Table 1. Mean number (±SE) of citrus leafminer per leaf and the percentage of infested leaves.

Date	No. larva/leaf	% Infested leaves	Temp. (C°)
17-4-98	4.5±0.25	85	34
2-5	2.1±0.19	47	39
16-5	1.9±0.2	59	41
30-5	0.7±0.12	32	42
13-6	0.9±0.14	25	42
28-6-98 to 25-1-99	0	0	-[1]
6-2-99	0.1±0.04	5	27
20-2	0.7±0.14	16	27
6-3	0.6±0.12	15	28
20-3	0.6±0.13	12	30
3-4	2.8±0.26	43	35
14-4	1.2±0.2	22	39
1-5	0.1±0.07	3	42
15-5	0	0	44

[1]Mean Temperature in Summer months (Jul. – Aug.) between 46-44 °C.
Mean Temperature in Fall months (Sept., Oct., and Nov.) between 44-31 °C.
Mean Temperature in winter months (Dec. Jan.) between 29-22 °C

meters), size and shape. Trees were sampled biweekly for two seasons, April 17, 1998-May, 5th 1999. A total of 29 samples from each tree were taken throughout the study period. On each sample date, 18 leaves picked up at random from each of the four cardinal quadrants, with a total of 72 leaves per tree. Samples were placed in plastic bag, transported to the laboratory and examined with a dissecting microscope. The number of larvae per leaf in each cardinal-quadrant and infested leaves were recorded. Meteorological data for the entire period was recorded. Abundance of leafminers larvae at different cardinal quadrants were compared using the least significant different (LSD) test at 5% level (SAS Institute, 1982).

Results and Discussion

A study of the data shows that population of the citrus leafminers fluctuated all the study period. (Table, 1). A peak abundance of larvae per leaf was recorded in the mid and early April for the two seasons, respectively. The highest mean numbers of larvae per leaf were 4.5 and 2.5 for the first and second seasons, respectively. Then the larval population declined rapidly and disappeared completely in late June and Mid-May for the two seasons, respectively.

The fluctuation of larval population and disappeared early probably due to high temperature which may reach up to 45 °C for more than two months in this area (Table, 1).

The population build up in spring for the two seasons seems to be related to the suitable weather conditions not to shoot proliferation which were available during summer and winter. (Pena, *et al.*, 1996) studied the population of citrus leafminer in Florida and found that spring season had the highest number of mines on lime leaves

Table 2. Mean number (±SE) of citrus leafminer larvae on the four cardinal quadrants of lime trees.

Directions	Average No. Larvae / Leaf
North	0.68 ± 0.08 a
South	0.78 ± 0.09 a
East	0.67 ± 0.08 a
West	0.8 ± 0.09 a

Values followed by the same letter, within columns, were not significant (P>0.05).

and mentioned that this increased seem to be more related to increase in temperature during the spring months than to new shoots. In winter, citrus leafminer disappeared totally and this may be related to the decrease in temperature. (Hespenheide, 1991) pointed out that cool whether delays oviposition of citrus leafminers and subsequent larval development as the leaf matures and become hard.

(Ba-Angood, 1977) clarify that relative humidity has probably no much influence in the development of the larvae because it remains feeding inside the leaf tissues where the humidity is always high .

The mean number of citrus leafminer larvae in each leaf was shown in (Table, 2). Irrespective of the date, the highest mean number of larvae per leaf was 0.8 which recorded on the west side of the trees, and the lowest was 0.68 on both north and east side, with no significant different. (Knapp, *et al.*, 1995) mentioned that within-tree distribution of *P. citrella* appeared to be related to the availability of leaf flush than any other factors.

The percentage of infested leaves was high in April in both years (Table, 1). In April 1998, 85% of the sampled leaves were infested with citrus leafminer larvae. This high infestation can kill a tree especially young one or at least make it very week so can be easily attack by other pests.

Summary

The highest level of infestation was detected in April for both seasons. Therefore, insecticides should be applied prior to the peak.

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ديناميكية التعداد لصانعات أنفاق أوراق الموالح
Phyllocnistis citrella (Lepidoptera: Gracillariidae)
على أشجار الليمون البلدي في مدينة الرياض

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صانعة أنفاق الموالح *Phyllocnistis citrella Stainton* من الحشرات المهمة علـــى معظـــم أنـــواع الموالح في العالم. تم دراسة التغيرات الموسمية التي تطرأ على أعداد هذه الحشرة على عشرة أشجار ليمون بلـــدي في محطة التجارب الزراعية التابعة لكلية الزراعة جامعة الملك سعود في المنطقة الوسطى مـــن المملكـــة العربيـــة السعودية. تم جمع ثمانية عشر ورقة حديثة عشوائياً من كل أتجاه من الأتجاهات الأربعة لكل شجرة كل أســـبوعين خلال موسمين من أبريل ١٩٩٨ حتى شهر مايو ١٩٩٩ وتم فحصها وعد اليرقات الحية الموجودة داخـــل الأنفـــاق وحساب نسبة الأوراق المصابة. لوحظ وجود فترة ذروة وصلت فيها أعداد اليرقات إلى أعلى معدل في شهر أبريـــل للموسمين. بعد ذلك انخفضت أعداد اليرقات حتى اختفت في شهر يوليو ١٩٩٨ في الموســـم الأول وظـــهرت فـــي الموسم الثاني في شهر فبراير ١٩٩٩ حتى وصلت إلى أعلى معدل في شهر ابريل ١٩٩٩، ثم تناقصت أعدادها إلـــى أن اختفت في نصف مايو. قد يرجع السبب في هذا التذبذب إلى ارتفاع درجات الحرارة في الشهور الحـــارة والتـــي بلغت أعلى من ٤٥°م. أما بالنسبة لتوزيع الحشرات بالإتجاهات الأربعة للأشجار فقد كـــانت أعلـــى فـــي الغـــرب والجنوب عنه في الشمال والشرق ولكن الفرق غير معنوي. وسجلت أعلى نسبة للأوراق المصابة (٥٨%) في شهر أبريل ١٩٩٨ وهذه النسبة عالية جداً وكفيلة بقتل الأشجار الصغيرة.