Minute sucking bug complex causing pimples on the skin of avocado fruit in the Soutpansberg district

AJ Alberts

Agricultural consultant
PO Box 222, Levubu 0929, South Africa
E-mail: driesa@mweb.co.za

ABSTRACT

The avocado bug (*Taylorilygus* spp.) causes lesions below the skin of avocado fruit making them unsuitable for export. These lesions are called bumps or "vosknoppe".

Reports of pimple like lesions in the Soutpansberg district and also from the Tzaneen region are also attributed to the same bug. Investigations are, however, pointing that several other minute sucking bugs belonging to the suborders Sternorrhyncha, Auchenorrhyncha and Heteroptera are to be found on avocado trees during the flowering and fruit set periods.

All insects visiting the avocado trees during the 2008 flowering and fruit set season were monitored. The results are presented. Strategies to monitor and control these minute sucking bugs are proposed.

INTRODUCTION

Descriptions of unsightly pimple like protrusions on the skin of avocado fruit are regularly reported by pack houses in the Soutpansberg district. The first report on unsightly bumps on avocados in South Africa from the Hazyview area was attributed to a *Taylorilygus* spp. (Du Toit *et al.*, 1993). The pimple like protrusions which are found on fruit from the Soutpansberg district and Tzaneen area do not match the bumps, also called "vosknoppe". An unidentified mirid (probably a *Lygus* spp.) was found to dominate the Hemipteran complex visiting avocado flowers during the 2008 flowering season.

Du Pont and Dennil (1996) have also reported that similar pimple like protrusions were found on the skin of Hass (10%) and Fuerte (2%) fruit after feeding by the citrus leafhopper *Penthimiola bella* (Stal) (Homoptera: Cicadellidae).

MATERIALS AND METHODS

All insects visiting the flowers of avocado, cultivars Fuerte and Hass, were monitored on some farms in the Soutpansberg district using coloured sticky traps. The monitoring was done from week 27 to week 38 during a rather extended flowering period of 2008. All the insects captured per week were recorded.

According to Peña (2003) sampling of mirids on avocado flowers can also successfully be done with a beating sampling technique. This can, however, only be done successfully under the warmer South African conditions early in the morning when temperatures are under 15ºC. Visual scouting must also be done early because the mirids hide or fly away when they detect movement around the trees.

A literature study was conducted to try and develop strategies for:

1. effective methods to monitor the minute sucking bug complex;
2. ways to develop a forecasting model using accurate climate forecasts and degree day models; and
3. more natural ways of controlling the problem (natural enemies and natural products).

RESULTS

Trap counts

Yellow, light blue, white, red and green sticky cards measuring 125 mm x 75 mm was used to monitor the insects visiting avocado flowers during the 2008 flowering season. Traps were replaced on a weekly basis and all the insects caught were classified to their orders using a stereo microscope with a 10x to 30x zoom lens and top lighting. The Hemiptera was classified to family groups (**Table 1**).

The standard yellow, light blue and white traps caught the highest numbers of insects. Numerous bees (Apoidea) visited the avocado flowers but were not caught on the sticky traps and are therefore not included in the Hymenopteran counts. Most of the Hymenopterans belonged to the suborder Parasitica. Flies (order Diptera) are important pollinators of avocado.

The red and green sticky traps caught the highest number of Mirids as well as the highest number of Hemipterans and are therefore at this stage recommended to monitor minute sucking bugs (**Figure 1** and

2).
The identification of minute sucking bugs in South Africa is still a problem as there are no taxonomists that work on this group.

Climate data

The effect of climate on insect occurrence and development is well known. Seasons change and so does the occurrence and populations of insects. According to Fisher (1994) ecologists interested in the effects of climate and on species diversity and composition have used a wide range of methods to describe and quantify seasonal variability. The use of climograms[1] is one such tool which is convenient to explain and measure the difference between seasons. A climogram plots two aspects of atmospheric condition on two graph axis and draws a visual pattern of the climate of a specific season.

Monthly average temperature and monthly average humidity was used to draw climograms of the past three seasons. The effect of temperature and humidity was chosen because it has got the biggest influence on insect occurrence and ontogenesis. A Similarity Index can likewise be calculated by measuring how much of the area of two climograms overlap.

Climograms drawn using average monthly temperature (x-axis) and average monthly humidity (y-axis) are used to calculate the Similarity Index of the past three seasons.

There is a huge difference in the climate of the past three seasons. The Similarity Index (SI) for the 2006/07 and 2007/08 seasons was only 15.5%. The SI for the 2007/08 and 2008/09 seasons was a mere 5.6% (**Figure 3** and **4**).

Maximum and minimum thresholds can also be set to see how an organism is adapted to a certain area or climate. Arbitrary thresholds for Lygus were set. On the x-axis the minimum and maximum thresholds for temperature was set on 12.2ºC and 34ºC whilst on the y-axis the minimum and maximum thresholds were set on 25% and 85% relative humidity respectively. It was only during December 2008 that the humidity dropped lower than the minimum threshold. Although temperatures and humidity mostly stayed within the set thresholds for the three seasons compared, it is still clear that those seasons varied much. Further studies must be done to determine the real threshold values for mirids in an attempt to explain the variability of populations over different seasons.

Correlation

A study to correlate climate data and the numbers

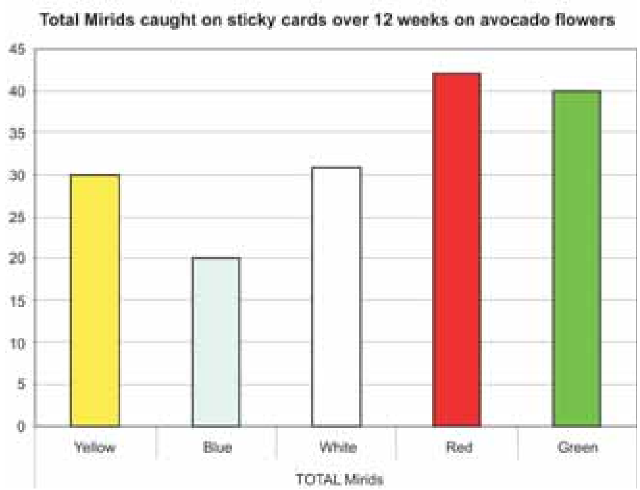

Figure 1. Total number of Mirids caught on sticky cards during the 2008 avocado flowering period

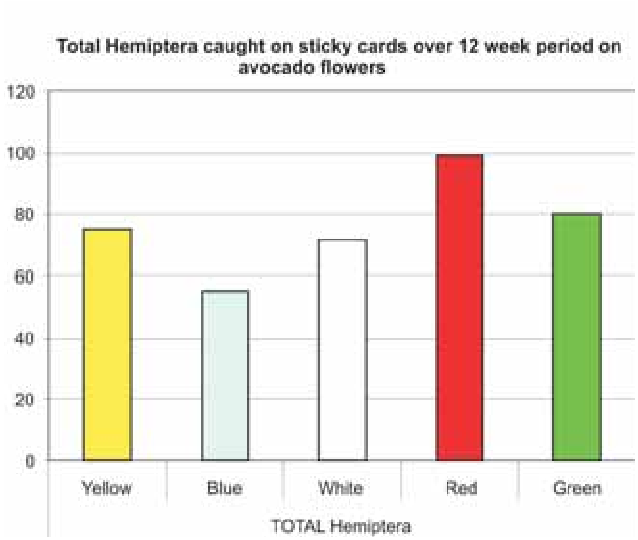

Figure 2. Total number of Hemipterans caught on sticky cards during the 2008 avocado flowering period

Table 1. Total number of insects caught on different coloured sticky cards during the 2008 flowering season

Order	Suborder	InfraOrder	Superfamily	Family	Size	Total number of insects 2008 flowering season				
						Yellow	Blue	White	Red	Green
Hemiptera	Heteroptera	Cimicomorpha	Miroidea	Miridae	>10mm	0	0	0	0	0
					5-10mm	10	9	5	12	24
					<5mm	20	11	25	30	16
	Auchernorrhyncha	Cicadomorpha	Cicadelloidea	Cicadellidae	Brown	33	34	41	49	39
					Green	12	1	0	6	1
	Sternorrhyncha			Triozidae	Other	0	0	0	2	0
Diptera						455	537	305	268	308
Coleoptera						38	20	19	27	26
Hymenoptera						180	149	96	142	145
Thysanoptera						53	208	321	59	97
Lepidoptera						8	8	4	5	6
TOTAL						**809**	**977**	**816**	**600**	**662**

[1]Also called climatograph, climograph, climagram, climagraph, climatogram, and hythergraph.

of Mirids caught on sticky traps per week was done. The average minimum and maximum temperatures as well as average humidity are plotted in **Figure 5**. It is noticeable that the average minimum temperatures stayed low until the middle of August (week 33) where after it rose sharply. Average maximum temperatures stayed above 23ºC for the whole period. These warm days allowed the insects to feed and develop.

The total number of growing degree days (GDD) using 12.2ºC as base temperature was calculated for every week of the 2008 avocado flowering period (**Figure 6**).

A polynomial trend line was fitted on these weekly values which emphasize the trend of slow growth and development earlier in the season while it is still colder and an acceleration of growth and development as the season warms up.

A similar trend was observed in the weekly trap catches of both Mirids and Heteropterans (**Figure 7** and **8**). It would therefore be possible to predict the population growth of Heteropterans using a GDD model and accurate weather forecasting.

Ways to control the minute sucking bug complex

A literature study was started to find safer methods to help control Heteropteran populations that pose problems. The mirids on avocado flowers can be controlled with chemicals and beta-cyfluthrin was registered for that purpose (Bruwer, 2002; Alberts, 2005). It is, however, very risky to spray any chemical that would kill the pollinators during the flowering period. Avocados rely heavily on cross pollination for good fruit set and yield. Much work was done on natural remedies and organisms as well as parasitoids. This paves the way to find a nature friendly solution to the problem in a future study and should be investigated locally.

DISCUSSION AND CONCLUSION

The study of the Heteroptera complex visiting avocado flowers and causing skin lesion damage on the fruit has brought forward some interesting results. It is unfortunate that we are still not able to identify the real culprits. Even the avocado bug (*Taylorilygus* spp.) after many years has only been identified up to genus level.

It has again been proven (Alberts, 2004) that trapping with coloured sticky cards is an effective method to monitor minute sucking bug complexes. These results can be used to build an area wide integrated pest management (IPM) model.

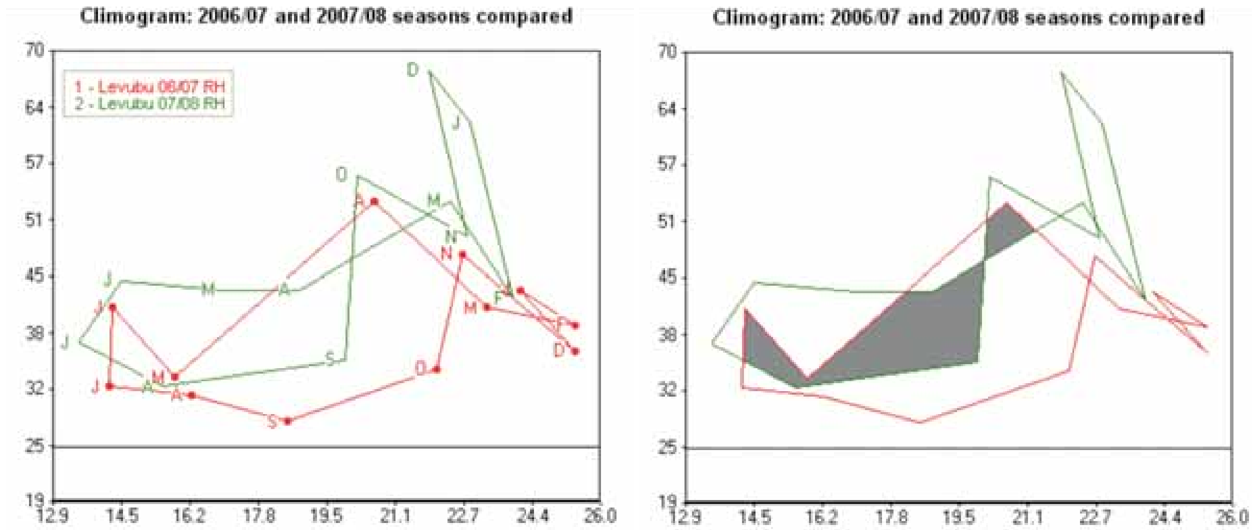

Figure 3. Climograms of the 2006/07 and 2007/08 seasons shows a Similarity Index of 15.5% (shaded area)

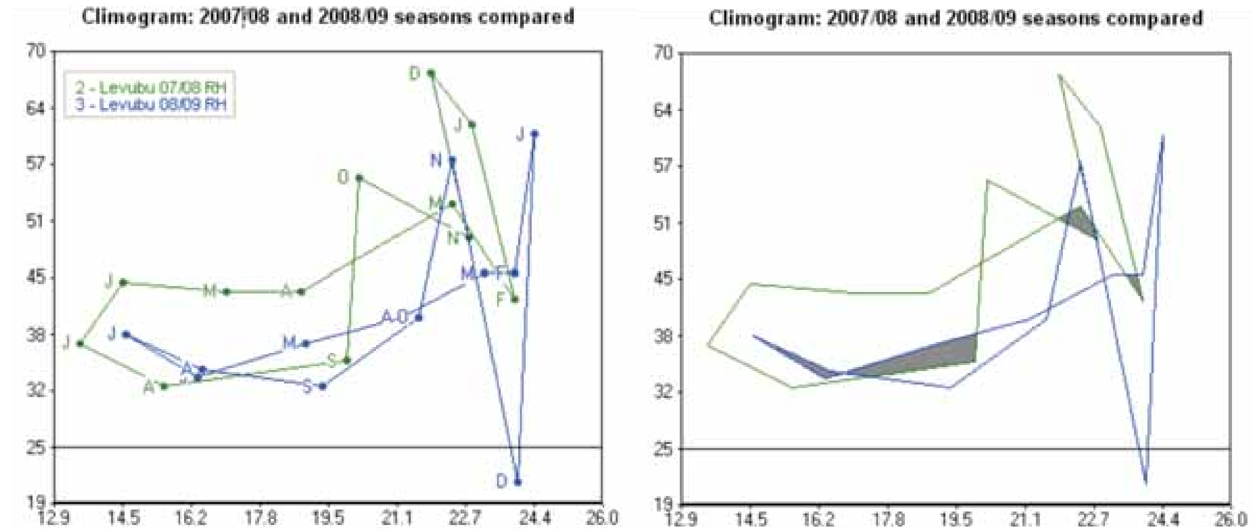

Figure 4. Climograms of the 2007/08 and 2008/09 seasons showing a Similarity Index of only 5.6%

The attempt to correlate climate to the occurrence and development of the minute sucking bug complex is showing promise. Further study to determine exact threshold values need to be done. The results from such work can then again be incorporated into an area wide IPM forecast model to warn growers in advance of any population build up.

LITERATURE CITED

ALBERTS, A.J. 2004. First report on the identification of possible causes of pimple like skin protuberances on avocado fruit in the Soutpansberg area. *South African Avocado Growers' Association Yearbook*, 27: 23-26.

ALBERTS, A.J. 2005. Heteropterans causing epidermal protuberances on avocado fruit and investigation of possible chemical control methods. *South African Avocado Growers' Association Yearbook*, 28: 53-55.

BRUWER, I.J. 2002. Eko-vriendelike insekdoders vir die beheer van suigbesies (Hemiptera) in avokadoboorde. *South African Avocado Growers' Association Yearbook*, 25: 1-5.

DU PONT, F.M.A. and DENNILL, G.B. 1996. An ecological study of the damage done to avocado fruits by citrus leafhopper Penthimiola bella (Cicadellidae) and coconut bug Pseudotheraptus wayi (Coreidae) in South Africa. *International journal of pest management*, Vol 42, No 2, pp. 107-112.

DU TOIT, W.J., STEYN, W.P. and DE BEER, M.S. 1993. Occurrence of protrusions on avocado fruit and the causative agent. *South African Avocado Growers' Association Yearbook* 16: 100-102.

FISHER, M. 1994. Another look at the variability of desert climates, using examples from Oman. *Global Ecology and Biogeography Letter*, 4: 79-87.

Peña, J.E., Glenn, H. and Baranowski, R.M. 2003. Dynamics and sampling of mirids (Hemiptera: Miridae) in avocado in Florida. Proceedings V World Avocado Congress 2003. pp. 495-501.

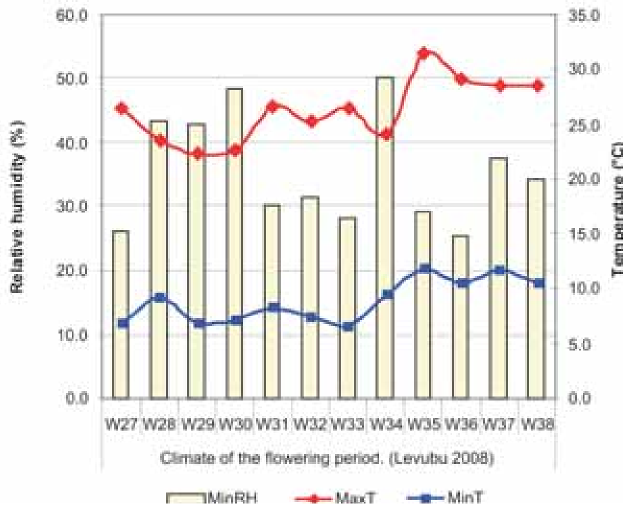

Figure 5. Climate (weekly averages) of the 2008 flowering season

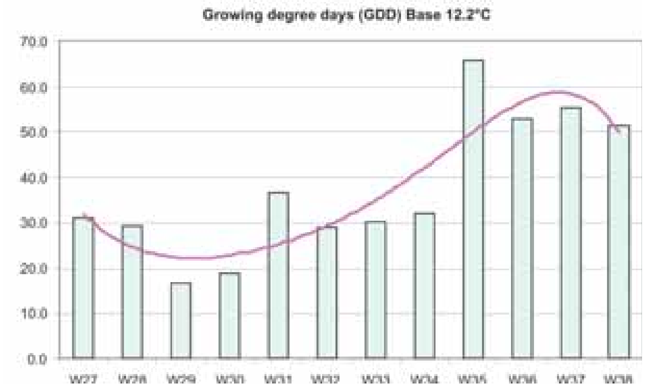

Figure 6. Total weekly Growing Degree Days (Base 12.2C) of the 2008 avocado flowering season

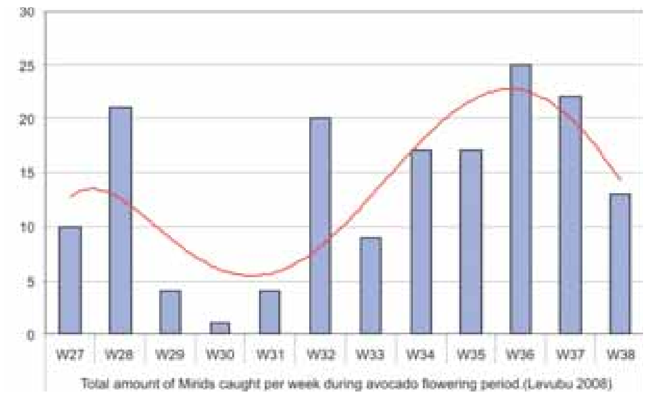

Figure 7. Total number of Mirids caught over the 12 week flowering period of 2008

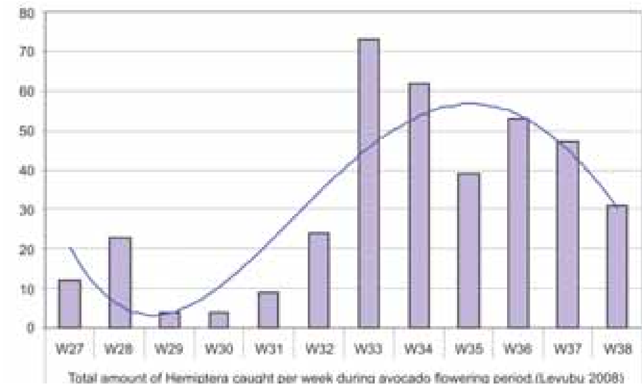

Figure 8. Total number of Hemipterans caught over the 12 week flowering period of 2008