Effects of host volatiles, leaf color, and cuticular trichomes on host selection by

*Liriomyza sativae* Blanchard

PANG Bao-Ping¹, BAO Zu-Sheng², ZHOU Xiao-Rong¹, CHENG Jia-An² (¹College of Agriculture, Inner Mongolia Agricultural University, Huhehot 010019, China; ²Department of Plant Protection, Zhejiang University, Hangzhou 310029, China). *Acta Ecologica Sinica*, 2004, 24(3): 547~551.

Abstract: The serpentine leafminer, *Liriomyza sativae* Blanchard, is one of the most serious worldwide pests of a great variety of vegetables and ornamental crops. It was first recorded in China in the Hainan province in 1993. Since then it has spread to the most regions of China, and it has attacked a wide variety of crops causing great economic losses. Previous studies have shown that the leafminer has different preferences for host plants. The mechanism on its host selection, however, is so far unknown. In this paper, the role of host volatiles, leaf color, and cuticular trichomes of host plants for host preference of the leafminer were studied in the laboratory.

A four-armed olfactometer was used to test the role of volatiles from host plants in host selection by the leafminer. One of the four arms was connected to the odor source of kidney bean leaves and the other three arms were connected to blank controls. The time spent by *L. sativae* adult females in the different areas of the olfactometer: each corresponding to one of the four odor sources was recorded and 30 females were tested in total. The results showed that although the time of the females in each of areas was significantly different (p<0.05), the time spent by the females in the area linked to the arm with the odor of kidney bean leaves was not always the longest. In another experiment, ten females were introduced into the olfactometer chamber simultaneously and the of the females remaining in each area of olfactometer was recorded once every 5 minutes for 30 minutes, and totally 100 females were tested. The number of females recorded in the different areas did not differ significantly (p>0.05). These results indicate that the volatile compounds emitted from kidney bean leaves do not play an important role in host selection by the leafminer.

To test the role of leaf color in host preference of the leafminer, a Petri dish (15 cm in diameter) was used in which a kidney bean leaf disc (4 cm in diameter) sealed with transparent film to prevent odor release was placed on one side and the
other side was a piece of filter paper with the same size as the leaf disc. One female leafminer was released into the container and the time spent by the leafminer on the leaf disc or the paper was recorded continuously for 10 minutes, and 30 leafminers were tested. The results showed that the time spent by the leafminer on the kidney leaf disc was much longer \((p<0.01)\) than that on the filter paper. In another experiment, four small flasks, one with a kidney bean leaf and the others with nothing in them as blank controls, were put into one of four corners of a square container \((80 \times 80 \times 15 \, \text{cm}^3)\). Ten females were introduced into the container each time and the number of the females in each corner of the container was recorded every 5 minutes for 20 minutes. One hundred females were tested. It was found that the number of the females present in the corner with bean leaves was much more \((p<0.01)\) than that in the other three corners with empty flasks.

A cucumber variety with hairy leaves was chosen to test the role of cuticular trichome of host plants in host preference of the leafminer. Three pairs of cucumber leaves (one normal leaf with cuticular trichomes and the other a control leaf from which the cuticular trichomes had been carefully removed with a forceps) were placed into a container \((15 \, \text{cm in diameter})\) and two pairs of the female and male were introduced. The number of eggs laid by the leafminer on the normal cucumber leaves and the control leaves was recorded after 24h, respectively. The results revealed that the number of the eggs was much less \((p<0.01)\) on the normal leaves than on the control leaves.

It was concluded that the physical characteristics of the host plants, leaf color and trichomes, play an important role in the host preference of *L. sativae*, while the volatile compounds emitted from host plants do not.

**Key words:** *Liriomyza sativae* Blanchard; host selection; host volatiles; leaf color; cuticular trichomes

---

1.1

1.1.1

1.1.2

1.1.3

1.2

1.2.1

(1)

(2)
在显著的差异

于培养基上

四角间轮流更换一次装有叶片的三角瓶

虫量差异不明显

同样的空三角瓶放置于平板另外三角作对照

用另一头雌虫

产生干扰作用

培养皿底部垫上滤纸并分成两半

后用解剖镜观察记录叶子圆片上的产卵数

气味源位于嗅觉仪的

( )

气味源所在臂时

单虫试验

将四季豆叶片用打孔器打出直径为

间隔

每个培养缸内贴有

头雌虫接入平板内

叶片

注意放置时以便于平板内供试的成虫能充分发现瓶内叶片

选择活泼的美洲斑潜蝇雌成虫

寄主植物叶色对美洲斑潜蝇寄主选择行为的影响

寄主挥发物对美洲斑潜蝇寄主选择行为的影响

寄主叶片表皮毛对美洲斑潜蝇寄主选择行为的影响

选择表皮毛较多的黄瓜

其在叶子圆片上停留的时间明显多于在滤纸上停留的时间

在单虫试验中美洲斑潜蝇在滤纸圆片上与在叶子圆片上停留的时间存在着极显著的差异

在多虫试验中美洲斑潜蝇在嗅觉仪各臂停留的虫量

选择同样挥发性物质的圆片

这说明供试寄主挥发物在美洲斑潜蝇寄主选择行为中作用不明显

表中数据为平均数

其在叶子圆片上停留的时间明显多于在滤纸上停留的时间

多虫试验中美洲斑潜蝇在嗅觉仪各臂停留的时间

间隔

内铺有约

的圆片

组成对的叶子圆片

用透明的食物保鲜膜密封圆片

待干后使用

注意不要损伤叶片

在单虫试验中美洲斑潜蝇在嗅觉仪各臂停留的时间

间隔

单虫实验中美洲斑潜蝇在嗅觉仪各臂停留的时间

从表

在试验中观察到

同时

待干后再用

表

Table 1 Time of Liriomyza sativae adult female staying in the arms of olfactometer in single adult test

<table>
<thead>
<tr>
<th>Arm with leaf volatile</th>
<th>I (min)</th>
<th>II (min)</th>
<th>III (min)</th>
<th>IV (min)</th>
<th>F (df=3,116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>5.32±0.10a</td>
<td>4.34±0.09b</td>
<td>5.65±0.11a</td>
<td>4.45±0.09b</td>
<td>3.72*</td>
</tr>
<tr>
<td>II</td>
<td>5.46±0.06a</td>
<td>3.98±0.12b</td>
<td>4.79±0.11c</td>
<td>5.56±0.09a</td>
<td>4.01*</td>
</tr>
<tr>
<td>III</td>
<td>4.26±0.12a</td>
<td>5.42±0.10b</td>
<td>5.82±0.12b</td>
<td>4.37±0.08a</td>
<td>3.90*</td>
</tr>
<tr>
<td>IV</td>
<td>5.11±0.10a</td>
<td>5.76±0.09a</td>
<td>4.29±0.12b</td>
<td>4.54±0.07b</td>
<td>3.75*</td>
</tr>
</tbody>
</table>

*Means in the same line followed by the same letter do not differ significantly (df=3,116, p>0.05), by Duncan’s multiple range test.

Table 2 Number of Liriomyza sativae adult female staying in the arms of olfactometer in multiple adults test

<table>
<thead>
<tr>
<th>Arm with leaf volatile</th>
<th>I ( )</th>
<th>II ( )</th>
<th>III ( )</th>
<th>IV ( )</th>
<th>F (df=3,36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>15.60±0.55a</td>
<td>14.70±0.70a</td>
<td>14.70±0.77a</td>
<td>15.10±0.64a</td>
<td>1.22</td>
</tr>
<tr>
<td>II</td>
<td>14.80±0.68a</td>
<td>14.80±0.55a</td>
<td>15.70±0.75a</td>
<td>14.70±0.60a</td>
<td>1.23</td>
</tr>
<tr>
<td>III</td>
<td>15.11±0.69a</td>
<td>15.40±0.64a</td>
<td>13.60±0.48b</td>
<td>15.90±0.38a</td>
<td>4.26*</td>
</tr>
<tr>
<td>IV</td>
<td>15.30±0.63a</td>
<td>14.70±0.58b</td>
<td>14.20±0.87b</td>
<td>15.80±0.39a</td>
<td>3.41*</td>
</tr>
</tbody>
</table>

*Means in the same line followed by the same letter do not differ significantly (df=3,36, p>0.05), by Duncan’s multiple range test.

2.2 由于不同的条件，可能存在（p<0.01）

（p<0.01）
Table 3  Time of *Liriomyza sativae* adult female staying in different treatments of leaf color test

<table>
<thead>
<tr>
<th>Direction</th>
<th>East</th>
<th>South</th>
<th>West</th>
<th>North</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf</td>
<td>6.57±0.06</td>
<td>6.69±0.05</td>
<td>6.63±0.06</td>
<td>6.67±0.04</td>
</tr>
<tr>
<td>Filter paper</td>
<td>3.20±0.04</td>
<td>3.07±0.05</td>
<td>3.11±0.04</td>
<td>3.11±0.03</td>
</tr>
<tr>
<td><em>u</em></td>
<td>40.77</td>
<td>50.97</td>
<td>38.95</td>
<td>71.20</td>
</tr>
</tbody>
</table>

Data are mean ± standard error; *u*0.05 = 1.96; *u*0.01 = 2.58

Table 4  Number of *Liriomyza sativae* adult female staying in the arms of olfactometer in leaf color test

<table>
<thead>
<tr>
<th>Arm with leaf</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>N</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf</td>
<td>32.80±0.44 Aa</td>
<td>2.40±0.22 Bb</td>
<td>1.60±0.15 Bb</td>
<td>3.20±0.33 Bb</td>
<td>157.60 **</td>
</tr>
<tr>
<td>Filter paper</td>
<td>3.40±0.22 Bb</td>
<td>30.40±0.27 Aa</td>
<td>3.20±0.17 Bb</td>
<td>2.90±0.31 Bb</td>
<td>358.57 **</td>
</tr>
<tr>
<td>Leaf</td>
<td>3.60±0.15 Bb</td>
<td>3.20±0.26 Bb</td>
<td>29.20±0.30 Aa</td>
<td>4.00±0.31 Bb</td>
<td>337.85 **</td>
</tr>
<tr>
<td>Filter paper</td>
<td>2.50±0.16 Bb</td>
<td>2.50±0.17 Bb</td>
<td>3.20±0.26 Bb</td>
<td>30.70±0.31 Aa</td>
<td>457.89 **</td>
</tr>
</tbody>
</table>

* Means in the same line followed by the same small or capital letter do not differ significantly or much significantly (df=3, 361; *p* > 0.05 or 0.01), by Duncan’s multiple range test.

References:


[3] Carolina J C H, Johnson M W. Host plant preference of *Liriomyza sativae* (Diptera; Agromyzidae) populations infesting green onion in


