54	0.95
Ovipostion period (days)	12.20	11.60	10.28	8.91
Generation time (days)	42.62	24.04	13.93	11.10
Longevity (days)	20.60	16.27	13.27	10.67
Total mean fecundity rate (egg/♀)	28.18	48.81	92.71	87.76
50% mortality (days)	39.5	22.0	13.50	16.0
Sex ratio(female/ total)	0.56	0.74	0.68	0.7
Intrinsic rate of increases(r_m)	0.029	0.08	0.15	0.19
Finite rate of increases($expr_m$)	1.02	1.08	1.16	1.21
Net reproductive rate (R_o)	4.16	12.13	17.22	19.09
Time for population double	23.90	8.66	4.62	3.64

the minimum period of ***T. urticae*** longevity was recorded at 30˚C as 10.67 days.

The longest period from reaching the female adult stage till the first egg deposition was observed at 15˚C to average 5.95 days, while the shortest period averaged 0.95 days at 30˚C.

The Oviposition period of female average 12.2, 11.6, 10.28 and 8.91 days at 15, 20, 25, and 30˚C The total means fecundity rate of female was reached maximum number at 25˚C as 92.71 eggs per female, while the minimum number of this period was observed at 15˚C as 28.18 eggs per female.

The generation time increased as temperature decreased it was averaged 42.62, 24.04, 13.93 and 11.1 days at 15, 20, 25 and 30˚C, respectively.

The mortality percentage 50% of ***T. urticae*** was observed to be 39.5, 22.0, 13.5 and 16.0 days at 15, 20, 25 and 30˚C, respectively. Sex ratio of female per total average was 0.56, 0.74, 0.68 and 0.7 at the same degree of temperature, respectively.

The intrinsic rate of nature increase ($\mathbf{r_m}$) it averages 0.029, 0.08, 0.15 and 0.19 at 15, 20, 25 and 30˚C, respectively. While the Finite rate of increase ($\mathbf{expr_m}$) was 1.02, 1.08, 1.16 and 1.21 at the same degree of temperature, respectively.

The Net reproductive rate **($\mathbf{R_o}$)** was increased as temperature increased, as it reached 4.16, 12.13, 17.22 and 19.09 days at 15, 20, 25 and 30˚C, respectively.

The time for generation doubling lasted 23.65, 8.66, 4.62 and 3.64 at 15, 20, 25 and 30˚C, respectively.

The above mentioned results indicated that, the shortest developmental time averaged 10.15 days at 30˚C, and the highest total mean fecundity rate was recorded at 25˚C as 92.71 eggs per female. The maximum intrinsic rate of increases ($\mathbf{r_m}$) was observed at 30˚C, to be (0.19) at mean generation time of 11.10 days. The shortest period required for doubling the population of ***T. urticae*** in Adsi fig variety, was recorded at 30˚C as 3.64 days.

F. Biology and Life table of *T. urticae* Koch on Conadria fig variety:-

1. Developmental time (life cycle):-

Data represented in table (32) demonstrated that, the incubation period of egg stage for female and male were 15.33 & 15.2 days; 10.09& 9.5 days; 5.33& 5.04 days and 3.53&3.29 days at 15, 20, 25 and 30˚C, for female and male, respectively.

The developmental period increased as the temperature decreased. Female larva stage averaged 8.21, 4.18, 2.46 and 2.11 days at 15, 20, 25 and 30˚C, respectively. The Protonymph averaged 6.88, 3.96, 2.32 and 2.11days and the deutonymph lasted 7.68, 4.09, 2.45 and 2.13 days at the same degree of temperature, respectively.

Male had the same trend, as male larvael stage averaged 8.25, 4.3, 1.92 and 1.87 days; Protonymph durated 6.3, 3.9, 1.9 and 1.6 days; deutonymph averaged 7.1, 4.05, 2.16 and 1.87 days at 15, 20, 25 and 30˚C, respectively.

The Developmental time for female and male, were 38.10& 36.85 days; at 15 ˚C; 22.32& 21.75 days at 20˚C; 12.56& 11.03 days at 25˚C and 9.9& 8.63 days at 30˚C, respectively.

2.Reproduction and life table parameters:-

Data in table (33)& fig. (18) illustrated that, generation time of female *T. urticae* was increased as the temperature decreased as it averaged 43.3, 25.14, 14.0 and 11.17 days at 15, 20, 25 and 30˚C, respectively.

Table (32) Duration (days) of *Tetranychus urticae* Koch on Fig (Conadria) at constant temperature and relative humidity 70 % ± 5 %

Temp. (C°)	Female			Male		
	Min.	Max.	Mean ±S.D.	Min.	Max.	Mean ±S.D.
Egg						
15	15	15.5	15.33±0.23	15	15.5	15.2±0.25
20	9	11	10.09±0.55	9	10	9.5±0.4
25	5	5.5	5.33±0.23	4.5	5.5	5.04±0.33
30	3	4	3.53±0.26	3	3.5	3.29±0.25
Larva						
15	7.5	9	8.21±0.48	7.5	8.5	8.25±0.35
20	3.5	5	4.18±0.54	3	5	4.30±0.71
25	2	3	2.46±0.32	1.5	2.5	1.92±0.35
30	1.5	2.5	2.11±0.29	1.5	2	1.87±0.22
Protonymph						
15	5.5	8.0	6.88±0.66	6.0	6.5	6.3±0.25
20	3.5	4.5	3.96±0.41	3.5	4	3.9±0.21
25	2.0	2.5	2.32±0.24	1.5	2.5	1.91±28
30	1.5	2.5	2.11±0.34	1.13	2	1.60±0.24
Deutonymph						
15	7	8.5	7.68±0.44	6.5	7.5	7.10±0.39
20	3.5	5	4.09±0.42	3.5	4.5	4.05±0.36
25	2	3	2.45±0.38	1.5	3	2.16±0.53
30	1.5	2.5	2.13±0.28	1.0	2.5	1.87±0.56
Life cycle						
15	36.30	39.50	38.10±0.74	36.0	38.0	36.85±0.83
20	20.50	24.0	22.32±1.29	20.0	23.5	21.75±0.92
25	11.5	13.50	12.56±0.57	9.50	12.5	11.03±0.89
30	8.5	11.0	9.90±0.55	8.0	9.5	8.63±0.45

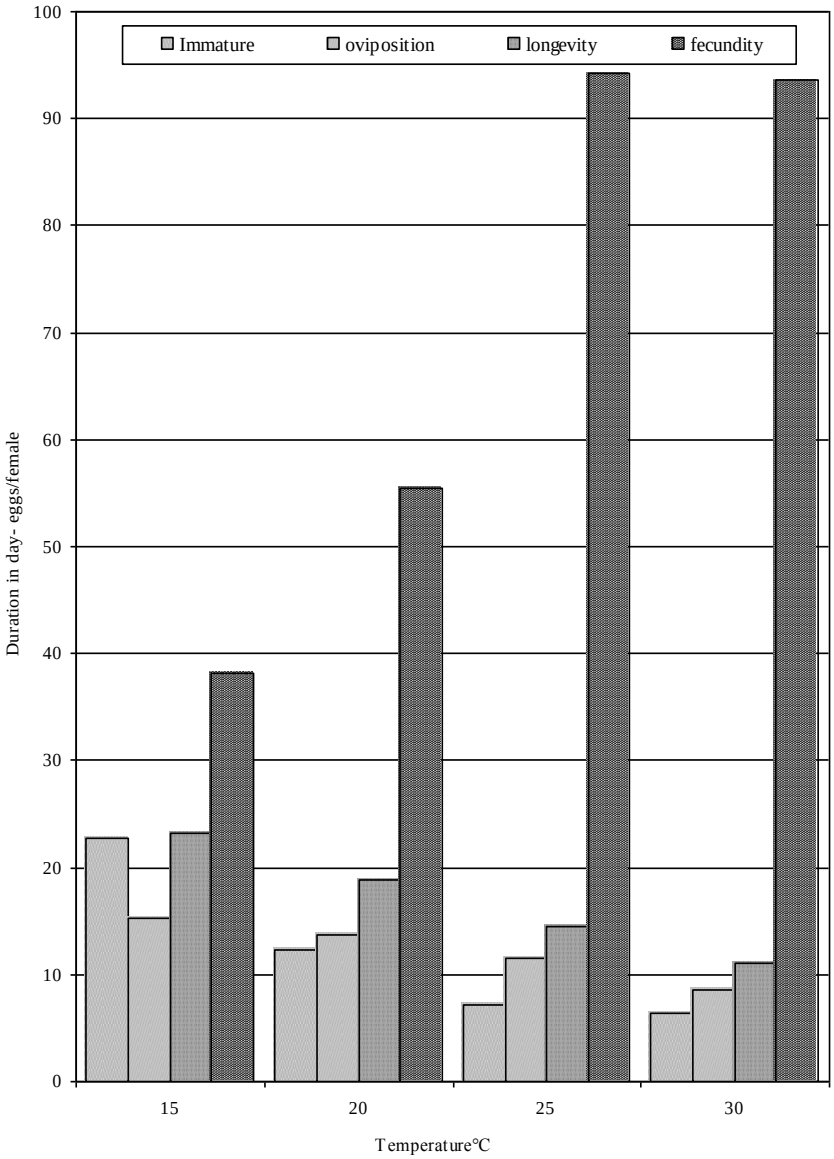

Fig (18) Effect of Temperature on female *T. urti*cae Koch immature stages, oviposition, longevity and fecundity on Conadria fig variety.

Table (33) Effect of temperature on the life table parameters of *Tetranychus urticae* Koch on Conadria fig variety

Parameter	Temperature (C°)			
	15	20	25	30
Developmental time (days)	38.10	22.32	12.56	9.90
Pre-Ovipostion period (days)	5.20	2.82	1.44	1.27
Ovipostion period (days)	15.28	13.68	11.51	8.55
Generation time (days)	43.30	25.14	14.00	11.17
Longevity (days)	23.26	18.90	14.55	11.08
Total mean fecundity rate (egg/♀)	38.14	55.45	94.18	93.66
50% mortality (days)	43.70	34.0	21.5	17.0
Sex ratio(female/ total)	0.62	0.66	0.58	0.72
Intrinsic rate of increases (r_m)	0.045	0.087	0.14	0.20
Finite rate of increases (exp r_m)	1.04	1.09	1.16	1.22
Net reproductive rate (R_o)	9.93	16.10	17.80	20.92
Time for population double	15.40	7.96	4.95	3.46

Female longevity of the two-spotted spider mite *T. urticae* was longest at 15˚C as 23.26 days, while the shortest period was observed at 30˚C as 11.08 days. The pre-oviposition period increased as the temperature decreased as it averaged 5.2, 2.82, 1.44 and 1.27 days at 15, 20, 25 and 30˚C, respectively.

Oviposition period increased as the temperature decreased as it averaged 15.28, 13.68, 11.51 and 8.55 days at 15, 20, 25 and 30˚C, respectively.

The maximum period for female egg deposition was recorded at 25 ˚C as 94.18 eggs/ female, while the minimum number of eggs deposited per female were (38.14 eggs/ female) at 15˚C.

The mortality percentage 50% averaged 43.7, 34.0, 21.5 and 17.0 days at 15, 20, 25 and 30˚C, respectively. Sex ratio reached 0.62, 0.66, 0.58 and 0.72 at the same degree of temperature.

The intrinsic rates of nature increase (r_m) were 0.04, 0.08, 0.14 and 0.20 at 15, 20, 25 and 30˚C, respectively. The corresponding values of finite rate of increase ($expr_m$) were 1.04, 1.09, 1.16 and 1.22 at the same degree of temperature, respectively.

The Net reproductive rate (R_o) was the highest at 30˚C as (20.92) at mean generation time of 11.17 days. The least value of (R_o) was obtained at 15˚C as 9.93 at mean generation time 43.3 days.

The time for population density doubling was 15.36, 7.96, 4.95 and 3.46 days at 15, 20, 25 and 30˚C, respectively.

In conclusion, these results illustrated, that the longest life cycle was 38.1 and 36.85 days; while the shortest life cycle was 9.9 and 8.63 days for female and male, respectively.

The highest female fecundity occurred at 25 ˚C and 30˚C as 94.18 and 93.66 eggs per female, respectively. The highest intrinsic rate of increases (r_m) was observed at 30˚C (0.20) and the lowest value was (0.045) at 15˚C.

G. Biology and Life table of *T. urticae* Koch on Gizi fig variety:-

1. Developmental time (life cycle):-

From table (34), data illustrated that temperature had negative effect on duration of all developmental stages. Incubation period decreased from 15.41 to 3.70 days and 15.25 to 3.63 days for female and male, respectively.,when temperature increased from 15 to 30 ˚C.

Duration of male larval stage averaged 7.75, 4.57, 2.56 and 1.86 days; Protonymphl durated 7.16, 4.10, 2.15 and 1.86 days and deutonymphal lasted 7.41, 4.14, 2.37 and 1.93 days at 15, 20, 25 and 30˚C, respectively.

Duration of female larval, averaged 7.58, 4.62, 2.8 and 2.55 days; Protonymphal durated 7.19, 4.27, 2.2 and 2.16 days and deutonymphal stages lasted 7.54, 4.36, 2.6 and 2.44 days at 15, 20, 25 and 30˚C, respectively.

In a accordance with results, obtained from periods of egg incubation, total immature stages and life cycle of ***T. urticae*** on Gizi fig variety, differed according to temperature used, the shortest period of life cycle was 10.85 days at 30˚C; while the longest one was 37.72 days at 15˚C for female. For male, the shortest duration was 9.28 days and the longest 37.57 days at 30 and15 ˚C, respectively.

Table (34) Duration (days) of *Tetranychus urticae* Koch on Fig (Gizi) at constant temperature and relative humidity 70 % ± 5 %

Temp. (C°)	Female			Male		
	Min.	Max.	Mean ±S.D.	Min.	Max.	Mean ±S.D.
Egg						
15	15	16	15.41±0.44	15	15.5	15.25±0.26
20	9	11	10.23±0.74	9	11	9.71±0.72
25	5.5	6	5.75±0.25	4.5	5.5	5.06±0.30
30	3.5	4	3.70±0.25	3.5	4	3.63±0.22
Larva						
15	7	8	7.58±0.35	7	8	7.75±0.39
20	4	5	4.62±0.4	4.5	5	4.57±0.18
25	2.5	3	2.80±0.33	2	3	2.56±0.35
30	2	3	2.55±0.33	1.5	2.5	1.86±0.35
Protonymph						
15	6.5	7.5	7.19±0.36	6.5	8	7.16±0.44
20	3.5	5	4.27±0.41	4	4.5	4.10±0.21
25	2	2.5	2.20±0.24	1.5	3	2.15±0.43
30	1.5	2.5	2.16±0.35	1.5	2.5	1.86±0.35
Deutonymph						
15	7	8	7.54±0.42	7	8.0	7.41±0.35
20	3.5	5	4.36±0.51	3.5	4.5	4.14±0.41
25	2	3	2.6±0.30	1.5	3.0	2.37±0.5
30	1.5	3	2.44±0.39	1.5	2.5	1.93±0.25
Life cycle						
15	37.6	39.5	37.72±0.92	36.10	38.5	37.57±0.73
20	21.5	25.0	23.48±1.30	21.2	24.5	22.52±0.42
25	12.2	14.3	13.35±0.64	11	13.3	12.14±0.72
30	9.6	12.0	10.85±0.62	8.5	10.5	9.28±0.77

2. Reproduction and life table parameters:-

Data from (Table 35& Fig. 19) demonstrated that, the adult female longevity increased as the temperature decreased as it durated 22.04, 18.97, 14.23 and 10.96 days at15, 20, 25 and 30˚C, respectively. Also, the pre-Oviposition period lasted 5.08, 2.91, 1.67 and 1.51 days at the same degree of temperature, respectively.

Oviposition period durated 14.5, 14.58, 11.07 and 8.16 days at 15, 20, 25 and 30˚C, respectively.

Maximum number of eggs produced by female was recorded at 30˚C as 99.53 eggs/ female. The minimum number of eggs per female was observed at 15˚C as 32.68 eggs/ female.

The mortality percentage (50%)of population ***T. urticae*** was 39.3, 25, 20.5 and 18 days and the sex ratio of female per total was 0.70, 0.68, 0.62 and 0.74 at 15, 20, 25 and 30˚C, respectively.

Maximum value of intrinsic rate of increased ($\mathbf{r_m}$) was obtained at 30˚C as 0.18 but the minimum was at 15˚C as 0.04.

The Finite rate of increases **(exp $\mathbf{r_m}$)** was 1.04, 1.08, 1.14 and 1.20 at 15, 20, 25 and 30˚C, respectively.

Net reproductive rate ($\mathbf{R_o}$) was the highest at 30˚Cas (21.35) at mean generation time (T) 12.36 days. The least of ($\mathbf{R_o}$) was recorded at 15˚Cas (7.5) at mean generation time 42.8 days.

The time for population doubling increased as the temperature decreased, the shortest period was 3.85 at 30 ˚C and the longest time was 17.3 days at 15˚C.

The above mentioned results clearly demonstrated that, the shortest developmental time; maximum fecundity; shortest generation time; maximum intrinsic rate of increased ($\mathbf{r_m}$) and the highest net reproductive rate, was recorded at 30˚C were 10.85 days; 99.53 eggs/ female; 0.18 and 21.35, respectively.

Table (35) Effect of temperature on the life table parameters of *Tetranychus urticae* Koch on Gizi fig variety

Parameter	Temperature (C°)			
	15	20	25	30
Developmental time (days)	37.72	23.48	13.35	10.85
Pre-Ovipostion period (days)	5.08	2.91	1.67	1.51
Ovipostion period (days)	14.50	14.58	11.07	8.16
Generation time (days)	42.80	26.39	15.02	12.36
Longevity (days)	22.04	18.97	14.23	10.96
Total mean fecundity rate (egg/♀)	32.68	50.60	86.37	99.53
50% mortality (days)	39.30	25.0	20.5	18.0
Sex ratio(female/ total)	0.70	0.68	0.62	0.74
Intrinsic rate of increases (r_m)	0.040	0.078	0.13	0.18
Finite rate of increases (exp r_m)	1.04	1.08	1.14	1.20
Net reproductive rate (R_o)	7.5	13.76	16.47	21.35
Time for population double	17.30	8.88	5.33	3.85

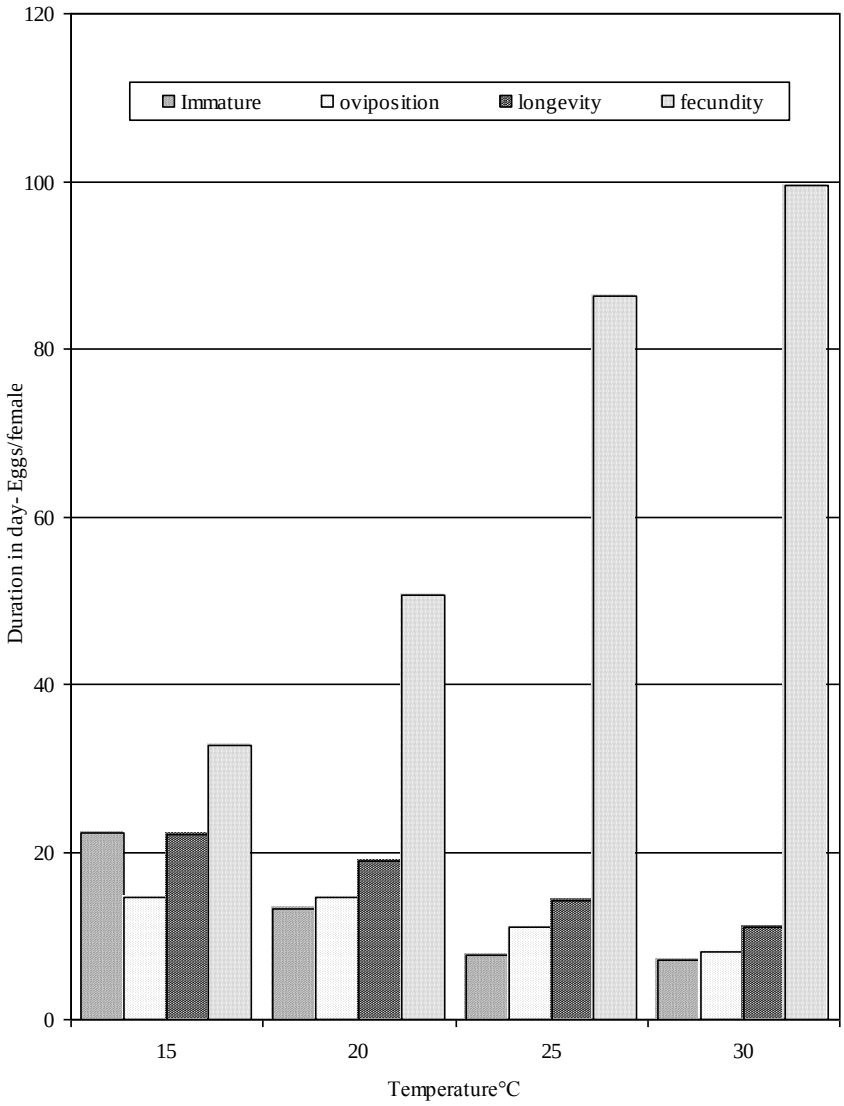

Fig.(19) Effect of Temperature on female *T. urticae* Koch immature stages, oviposition, longevity and fecundity on Gizi fig variety.

II. Biology and life table of *Tetranychus urticae* Koch on two pear varieties:

The effect of four constant temperatures (15, 20, 25 and 30 ˚C) on the biological aspects and demographic parameters (R_o, G, r_m and $expr_m$) of ***Tetranychus urticae*** **Koch** was studied in the laboratory under controlled condition ±2 ˚C and 70 % ± 5 % **R. H.**

A. Biology and Life table of *T. urticae* Koch on Lacont pear variety: -

1.Developmental time (life cycle): -

Results in table (36) showed that, the incubation period of egg stage for female and male was 11.78 & 11.56 days at 15˚C; 7.94& 8.0 days at 20˚C; 4.51& 4.5 days at 25˚C and 2.67& 2.72 days at 30˚C, respectively.

The average duration of female and male larvael stages, were 6.73& 6.87 days; 2.71& 2.65 days; 1.72& 1.65 days and 1.25& 1.23 days at 15, 20, 25 and 30˚C, respectively.

The protonymphal periods for female and male averaged 5.43& 5.44 days; 2.93& 2.4 days; 1.72& 1.5 days and 1.23& 1.19 days at 15, 20, 25 and 30˚C, respectively.

The average duration of female and male deutonymph were 6.84& 6.06 days at 15˚C; 3.04& 2.75 days at 20˚C; 1.8 and 1.75 days at 25˚C and 1.33& 1.19 days at 30˚C, respectively.

The shortest life cycle was recorded for female and male at 30˚C as 6.48 and 6.33 days, while the longest one was observed at 15˚C as 30.78 and 29.93 days, respectively.

Table (36) Duration (days) of *Tetranychus urticae* Koch on Pear (Lacont) at constant temperature and relative humidity 70 % ± 5 %

Temp. (C°)	Female			Male		
	Min.	Max.	Mean ±S.D.	Min.	Max.	Mean ±S.D.
Egg						
15	11.0	12.50	11.78±0.42	11.0	12.0	11.56±0.49
20	7.0	9.0	7.94±0.44	7.5	9.0	8.0±0.53
25	4.0	5.0	4.51±0.31	4.0	5.0	4.5±0.33
30	2.5	3.5	2.67±0.24	3.0	3.0	2.72±0.24
Larva						
15	6.0	7.5	6.73±0.45	6.0	7.5	6.87±0.44
20	2.5	3.2	2.71±0.26	2.0	3.0	2.65±0.33
25	1.5	2.0	1.72±0.25	1.5	2.0	1.65±0.24
30	1.0	1.5	1.25±0.23	1.0	1.5	1.23±0.25
Protonymph						
15	5.0	6.5	5.43±0.58	5.0	6.0	5.44±0.41
20	2.0	3.5	2.93±0.51	2.0	3.0	2.40±0.45
25	1.5	2.0	1.72±0.25	1.0	2.0	1.50±0.33
30	1.0	1.5	1.23±0.25	1.0	1.5	1.19±0.25
Deutonymph						
15	6.0	7.5	6.84±0.57	5.0	6.5	6.06±0.62
20	2.0	3.5	3.04±0.44	2.0	3.5	2.75±0.54
25	1.5	2.0	1.80±0.42	1.5	2.0	1.75±0.26
30	1.0	1.50	1.33±0.20	1.0	1.5	1.19±0.25
Life cycle						
15	29.4	33.3	30.78±1.24	28.2	31.7	29.93±3.8
20	15	18.5	16.62±0.92	14.5	17.5	15.8±1.0
25	8.9	10.5	9.75±0.44	8.8	10	9.4±0.39
30	5.7	7.5	6.48±0.47	5.7	7.0	6.33±0.27

2.Reproduction and life table parameters: -

Data in table (37) and Fig. (20) clearly demonstrated that the maximum average period of female longevity was recorded at 15˚C, which averaged 27.22 days. The minimum average value was 12.6 days at 30˚C.

The pre-oviposition period average 3.95, 1.56, 1.17 and 0.75 days at 15, 20, 25 and 30˚C, respectively, However, oviposition period lasted 17.85, 18.85, 13.03 and 10.93 days at the same degree of temperature, respectively.

The total mean fecundity rate of female was increased as temperature increased. It averaged 44.47, 77.21, 111 and 163.42 eggs per female at 15, 20, 25 and 30˚C, respectively.

The maximum 50% mortality was obtained at 15˚C as (30.12 days) and the minimum 50% mortality was recorded at 30˚C as 16.69 days.

Sex ratio per female of the total, was deurated 0.58, 0.74, 0.7 and 0.76: at 15, 20, 25 and 30˚C, respectively.

The maximum intrinsic rate of increases (r_m) was recorded at 30˚C as (0.31) at the mean generation time 7.23 days. The minimum value at 15˚C was 0.05 at mean generation time 34.54 days.

The corresponding values of finite rate of increases (exp r_m) were 1.36 and 1.05, respectively.

Net reproductive rate (R_o) averaged 11.27, 23.89, 30.0 and 37.67 at 15, 20, 25 and 30˚C, respectively.

The time for population doubling lasted 12.0, 5.77, 3.46 and 3.22 days at 15, 20, 25 and 30˚C, respectively.

The above mentioned results indicated that, the shortest developmental time averaged 6.48at 30˚C and the highest total mean fecundity rate was recorded at 30˚C as 163.42 eggs/ female. The minimum intrinsic rate of increases (r_m) was observed at 30˚C (0.31) at mean generation time 7.23 days.

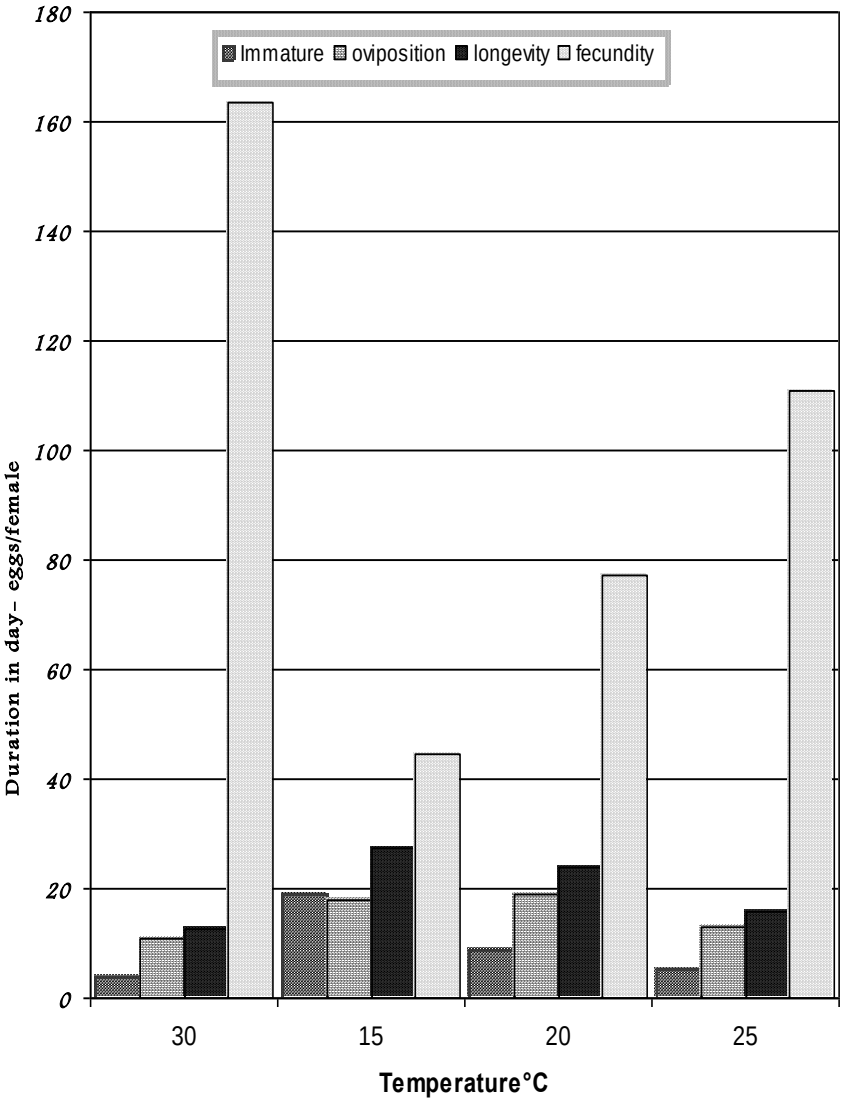

Fig. (20) Effect of temperature on female *T. urticae* immature stages, oviposition, longevity and fecundity on Lacont pear variety

Table (37) Effect of temperature on the life table parameters of *Tetranychus urticae* Koch on Lacont pear variety

Parameter	Temperature (C°)			
	15	20	25	30
Developmental time (days)	30.59	16.57	9.67	6.48
Pre-Ovipostion period (days)	3.95	1.56	1.17	0.75
Ovipostion period (days)	17.85	18.85	13.03	10.93
Generation time (days)	34.54	18.13	10.84	7.23
Longevity (days)	27.22	23.84	15.91	12.60
Total mean fecundity rate (egg/♀)	44.47	77.21	111.0	163.42
50% mortality (days)	30.12	17.6	18.34	16.69
Sex ratio(female/ total)	0.58	0.74	0.70	0.76
Intrinsic rate of increases (r_m)	0.0557	0.12	0.20	0.31
Finite rate of increases (exp r_m)	1.05	1.13	1.22	1.36
Net reproductive rate (R_o)	11.27	23.89	30.00	37.67
Time for population double	12.00	5.77	3.46	3.22

B. Biology and Life table of *T. urticae* Koch on Hood pear variety: -

1.Developmental time (life cycle): -

Data represented in Table (38) showed that, the mean female incubation period of ***T. urticae*** decreased as temperature increased. It averaged 13.75, 7.97, 4.76 and 2.82 days at 15, 20, 25 and 30˚C, respectively. For male it durated 13.38, 7.80, 4.70 and 2.8 days at the same degree of temperature, respectively. The duration of female larval stage averaged 7.38, 3.24, 2.09 and 1.53 days; Protonymphal durated 6.22, 2.74, 2.04 and 1.62 days and deutonymphal lasted 6.97, 3.28, 2.17 and 1.69 at 15, 20, 25 and 30˚C, respectively.

The male larval stage averaged 7.27, 3.0, 1.95 and 1.3 days, Protonymph lasted 5.66, 2.77, 1.62 and 1.38 days and deutonymph durated 6.44, 3.09, 2.16 and 1.4 days at 15, 20, 25 and 30˚C, respectively.

The shortest period of life cycle of female and male ***T. urticae*** was recorded as 7.66 and 6.88 days at 30˚C. while the longest period was observed at 15˚C as (34.29& 32.75 days) for female and the male, respectively.

2.Reproduction and life table parameters: -

Data in (Fig. 21) and table (39) demonstrated that the adult female longevity was affected by temperature. Maximum average duration of female survival was observed at 15˚C as 25.37 days. Minimum female longevity was recorded at 30˚C as 10.7 days. Maximum number of eggs produced by females was observed at 30˚C and 25˚C as 152.83 and 99.6 eggs/ female, respectively. Minimum number of eggs per female was recorded at 15 and 20˚C as 37.68 and 51.75-eggs/ female, respectively.

Table (38) Duration (days) of *Tetranychus urticae* Koch on Pear (Hood) at constant temperature and relative humidity 70 % ± 5 %

Temp. (C°)	Female			Male		
	Min.	Max.	Mean ±S.D.	Min.	Max.	Mean ±S.D.
Egg						
15	12.5	15	13.75±0.73	12	15	13.38±1.11
20	7.5	8.5	7.97±0.35	7.5	8	7.80±0.25
25	4.5	5.5	4.76±0.31	4.5	5	4.70±0.26
30	2.5	3	2.82±0.24	2.5	3	2.80±0.25
Larva						
15	6.5	8	7.38±0.53	6	8	7.27±0.62
20	3	3.5	3.24±0.24	2.5	3.5	3.0±0.32
25	1.5	2.5	2.09±0.29	1.5	2.5	1.95±0.33
30	1.2	1.8	1.53±0.18	1.0	1.5	1.30±0.25
Protonymph						
15	5	7.5	6.22±0.90	5	6	5.66±0.43
20	2.5	3.5	2.74±0.25	2.5	3	2.77±0.34
25	1.5	2.5	2.04±0.36	1	2	1.62±0.48
30	1.2	2	1.62±0.28	1	1.5	1.38±0.22
Deutonymph						
15	6	8	6.97±0.59	6	7	6.44±0.39
20	3	3.5	3.28±0.23	3	3.5	3.09±0.20
25	1.7	2.7	2.17±0.31	1.5	2.5	2.16±0.32
30	1.3	2	1.69±0.26	1	1.5	1.40±0.18
Life cycle						
15	32	36.5	34.29±1.29	30.9	35.5	32.75±1.54
20	16.6	17.7	17.23±0.49	15.8	18.2	16.67±0.68
25	10.3	12.7	11.06±0.65	9.6	11.2	10.43±0.58
30	6.3	9.2	7.66±0.62	5.9	7.5	6.88±0.51

Table (39) Effect of temperature on the life table parameters of *Tetranychus urticae* Koch on Hood pear variety

Parameter	Temperature (C°)			
	15	20	25	30
Developmental time (days)	34.26	17.23	11.15	7.78
Pre-Ovipostion period (days)	5.42	2.34	1.79	1.25
Ovipostion period (days)	16.3	16.47	10.75	8.53
Generation time (days)	39.68	19.57	12.94	9.03
Longevity (days)	25.37	20.23	13.70	10.7
Total mean fecundity rate (egg/♀)	37.68	51.75	99.60	152.83
50% mortality (days)	30.70	15.07	20.35	16.00
Sex ratio(female/ total)	0.66	0.50	0.60	0.76
Intrinsic rate of increases (r_m)	0.0435	0.07	0.16	0.26
Finite rate of increases (exp r_m)	1.04	1.08	1.18	1.29
Net reproductive rate (R_o)	7.79	8.71	19.42	27.88
Time for population double	16.00	9.90	4.33	2.66

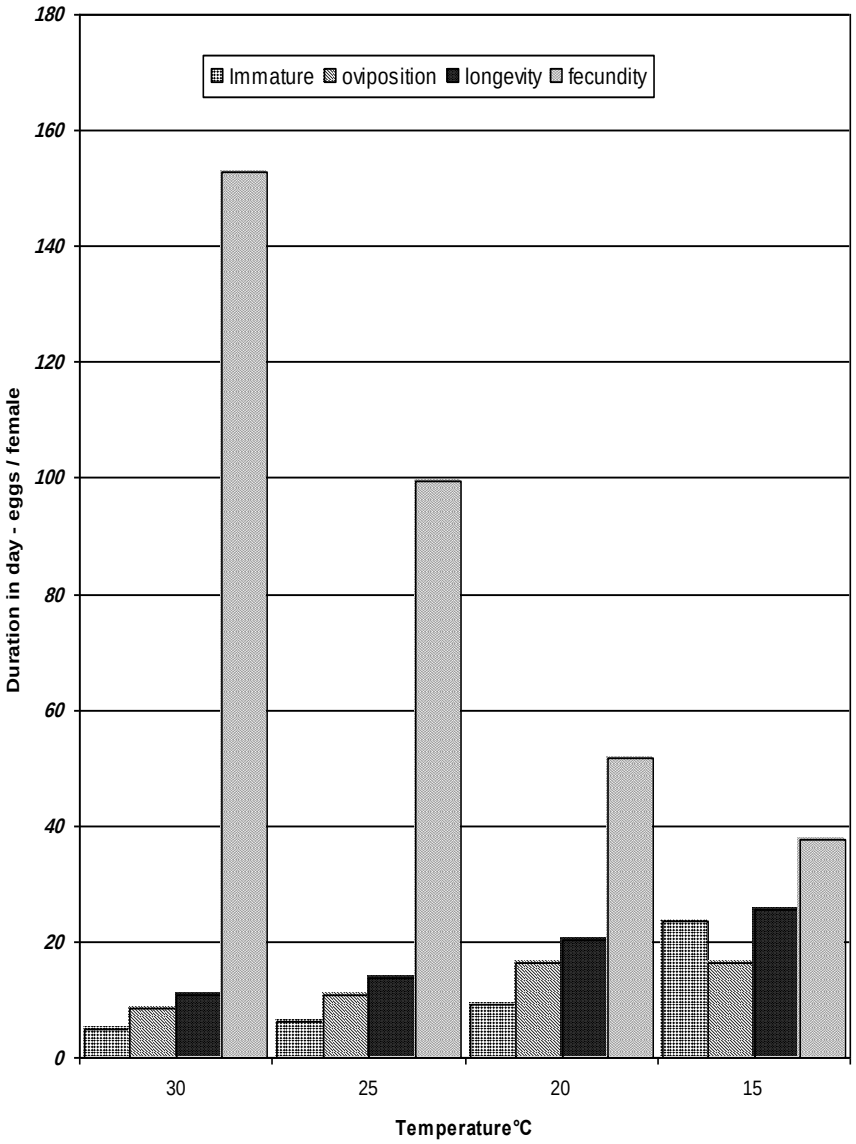

Fig. (21) Effect of temperature on female *T. urticae* immature stages, oviposition, longevity and fecundity on Hood pear variety.

The pre-oviopsition period increased as the temperature decreased as it lasted 5.42, 2.34, 1.79 and 1.25 days at15, 20, 25 and 30˚C, respectively.

Sex ratio averaged 0.66, 0.5, 0.6 and 0.76 female per total at 15, 20, 25 and 30˚C, respectively.

The mortality percentage 50% was 30.7, 15.07, 20.35 and 16.0 days 15, 20, 25 and 30˚C, respectively.

Data from table (39) showed that the maximum intrinsic rate of increases (r_m) was recorded at 30˚C as (0.26) and the minimum value at 15 ˚C as 0.04.

The finite rate of increases (exp r_m) was 1.04, 1.08, 1.18 and 1.29 at mean generation time of 39.68, 19.57, 12.85 and 8.91 days at 15, 20, 25 and 30˚C, respectively.

The highest net reproductive rate (R_o) was obtained at 30˚C as 27.88. The least value of (R_o) was obtained at 15˚C as (7.79). The time for population doubling lasted 16.0, 9.9, 4.33 and 2.66 days at 15, 20, 25 and 30˚C, respectively.

The above mentioned results indicated that, the shortest developmental time of ***T. urticae***; the highest fecundity of female; the shortest generation period, and the maximum intrinsic rate of increased (r_m) were 7.66 days; 152.83 eggs/female; 7.78 days; 9.03 days and 0.26 at 30˚C, respectively.

Results are in agreement with Farrag (1975); Ibrahim (1980); Mohamed (1982); El-Halawany *et al*. (1989); Tsia *et al*. (1989); El-Halawany et al. (1990a); Wermelinger and Delucchi (1990); Wermelinger et al. (1990); Kim et al. (1993); Lewis (1994); Cao et al. (1998); Liu and Tasi (1998) and Bonato (1999).

(3) Chemical analysis

Effect of chemical composition of leaves of different fig varieties on the biology of *T. urticae* Koch.

Data from table (40) & Fig. (22) showed that, the lowest percentage nitrogen content was (1.62%) associated on Gizi fig variety while the highest was observed on Black michen as (3.30%). On the other hand, the highest percentage of phosphorus, reducing sugars and total sugar were observed on Black michen fig variety as 0.15, 10.31 and 16.13% respectively, while the lowest of these value was 0.14, 4.56 and 8.31%, respectively on Gizi fig variety. The highest percentage of potassium was recorded in Gizi fig variety (1.64%) while the lowest was observed in Black michen fig variety (1.32%).

Results presented in table (41) illustrated that, there is significant negative correlation between leaf nitrogen, Phosphorus, reducing- and total sugars and incubation period, life cycle and generation time. In addition, positive correlation is present between both leaf nitrogen, phosphorus, reducing- and total sugars and the oviopsition period, longevity, fecundity and intrinsic of increases (r_m). On the other hand, significant positive correlation are found between the leaf potassium and incubation period, life cycle and generation time but negative correlation existed between the leaf potassium and oviposition period, longevity, fecundity and (r_m).

These results indicated that the increase in leaf content of nitrogen, Phosphorus and sugars would have a positive affect on female longevity, fecundity, oviposition and (r_m) which in

Table (40) Chemical composition of dry leaves for seven fig varieties.

Varieties	Nitrogen %	Phosphorus %	Potassium %	Reducing sugars %	Total sugars %
Black michen	3.30	0.15	1.32	10.31	16.13
Cadota	3.08	0.148	1.40	8.72	16.02
Sultani	2.24	0.148	1.41	8.69	15.77
Doritto	2.20	0.146	1.43	8.58	14.92
Adsi	2.17	0.146	1.47	7.3	14.83
Conadria	2.06	0.14	1.48	6.77	13.68
Gizi	1.62	0.14	1.64	4.56	8.31
L.S.D. 0.05	0.29	0.02	0.20	2.80	4.16

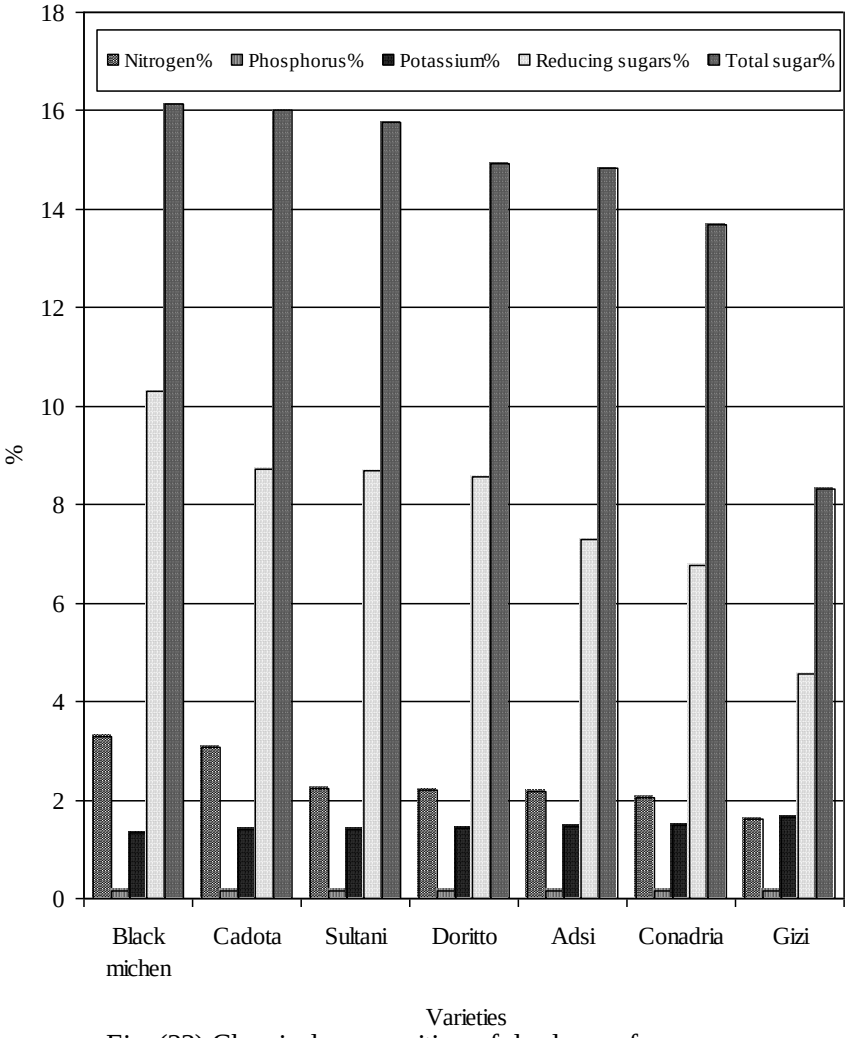

Fig. (22) Chemical composition of dry leaves for seven fig varieties

consequence, will result in more damage to plant, but the content of potassium reduced growth of mites and damage it.

Chemical analysis of Black michen and Gizi leaves of fig varieties, showed that nitrogen, phosphorus, reducing- and total sugars in leaves of Black michen are higher than those in leaves of Gizi fig variety, except the potassium content (Table42).

Results of chemical analysis semed to be compatible with the previous results obtained from the biological studies of ***T. urticae*** Koch on leaves of Black michen and Gizi fig varieties. Leaves of Black michen fig variety highly prolonged female oviposition period, longevity and increased female fecundity than leaves of Gizi fig variety. These differences were found to be highly significant on oviopsition and fecundity but only significant on longevity. In contrast, highly prolonged female immature stages on Gizi than on Black michen. These results explain that the Black michen was more susceptible to the infestation by ***T. urticae*** Koch than Gizi fig variety.

These results are in agreement with Heikal (1977), Mohamed (1982), El-Halawany *et al*. (1989), El- Halawany *et al*. (1990a), Wermelinger and Delucchi (1990), Lewis (1994), Taha and El-Raies (1996), Taha *et al.* (1997) and Azouz (1999). Negative correlation between leaf contents of nitrogen, phosphorus, reducing, non-reducing -, total –sugars and protein and each of the incubation period and different periods of the developmental stages of the *T. urticae* were shown to be, significantly on the contrary, Also found significant positive correlation, between leaf contents of nitrogen, phosphorus, reducing-, non-reducing -, total –sugars and the life span,

oviposition, post- ovipostion periods, and female longevity. About similar trend was, also shown with female fecundity. In addition he found positive correlation between leaf contents of potassium and each of the periods egg incubation different development stages, life cycle and pre -oviposition, were detected. Also found negative correlation were obtained between leaf contents of potassium and each of life span, ovipostion, post- oviposition periods, female longevity and fecundity. Also found Black michen variety favoured greatly the density of *T. arabicus* followed by Conadria variety, while Doritto was the least sensitive variety. Black michen variety highly favored the mite Oviposition and fecundity than did Doritto variety. It was also found that the three fig varieties differed, significant in their susceptibility to *T. arabicus.* El-Halawany *et al.* (1990a) found that, the leaves of Sultani were more susceptible to infestation with phytophagous mites, than leaves of Adsi variety. This may be due to the long and large numbers of hair on the lower surface of macronutrients. Also he found that leaves of Sultani variety, were more favorable to *T. arabicus* development and fecundity than leaves of Adsi variety. Sultani leaves highly prolonged Oviposition period and female longevity and increased fecundity.

SUMMARY and Conclusion

The present study aimed to throw light on the incidence of mites inhabiting Fig (***Ficus carica*** L.) and Pear (***Pyrus communis*** L.) in some different localities of Egypt. In addition, the population dynamics of certain mites, occurring with Sultani fig variety and Lacont Pear variety under environmental conditions of the field at Sinhera district, Qalubia Governorate during two successive years beginning from January 1998 to the end of December 1999. Also, the effect of two pear varieties, (Lacont and Hood) and seven fig varieties, (Black michen, conadria, cadota, Adsi, Doritto, Sultani and Gizi) on the biology of ***Tetranychus urticae*** Koch was investigated under laboratory conditions. Moreover the effect of chemical content in leaves on the biology of ***T. urticae*** on different fig varieties was concerned.

Results revealed the following: -

1. Occurrence studies indicated that 33 mites species belonging to 25 genera and 13 families, were collected from different habitats laid into three categories as the following:

a- Phytophgous mites included 13 species belonging to 10 genera and 4 families, namely, *Tetranychus urticae* Koch, *T. cucurbitacearum* (Sayed), *Eutetranychus orientalis* (Klein), *Panonychus ulmi* (Koch) and *Bryobia practiosa* Koch (Tetranychidae); *Cenopalpus pulcher* (C.& F.), *C. lanceolatisetae* Attiah, *Brevipalpus obovatus* Donnadieu, *B. phoenicis* (Geijskes) (Tenuipalpidae); *Eriophyes ficus*

Cotté, *Epitrimerus pyri* Nalepa (Eriophyidae); *Rhyncaphytoptus ficifoliae* Keifer and *Diptilomiopus ficus* Attiah (Rhyncaphytoptidae).

b- Predaceous mites comprised 11species belonging to 9 genera and 5 families distinctly, *Phytoseius finitimus* Ribaga, *Amblyseius swirskii* (A.-H.), *Euseius scutalis* A.-H., *Amblyseius ficus* El-Halawany & Abdel Samad, *A. cydnodactylon* Shehata & Zaher and *Typhlodromus pyri* Scheuten (Phytoseiidae); *Agistemus exsertus* Gonzalez (Stigmaeidae); *Cheyletogenes ornatus* (C. & F.) (Chyletidae); *Saniosulus nudus* Summers and *Eupalopsellus olearius* Zaher & Gomaa (Eupalopsellidae) and *Hemisarcoptes malus* Shimer (Hemisarcoptidae).

c. Mites of miscellaneous feeding habits represented by 9 species belonging to 6 genera and 4 families namely, *Tarsonemus setifer* Ewing, *T. smithi* Ewing and *T. fusari* Cooreman (Tarsonemidae); *Tydeus californicus* Banks; *T. Kochi* Oudemans and *Pronematus ubiguitus* McG. (Tydeidae); *Siculobata sicula* Grandjean and *Zygoribatula sayedi* El-Badry& Nasr (Oribatidae) and *Tyrophagous putrescentiae* (Schrank) (Acaridae).

2.Population dynamics of mites occurring on fig trees showed that ***Eriophyes ficus*** Cotté was the main pest infesting Sultani fig variety trees and ***Tetranychus urticae*** Koch was the second in important phytophagous mite species. Individuals of the eriophyid bud mite ***E. ficus*** were observed in greater number on Lower surface of the young leaves than on the old leaves of Sultani fig variety trees. The individuals of ***T.***

urticae, were observed with high number on lower surface of Sultani fig variety leaves.

3. The eriophyid bud mite ***E. ficus*** has two peaks of seasonal abundance on young leaves of Sultani fig variety, one in June and the other in November, in the first year. However, in the second year, it has also two peaks in June, and in October. Individuals of ***E. ficus*** appeared in few numbers in March in the first year and in April in the second year, and gradually decreased in December in the first year and in November in the second year. On old leaves of Sultani fig variety, ***E. ficus*** has two peaks, which were recorded in July and November during the two successive years. The eriophyid bud mite appeared in little numbers on old leaves in April and increased graduall to July but it had to decrease in number from August to October, and entirely disappeared from January to march during the two successive years. Population density of ***E. ficus*** exhibited significant positive correlation with temperature, while relative humidity was non-significantly, correlated with the mite population but in the first year it was negative and in the second year it was positive correlated on both young and old leaves of Sultani fig varieties.
4. The two-spotted spider mite ***T. urticae*** has two annual peaks, one in June and the other in October in the first year on young and old leaves of Sultani fig variety. However, on young leaves it has two peaks in June and October and only one peak in June on old leaves in the second year.

Mite individuals appeared in few numbers in spring, then increased, reaching maximum number in June and October, and disappeared gradually until march, then it was, entirely observed from January to March during the two successive years. Generally, population density of ***T. urticae*** was positively correlated with temperature during the two successive years, but in the first year it was highly significant while in the second one it exhibited non-significant correlation. However, non-significant negative correlation between density of ***T. urticae*** and relative humidity on young and old leaves, during the two successive years.

5. The predator mite, ***Phytoseius finitimus*** Ribaga has two annual peaks of seasonal abundance in June and October in the first year, and in June and November in the second year on young leaves. On old leaves, it has two peaks in July and October during two successive years of Sultani fig variety. Generally, the predator mite ***P. finitimus*** appeared on young and old leaves of Sultani fig variety in spring, then increased in number during summer months, but was not observed in winter months during the two successive years. Population of ***P. finitimus*** was positively high significant correlated with temperature, on young and old leaves, but non-significant between mite density and relative humidity.
6. Ecological studies of mites occurring on Pear trees revealed that ***Tetranychus urticae*** Koch, was the main mite pest infesting pear varieties and ***Epitrimerus pyri***

Nalepa represented the second important phytophagous mites. Individuals of ***T. urticae*** were observed, in high numbers on lower surface of leaves. Also all stages of ***E. pyri*** were found on both lower and upper surfaces of leaves of pear trees.

7. The two-spotted spider mite ***T. urticae*** has two annual peaks of seasonal abundance in July and in October in the first and in June and November in the second year. The two-spotted spider mite was appeared on leaves in May in the first year and in April in the second year, then increased in number during the summer and autumn months. The mite species was disappeared from January to April in the first year and from January to March in the second year. Population density of ***T. urticae*** was highly significant positive correlated with temperature in the first year while in the second year it was only significant. Relative humidity, was non-significant, but negatively correlated in the first year and positively correlated in the second one.
8. ***E. pyri*** has one annual peak of seasonal abundance in June in the first year and in July in the second year. The eriophyid mite, however was appeared on leaves in May, then increased in numbers and reach maximum number in June in the first year and in July in the second year, then the mite gradually decreased in number until December, during two successive years. The mite disappeared from January to April during the two successive years. Also, Population of ***E. pyri*** was positively affected with

temperature, in the first year it was non-significant but in the second year it was positively high significant. Relative humidity, however showed, no any significance, with population of mite.

9. The predator mite ***Ambylseius. swiriskii*** (A.-H.) was recorded with high number on Lacont pear variety, but it has one annual peak of seasonal abundance was recorded in July during the two successive year. Phytoseiid mite appeared in May in the first year and in April in the second year. The predator mite than disappeared from January to April in the first year and from January to March in the second year. Population densityt of the Predator mite ***A. swiriskii*** it was positively high correlated with temperature, but non-significant correlation occurred between the density of mite population of the predator and the relative humidity, during the two successive years.
10. Population density of the predator ***Phytoseius finitimus*** Ribaga had significant positive correlation with the density of population of both phytophagous mites, ***E. ficus*** and ***T. urticae*** on young and old leaves of Sultani fig variety, during the two successive years. The density population decreased in number in the first year of phytophagous mites 1998 than in the second year 1999. This may be due to increase the population density of predator mite ***P. finitimus***. Therefore the predator mite ***P. finitimus*** main important role in suppressing the population density of phytophagous mites ***E. ficus*** and ***T. urticae*** on trees of Sultani Fig variety.

11. The relationship between density of the population of the predator mite ***A. swiriskii*** and that of ***T. urticae*** was significant during the two successive years. Also the relation ship between the predator mite population and that of ***E. pyri*** was positive affected during two successive year. The predator mite ***A. swiriskii*** played arole on suppressing density of the phytophagous mites population in the first year than in the second year on Lacont pear variety trees.
12. The shortest developmental time (6.67) days and the high fecundity of female (128.05 eggs/ female) were recorded at 30˚C. Also the shortest generation period (7.77 days) and the highest intrinsic rate of increase (r_m) (0.29) was obtained at 30˚C when the two-spotted spider mite ***T. urticae*** fed on Black michen fig variety.
13. Duration of different developmental stages of ***T. urticae,*** when was fed on Cadota fig variety at 30˚C was 7.23 days. The longest longevity (26.45 and 20.3days) at 15 and 20˚C, while the highest female fecundity occurred at 30 and 25˚C, average numbers of deposited eggs per female were 117.7 and 111.66 eggs, respectively.
14. The shortest developmental time; maximum sex ratio; shortest generation time; maximum intrinsic rate of increase (r_m) and the highest net reproductive rate (Ro) was recorded at 30˚C, while the contrary was obtained at 15˚C when ***T. urticae*** was fed on Sultani fig variety.
15. The maximum net reproductive rate (Ro) (15.02) at shortest generation (10.37days) was at 30˚C, when the ***T.***

urticae fed on Doritto fig variety. The lowest intrinsic rate of increase (r_m) was recorded at 15˚C as (0.034). The highest total mean fecundity rate was found at 25˚C as 115.5 eggs per female.

16. The shortest developmental time of female and male of ***T. urticae*** when fed on Adsi fig variety was recorded at 30˚C as (10.15& 9.29 days). While the longest longevity of female was obtained at 15˚C as 20.6 days. The highest 50% mortality was 39.5 days at 15˚C.
17. The shortest incubation period of ***T. urticae*** when it was recorded on Conadria fig variety at 30˚C was 3.55 and 3.29 days for female and male, respectively). The shortest period of oviposition at 30˚C (8.55 days) while the highest total mean fecundity rate was at 25˚C (94.18 eggs per female). Maximum intrinsic rate of increase (r_m) at 30˚C was 0.20.
18. The shortest developmental period of female and male of ***T. urticae*** were 10.85 and 9.28 days at 30˚C, on Gizi fig variety. The longest longevity was observed at 15˚C (22.04days). The maximum net reproductive rate (Ro) was recorded at 30˚C as 21.35 at mean generation time (12.36days) and total egg deposited per female (99.53 eggs).
19. The longest developmental time reached 30.78 and 29.93 days, for female and male at 15˚C when the two-spotted spider mite ***T. urticae*** was fed on Lacont pear variety. The highest total mean fecundity rate was recorded at 30˚C (163.42 eggs/ female). The maximum intrinsic rate of

increase (r_m) was observed at 30˚C (0.31) and net reproductive rate (Ro) (37.67) at mean generation time 7.23 days.

20. The shortest periods of egg incubation period; larval stage and protonymphal period, were recorded at 30˚C (2.82 & 2.8; 1.53& 1.3 and 1.62 and 1.38 days for female and male, respectively, when ***T. urticae*** was reared on Hood pear variety. The highest fecundity; shortest generation time and the maximum intrinsic rate of increased (r_m) were observed at 30˚C. The longest period for generation doubling 16 days and highest 50% mortality at 15˚C.
21. Tasting the effect of leaves chemical contents f seven fig varieties, on the biology of ***T. urticae*** it was found that significant Positive correlation between leaf contents of Nitrogen, Phosphorus, reducing-and total Sugars and the oviposition, longevity, fecundity and intrinsic rate of increases. On the other hand, negative correlation between leaf content of Nitrogen, phosphorus, reducing-and total sugars and incubation period, life cycle and generation. Negative correlation between leaf contents of potassium and oviposition, longevity, fecundity and intrinsic rate of increases, on the contrary, Positive correlation between leaf contents of potassium and Incubation period, life cycle and generation, was observed.
22. Black michen fig variety prolonged Oviposition period, longevity and fecundity of ***T. urticae*** than Gizi fig variety, and this may be due to the such variety has high contents of Nitrogen, Phosphorus, reducing-, and total Sugars than in Gizi fig variety.

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بسم الله الرحمن الرحيم

الـمـلـخـص الـعـربـى

دراسات على بعض أنواع الحلم الذى يصيب بعض أشجار الفاكهة

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يعتبر التين البرشومى والكمثرى من الأشجار المنتجة لفاكهتين مرغوبتين بمصر وعلى المستوى العالمى نظراً لارتفاع قيمتها الغذائية بالاضافة إلى لذة الطعم وجودة النكهة اللذان أديا إلى اقبال المواطنين على استهلاكها على مدار العام. ولكن قد تلاحظ خلال السنوات الأخيرة تدهور إنتاج كل منهما فى مصر.... فرغم زيادة المساحة المنزرعة من التين البرشومى من ٤٣٢٨٥ فدان عام ١٩٩٥م إلى ٥٥٢٨٠ فدان عام ١٩٩٩م فقد قلت إنتاجيتة من ٥,٤٧ طن إلى ٣,٦٧طن / فدان خلال عامى١٩٩٥، ١٩٩٩على التوالى. وبالنسبة للكمثرى تناقصت أيضاً المساحة المنزرعة من ١٣٥٢١ إلى ٩٩٢٥ فدان وكذلك الإنتاجية من ٤,٠١- ٣,٨٥طن/ فدان خلال عامى ١٩٩٥،١٩٩٩ على التوالى.

ويعزى هذا النقص إلى الآفات المختلفة التى تصيب أشجارها والذى تساهم الآفات الأكاروسية التى تصيبها بجزء لا يستهان به فى هذا التدهور ... لذا فيهدف البحث إلى إلقاء الضوء على الأكاروسات المتواجدة على أشجار التين والكمثرى فى بعض محافظات مصر، كمايتضمن البحث أيضاً دراسة الكثافات العددية للأكاروسات المرتبطة بصنف التين السلطانى وصنف الكمثرى الليكونت فى قرية سنهرة بمحافظة القليوبية خلال عامين متتاليين من شهر يناير ١٩٩٨ إلى ديسمبر ١٩٩٩...وفيها تم الآتى:-

- وأجريت دراسات بيولوجية للعنكبوت الأحمر العادى على أوراق أصناف التين البرشومى (بلاك مشين، كادوتا، سلطانى، عدسى، دوريتو، جيزى، كونادريا) وكذلك صنفى الكمثرى (الليكونت ، هود) تحت أربعة درجات حرارة (١٥، ٢٠،٢٥،٣٠ م°) ولمعرفة أمثل درجة حرارة تلائم تكاثر العنكبوت الأحمر العادى .
- كما تضمن البحث أيضاً دراسة محتوى أوراق أصناف التين من العناصر الكبرى والسكريات وعلاقة ذلك بالسلوك البيولوجى للعنكبوت الأحمر العادى .

وتشير النتائج المتحصل عليها إلى ما يلى :-

أولاً- اتضح من الدراسة تواجد ثلاثة وثلاثون نوعاً من الأكاروسات تتبع خمسة وعشرون جنساً تنتمى إلى ثلاثة عشر عائلة وقد قسمت هذه الأنواع إلى ثلاثة مجموعات رئيسية وفقاً لطبيعة سلوكها الغذائي :-

أ. أكاروسات نباتية التغذية Phytophagous mites

وتشمل ثلاثة عشر نوعا تتبع عشرة أجناس وأربعة عائلات وهى :-

Tetranychus urticae Koch, *T. cucurbitacearum* (Sayed), *Eutetranychus orientalis* (Klein), *Panonychus ulmi* (Koch) and *Bryobia practiosa* Koch (Tetranychidae); *Cenopalpus pulcher* (C. & F.), *C. lanceolatisetae* Attiah, *Brevipalpus obovatus* Donnadieu, *B. phoenicis* (Geijskes) (Tenuipalpidae); *Eriophyes ficus* Cotté, *Epitrimerus pyri* Nalepa (Eriophyidae); *Rhyncaphytoptus ficifoliae* Keifer and *Diptilomiopus ficus* Attiah (Rhyncaphytoptidae).

ب- أكاروسات مفترسة Predacious mites

وتتمثل باحدى عشر نوعا تابعة لتسعة أجناس وخمسة عائلات وهى :-

Phytoseius finitimus Ribaga, *Amblyseius swirskii* (A. -H.), *Euseius scutalis A.* -H., *Amblyseius ficus* El-Halawany & Abdel Samad, *A. cydnodactylon* Shehata & Zaher and *Typhlodromus pyri* Scheuten (Phytoseiidae); *Agistemus exsertus* Gonzalez (Stigmaeidae); *Cheletogenes ornatus* (C. & F.) (Cheyletidae); *Saniosulus nudus* Summers and *Eupalopsellus olearius* Zaher & Gomaa (Eupalopsellidae) and *Hemisarcoptes malus* Shimer (Hemisarcoptidae).

ج- أكاروسات متباينةالسلوك الغذائى Mites of miscellaneous feeding habits

وتشمل تسعة أنواع تابعة لستة أجناس وأربعة عائلات وهى :-

Tarsonemus setifer Ewing, *T. smithi* Ewing and *T. fusari* Cooreman (Tarsonemidae); *Tydeus californicus* Banks; *T. Kochi* Oudemans and *Pronematus ubiguitus* McG. (Tydeidae); *Siculobata sicula* Grandjean and *Zygoribatula sayedi* El-Badry& Nasr (Oribatidae) and *Tyrophagous putrescentiae* (Schrank) (Acaridae).

ثانيـاً- أتضح من الدراسات البيئية للأكاروسات المتواجدة على أشجار التين البرشومى أن النوع *Eriophyes ficus* Cotté هو أهم الأكاروسات النباتية التى تصيب أشجار التين السلطانى حيث يتواجد بأعداد أكبر على السطح السفلى عن السطح العلوى وجد يهاجم البراعم والثمار ، و يأتى العنكبوت الأحمر العادى فى المرتبة الثانية حيث يتواجد أيضاً بأعداد كبيرة على السطح السفلى عن السطح العلوى .

ثالثاً- لوحظ وجود ذروتين من الكثافة العددية لحلم براعم التين *E. ficus* على الأوراق الحديثة فى شهري (يونيو و نوفمبر) فى السنة الأولى وفى (يونيو وأكتوبر) فى السنة الثانية ، حيث يتواجد الحلم على الأوراق الحديثة بأعداد

قليلة فى شهرى مارس وأبريل ويقل تعداده فى شهر ديسمبر حيث تهاجر الأفراد إلى البراعم وقد وجد أيضاً لهذا الحلم ذروتين من الكثافة العددية على الأوراق القديمة فى شهرى يوليو ونوفمبر خلال سنتين الدراسة وشوهد كذلك أنه فى الفترة من يناير إلى مارس حيث يهاجر كذلك إلى البراعم.

أما عن درجة الحرارة فقد وجد أن لها تأثير معنوى موجب على تذبذب أعداد حلم براعم التين على كل من الأوراق الحديثة والقديمة لصنف التين السلطانى وعلى العكس فلم تظهر الرطوبة النسبية أى تأثير معنوى على تعداد الحلم على الأوراق الحديثة وعلى القديمة.

رابعًا– كان لأكاروس العنكبوت الأحمر العادى *Tetranychus urticae* ذروتين من الكثافة العددية فى شهرى يونيو وأكتوبر على الأوراق الحديثة خلال السنتين فى حين تواجد له ذروتين فى شهري يونيو وأكتوبر على الأوراق القديمة خلال السنة الأولى أما فى السنة الثانية فقد وجد له ذروة واحدة فى شهر يونيو حيث يتواجد الأكاروس بأعداد قليلة فى الربيع ويتزايد تعداده تدريجيا ويصل إلى أقصاه فى شهرى يونيو وأكتوبر ثم بعد ذلك يقل تعداده تدريجاً حتى يختفى فى الفترة من يناير حتى مارس خلال السنتين المتتاليتين من الدراسة . وكان لدرجة الحرارة تأثير موجب على تعداد العنكبوت الأحمر العادى خلال السنتين على الأوراق الحديثة والقديمة ، بينما كان هناك ارتباط غير معنوى سالب بين تعداد الأكاروس والرطوبة النسبية خلال الدراسة.

خامساً– كان للمفترس الأكاروسى *Phytoseius finitimus* ذروتان من الكثافة العددية خلال شهرى (يونيو وأكتوبر) على الأوراق الحديثة فى السنة الأولى، أما فى السنة الثانية فقد كانا خلال شهرى (يونيوو نوفمبر) على الأوراق الحديثة، ويوليو وأكتوبر على الأوراق القديمة خلال السنتين. وعموماً فإن المفترس الأكاروسيتواجد على الأوراق الحديثة والقديمة على صنف التين السلطانى فى الربيع ويتزايد تعداده خلال أشهر الصيف والخريف ويختفى فى

أشهر الشتاء خلال السنتين المتتاليتين من الدراسة وكان هناك ارتباط معنوى موجب لتأثير درجة الحرارة على الأوراق الحديثة والقديمة وتأثير غير معنوى للرطوبة النسبية على المفترس خلال العامين المذكورين.

سادساً- أظهرت الدراسات البيئية للأكاروسات المتواجدة على أشجار الكمثرى أن النوع ***T. urticae*** هو الآفة الرئيسية الأولى يليه ***Epitrimerus pyri*** فى المرتبة الثانية حيث يتواجد النوع الأول بأعداد كبيرة على السطح السفلى لأوراق الكمثرى أما النوع الثانى يتواجد على السطح السفلي والعلوي لأوراق الكمثرى صنف الليكونت.

سابعاً- كان لأكاروس العنكبوت الأحمر العادى ذروتين من الكثافة العددية خلال شهرى (يوليو وأكتوبر) فى السنة الأولى و(يونيو وأكتوبر) فى السنة الثانية ، حيث بدأ ظهور الأكاروس فى مارس وأبريل ثم تزايدت أعداده خلال أشهر الصيف والخريف واختفى تماماً فى الفترة من يناير حتى مارس. وقد كان لدرجة الحرارة تأثير معنوى موجب على العنكبوت الأحمر العادى على أشجار الكمثرى خلال السنتين المتتاليتين من الدراسة بينما كان للرطوبة النسبية تأثير غير معنوى على تعداد الأكاروس.

ثامناً- كان لحلم صدأ أوراق الكمثرى الدودى ***E. pyri*** ذروة واحدة من الكثافة العددية خلال يونيو فى السنة الأولى وخلال يوليو فى السنة الثانية ، ويبدأ تواجد هذا الحلم على الأوراق فى شهر مايو ثم يتزايد أعداده تدريجياً وتصل إلى الذروة المذكورة فى يونيو ويوليه ثم يتناقص بعد ذلك التعداد تدريجياً حتى ديسمبر ويختفى فى الفترة من يناير حتى أبريل خلال سنتى من الدراسة.

تاسعاً- اتضح تواجد المفترس الأكاروسى ***A. swirskii*** بأعداد كبيرة على أوراق الكمثرى الليكونت ومحققاً ذروة واحدة فى شهر يوليو وذلك للسنتين المتتاليتين من الدراسة، وقد بدأ تواجده بأعداد قليلة على أشجار الكمثرى فى مايو وتزايد تعداده فى يوليو ثم انخفض خلال الفترة من يناير حتى مارس.

وكان لدرجة الحرارة تأثير معنوى موجب على تعداد المفترس ***A. swirskii*** بينما كان هناك تأثير غير معنوى سالب للرطوبة النسبيةعلى تعداده خلال السنتين المتتاليتين من الدراسة.

عاشراً– كان للمفترس الأكاروسى ***P. finitimus*** تأثير إيجابى فعال على خفض تعداد على كل من حلم براعم التين والعنكبوت الأحمر العادى على الأوراق الحديثة والقديمة لصنف التين السلطانى خلال السنتين المتتاليتين من الدراسة ، حيث انخفض تعداد الأكاروسات النباتية فى السنة الأولى عنه فى السنة الثانية وربما يرجع ذلك إلى زيادة تعداد المفترس الأكاروسى***P. finitimus*** الذى يعتبرأن له دور هام وفعال فى خفض تعداد الأكاروسات النباتية بوجه عام على صنف التين السلطانى .

حادى عشر– أظهر المفترس الأكاروسى ***A. swirskii*** تأثير فعال وإيجابى فى خفض تعداد العنكبوت الأحمر العادى وحلم صدأ أوراق الكمثرى خلال العامين المتتاليين من الدراسة ، وبذلك نجد أن المفترس الأكاروسى له دور هام وفعال فى خفض تعداد الأكاروسات النباتية فى السنة الأولى عنه فى السنة الثانية على صنف الكمثرى الليكونت.

الدراســات البيولوجــيـة

ثانى عشر– عند تربية العنكبوت الأحمر العادى على صنف التين بلاك ميشين تحت أربعة درجات حرارة مختلفة هى (١٥، ٢٠،٢٥،٣٠ °م) كانت أقصر دورة حياه هى (٦,٦٧) يوم بينما حققت الاناث أعلى معدل للخصوبة الأنثى fecundityحيث وصل متوسط عدد البض إلى ١٢٨,٠٥بيضة لكل أنثى على درجة حرارة ٣٠ °م . وكان أقصر فترة للجيل Generation هى٧,٧٧ يوماً وأعلى معدل للزيادة الذاتية (r_m) ٠,٢٩على درجة حرارة ٣٠ °م.

ثالث عشر– فى حالة تربية العنكبوت الأحمر العادى ***T. urticae*** على صنف التين كادوتا كانت أقصر فترة لحياة الإناث الكاملة longevity هى ٢٦,٤٥،

٢٠,٣ يوم على درجة حرارة ١٥،٢٠ °م بينما أعلى معدل لخصوبة الإناث كان على درجة ٣٠ ، ٢٥ °م هو١١٧,٧٣، ١١١,٦٦ بيضة /أنثى على التوالى .

رابع عشر–عند تربية العنكبوت الأحمر العادى على صنف التين السلطانى سجلت أقصر فترة لدورة الحياةlife cycle وأعلى معدل للنسبة الجنسية Sex ratio وأقصر فترة جيل generation وأعلى معدل للزيادة الذاتى (r_m) وأعلى صافى لمعدل التكاثر (R_o) على درجة حرارة ٣٠ °م ولكن تحقق عكس ذلك لهذه القيم على درجة حرارة ١٥ °م .

خامس عشر– كان أعلى صافى لمعدل التكاثر(R_o) ١٥,٠٢ عند أقل فترة للجيل generation (١٠,٣٧) يوم على درجة حرارة ٣٠ °م عندما ربى العنكبوت الأحمر العادى على صنف التين دوريتو بينما كان أقل معدل للزيادة الذاتى(r_m) ٠,٠٣٤ على درجة حرارة ١٥ °م وأعلى معدل لوضع البيض على درجة حرارة ٢٥ °م(١١٥,٥٠ بيضة / أنثى).

سادس عشر– سجلت أقصر فترة لدورة الحياة life cycle لإناث وذكور العنكبوت الأحمر العادى عند تربيته على صنف التين العدسى على درجة حرارة ٣٠ °م (١٠,١٥، ٩,٢٩يوم على التوالى) بينما أطول فترة لحياة الإناث الكاملة longevity (٢٠,٦يوم) وأعلى نسبة للموت ٥٠(% من اعدد الأفراد) بعد مضى ٣٩,٥ يوم على درجة حرارة ١٥ °م .

سابع عشر– كانت أقصر فترة لحضانة البيض للعنكبوت الأحمر عند تربيته على صنف التين كونادريا على درجة حرارة ٣٠ °م هى (٣,٥٥، ٣,٢٩يوم) للإناث والذكور على التوالى. فى حين كانت أقصر فترة لوضع البيض Oviposition period على درجة حرارة ٣٠ °م هى ٨,٥ يوما ، بينما كان أعلى معدل لوضع البيض fecundity على درجة ٢٥ °م (٩٤,١٨ بيضة /أنثى) و أعلى معدل للزيادة الذاتى (r_m) (٠,٢٠) على درجة حرارة ٣٠ °م.

ثـامن عشـر– سـجلت أقصـر فتـرة لـدورة لحيـاة للإنـاث والـذكور(life cycle) ***T. urticae*** ١٠,٨٥، ٩,٢٨يوم علـى درجـة حرارة ٣٠ ˚م عند تربيته علـى صـنف التين جيزى، وكانت أطول فترة حياه للطور الكامل Longevityعلـى درجـة حـرارة ١٥ ˚م هـى ٢٢,٠٤يوم وكـان أعلـى صـافى لمعـدل التكـاثر(R_o) علـى درجـة حرارة ٣٠ ˚م هى٢١,٣٥ عند متوسط للجيل generation ١٢,٣٦ يوم وقد كان متوسط عدد البيض الموضوع هو٩٩,٥٣بيضة للأنثى.

تاسع عشر– عند تربية العنكبوت الأحمر العادى كانت أطول فترة لدورة الحياة life cycle(٢٩,٩٣،٣٠,٧٨يوم) للإنـاث والـذكور علـى التوالى علـى درجـة حـرارة ١٥ ˚م علـى صـنف الكمثرى الليكونـت، ولكـن سـجلت أعلـى خصـوبة للإنـاث fecundity علـى درجـة ٣٠ ˚م (١٦٣,٤٢بيضـة /أنثـى) وأقـل معـدل للزيـادة الذاتى(r_m) (٠,٣١) عند صـافى معدل التكاثر قدره ٣٧,٦٧ وكانت أقصر فترة جيل generation ٧,٢٣ يوم على درجة حرارة ٣٠ ˚م .

عشرون– سـجلت أقصـر فتـرة لحضـانة البيض والطـور اليرقـى وطـور الحوريـة الأولـى (٢,٨٢، ٢,٨– ١,٥٣، ١,٣– ١,٦٢،١,٣٨ يومـاً) للإنـاث والـذكور علـى التوالى علـى درجـة حرارة ٣٠ ˚م عند تربيـة ***T. urticae*** علـى صـنف الكمثرى هـود . بينمـا كـان أطـول فتـرة لوضـع البيض Oviposition period وأقصـر فترة جيل generation وأعلـى معدل للزيادة الذاتى (r_m) علـى درجـة حرارة ٣٠ ˚م، وكانت أطول فترة لتضـاعف الجيل Generation doubling ١٦يوماً وأعلـى نسبة للموت (٥٠% من التعداد) على درجة ١٥ ˚م.

واحـد وعشـرون– بتحليـل الأوراق كيميائيـاً ومقارنـة بالنتـائج البيولوجيـة المـذكورة آنفـاً لـوحظ أن هنـاك ارتبـاط معنـوى موجـب بـين محتـوى الأوراق مـن النتـروجين والفسـفور والسـكريات المختزلـة والكليـة وبـين فتـرة وضـع البـيض Oviposition وفتـرة حيـاة الأنثـى longevity ومعـدل الزيـادة الـذاتى (r_m) ، وعلـى العكـس مـن ذلـك فقـد كـان الارتبـاط سـالباً بـين هـذه العناصـر وفتـرة حضـانة البـيض

Incubation period ودورة الحياة life cycle وفترة الجيل Generation period.

اثنان وعشرون– وجد أن هناك ارتباط سالب بين محتوى الأوراق من البوتاسيوم وبين فترة وضع البيضOviposition وفترة حياة الأنثىlongevity ومعدل الزيادة الذاتى (r_m) ، على العكس من ذلك فقد كان الارتباط موجباً بين محتوى الأوراق من البوتاسيوم وفترة حضانة البيض Incubation period ودورة الحياة life cycle وفترة الجيلGeneration period .

ثلاثة وعشرون – سجل الصنف بلاك مشين أطول فترة وضع بيض Oviposition وأعلى خصوبة Fecundity وأطول فترة لحياة الأنثى longevity عن الصنف جيزى، ويرجع ذلك إلى أن بلاك ميشين كان محتوى الأوراق من النتروجين والفوسفور والسكريات المختزلة والكلية مرتفعاً عن لصنف جيزى.

ومن النتائج السابقة يمكن استخلاص الآتى:-

١. أنه لمن المعلوم أن الهدف النهائى من البحث هو كيفية حماية أشجار الفاكهة تحت الدراسة من الهجوم الضارى للآفات الأكاروسية ، ولكى يتحقق هذا الهدف فلا بد أن يسبقه الحصول على معلومات مفصلة عن حياة تلك الآفات والأضرار التى تسببها والعوامل التى تؤثر على زيادة أو خفض تعدادها ...والذى عنى به أساساً هذا البحث. ولقد بدأ الاهتمام – من خلال هذا البحث بالآفات الأكثر خطورة من أنواع الحلم النباتية التغذية ... واضعين فى الأعتبار المفاهيم الحديثة " لتنظيم تعداد الآفة" بدلاً من "ابادة

الآفـة". ولقـد وقـع الأختيـار علـى البـدء بحلـم العنكبـوت الأحمـر العـادى *Tetranychus urticae* والحلم الدودى وخاصـة الأنواع *Eriophyes ficus* و *Epitrimerus pyri* لشدة خطورتهم ودورهم المدمر لهذه الأشجار.

٢. إن معرفة موعد الذروات السنوية للتذبذبات الموسمية لكل نوع من أنواع الحلم النباتية التغذية المستخدمة فى هذه الدراسة لتكون مفيدة فى تحديد موعد بدء تطبيق البرامج المقترحة للمكافحة.

٣. إن معرفـة أنـواع الحلـم المفترسـة المتواطنـة والمصـاحبة لتلـك الآفـات نباتيـة التغذيـة تعتبـر مـن أكثـر الأعداء الطبيعيـة نجاحـاً فـى الحد من تعداد الآفات المصـاحبة لها ولهذا فـأودُ أن أقتـرح باسـتخدامها بعينهـا فـى برنـامج المكافحـة البيولوجية على المستوى التطبيقى...

٤. إن العلاقة الإيجابيـة المؤكدة خـلال الدراسـة الحاليـة، بين محتوى الأوراق من العناصـر والمركبـات الغذائيـة وبين زيـادة تعداد أنـواع الحلـم نباتيـة التغذيـة من الأنواع تحت الدراسـة– يجـب الاسـتفادة منهـا فـى الحد من تعداد تلك الآفات لكـى لا تصـل إلـى ذروتها المعتادة وذلك بالتحكم فى نظام التسميد من ناحية نوع وكم المخصبات المستخدمة والمواعيد المناسبة لاستخدامها.