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New Data to the Knowledge of *Calepitrimerus vitis* Nalepa in the Vine-growing Region of Szekszárd, Hungary (Acari: Eriophyidae)

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The eriophyid mite *Calepitrimerus vitis* is a common pest in many vineyards in Hungary. Deutogynes (winter-form) of *Calepitrimerus vitis* in the vineyards of Szekszárd emerge from their overwintering sites in spring. Protogynes (summer-form) start to appear at the beginning of May, replacing deutogynes gradually. The process lasts until the end of May when the deutogynes disappear. The mite population increases slightly during the summer months. In August a rapid increase occurs. The maximum density of mites is reached at the middle of August or at the beginning of September, when the first deutogynes appear. The mite density declines in September rapidly and it is very low in October.

The hibernation shelters are in the buds and at the cane base with the 2 year old wood. The most females are found at the cane base and in buds 1–4. In upper buds mite density gradually declines. A washing technique is described to estimate the population of *Calepitrimerus vitis* and useful for sampling of eriophyid mites either in summer or winter.

Keywords: *Calepitrimerus vitis*, eriophyid mite.

The eriophyid mite *Calepitrimerus vitis* Nalepa was detected in vineyards of Szekszárd first in 1979 and it has been causing significant damage since 1982. The control of this pest is not effective and so it is important to collect information on its biology and ecology. In case of mite infestation leaves curl and growth of the shoots and leaves is retarded. High level of infestation in spring may cause as much as an 85% decrease in the weight of the grapes at harvest time (Pérez-Marín, 1992). Population dynamics and hibernating shelters of *Calepitrimerus vitis* Nalepa have been studied in several other countries (Carmona, 1978; Baillod and Guignard, 1986; Liguori, 1987, 1988). However, investigation is required for each region for the development of integrated and biological pest management programmes, and so it is necessary to collect information on the biology and ecology of this pest in the vineyards of Szekszárd. A washing technique is described to estimate the population of *Calepitrimerus vitis,* useful for sampling of eriophyid mites either in summer or winter.

Materials and Methods

For the study of the population dynamics of *Calepitrimerus vitis* samples were taken in the period April–October in 1997–1999. The trial was carried out in Chardonnay grape variety, the plot size was 0.2 ha. No insecticide treatment was carried out in the vineyards for the past 5 years.

Sampling started in the spring of 1997, after bud burst. Samples were taken in the spring every 3 weeks, in the summer every 4 weeks. A sample of 30 leaves was collected in each time, chosen the leaves from the plot randomly. The leaves were chosen from the apical shoot area since these leaves had a high density of mites.

A shaking technique was carried out in water to move mites from the leaves. The solution was tinted and after sieving the mites were counted on the sieving-disc under binocular microscope at 50 x magnification.

Leaves were broken into small pieces in a 300 ml glass pouring out 150 ml tap water. An LE-203 type shaking machine was applied for a half an hour to move mites form the leaf surface to the solution. This technique substitutes the solving material and the individually handy washing. It is important because the solving material in many cases kills the mites. Our shaking technique let us observe living mites under binocular microscope. After shaking the solution was tinted with "Azúr II. eozin" microscopical colour. The tinted solution was sieved through a two-phase vacuum-sieving. The size of first sieving-tissue is 300 μ, the second is 40 μ, the latter is a changeable sieving disc. The two sieving surface occupy a "one under another" position in a plastic sieving-box fitting in a vacuum-tube. In the first sieving phase the rough dirt and leaf pieces are separated, in the second phase the mites are caught.

The blue background is optimal for observing mites under microscope. The changeable sieving disc is 3 cm in diameter. The mites were observed under binocular microscope at 50 x magnification. The observing unit was a microscopical visual field. A microscopical visual field at the 50 x magnification is 0.2 cm^2 (0.196 cm^2). The area of sieving disc is 7 cm^2 (7.065 cm^2), that is 35 microscopical visual fields. The number of eriophyids per leaf was calculated from the average number of mites found on sieving disc.

Investigation of deutogyne distribution in cane was carried out with a bud washing technique. In accordance with the observation of Schruft (1966), Sántha (1981) and Petter (1984) the hibernation shelters of deutogynes are the buds and the two year old woody bark. The samples were taken on 2 December 1997 and on 1 December 1998. 30 vine canes – picked at random – were collected. The canes were collected with the two year old wood. As the buds are often infested differently, pairs of successive buds were made. Thus six pairs of buds were investigated (1–2, 3–4, 5–6 ... 11–12) in each cane. The cane base and the 2 cm long two year old wood gave the sample number 7. The number of mites collected from buds in the same position gave the basis to calculate the average number of deutogynes in bud pairs.

The buds were examined with washing-out technique. The procedure was the same as mentioned above. The buds were gently dissected with a scalpel in a 300 ml glass pouring out 100 ml tap water. After shaking and colouring the samples were sieved. The mites caught on the sieving disc were observed then under binocular microscope. Their number was calculated as mentioned above.

Results and Discussion

Population dynamics of Calepitrimerus vitis *Nalepa in the vineyards of Szekszárd*

During investigation of the samples in the 3 experimental years we got information about the population dynamics of this pest in our region. The results are shown in *Fig. 1*. No insecticide treatments were carried out in the vineyard for 5 years which might directly have an acaricidal effect.

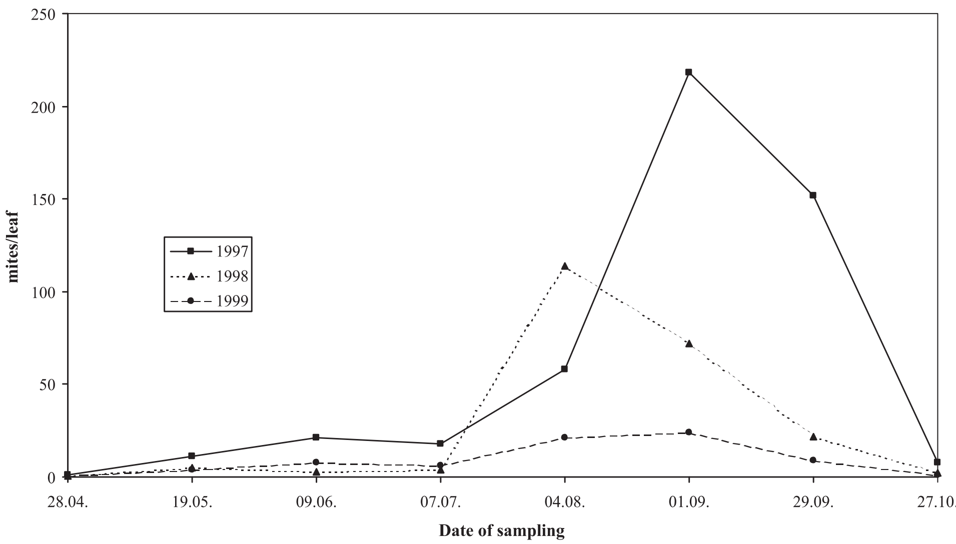


Fig. 1. The population dynamics of *Calepitrimerus vitis* Nalepa in 1997–1999

Population dynamics in 1997 (Fig. 1)

The mite density was low in the spring in 1997 (1 mite/leaf), and remained low with a slight increase until the beginning of July. A rapid increase occurred from the beginning of August. The maximum density (218 mites/leaf) was reached at the end of August and in the first days of September. During September the mite density remained high and we observed the pest both on the surface and the back side of leaves. The mite density decreased rapidly from the end of September and reached a low value upto the end of October.

The warm, dry summer was favourable to the mass multiplication of *Calepitrimerus vitis.* In 1997 the high temperature and the low precipitation resulted in high level of mite infestation. The temperature and precipitation were average in June and July. From the beginning of August to the end of October a warm and dry period succeeded and this period resulted in the increase of mite density. The mean temperature in August was higher than the former two months and the precipitation was low. The September was also dry and warm. Although the mite density rapidly decreased from the beginning of October, a portion of mites still stayed on the leaves at the end of the month. The mite density in the sample collected at the end of October was still 8 mites/leaf.

Population dynamics in 1998 (Fig. 1)

In the spring of 1998 the mite density (0.5 mite/leaf) was lower than in the spring of 1997. The number of mites was low until the beginning of July as also observed in 1997. The mite density increased rapidly from the beginning of July and reached the maximum value (114 mites/leaf) at the beginning of August. After that the mite density gradually decreased to the low level to the end of September. In 1998 the infestation level was lower than in 1997, the maximum density was reached earlier and taking refuge was started earlier. The reason for the low mite density in spring may be the high level of precipitation in May and June. The mean temperature during the summer months was more favourable for mites than in the former year. In 1998 the permanent precipitation of the summer and the autumn months and the high level of relative humidity had an unfavourable effect on the mite population and blocked the multiplication of *Calepitrimerus vitis.*

Population dynamics in 1999 (Fig. 1)

In the spring of 1999 the mite density (0.5 mite/leaf) was low. The population remained low during the whole year. Only in August and September could be observed a slightly increase in the mite density. The maximum density (24 mites/leaf) was reached at the beginning of September. This value was much more lower than in the former years. In the second half of September the mite density decreased and remained low until the end of October. The reason for the low mite density in 1999 was definitely the weather conditions. The average temperature in the summer and the autumn months appeared to be favourable to the multiplication of mites. However the precipitation 405 mm (June 157 mm, July 180 mm, August 68 mm) falling during the summer months and the high level of relative humidity blocked the multiplication of mites. The September and October were warm and dry but taking the previous interval into consideration in spite of the favourable weather conditions there was no increase in mite density during the autumn months. The dry and warm summers appeared to favour high population of mites as noted by other researchers (Baillod and Guignard, 1986; Pérez-Moreno and Moraza-Zorrilla, 1998). The warm and dry summer of 1997 produced higher density than in the former two years. In these years (1998, 1999) the average temperature was similar, but the precipitation was much more than in 1997 *(Figs 2, 3).*

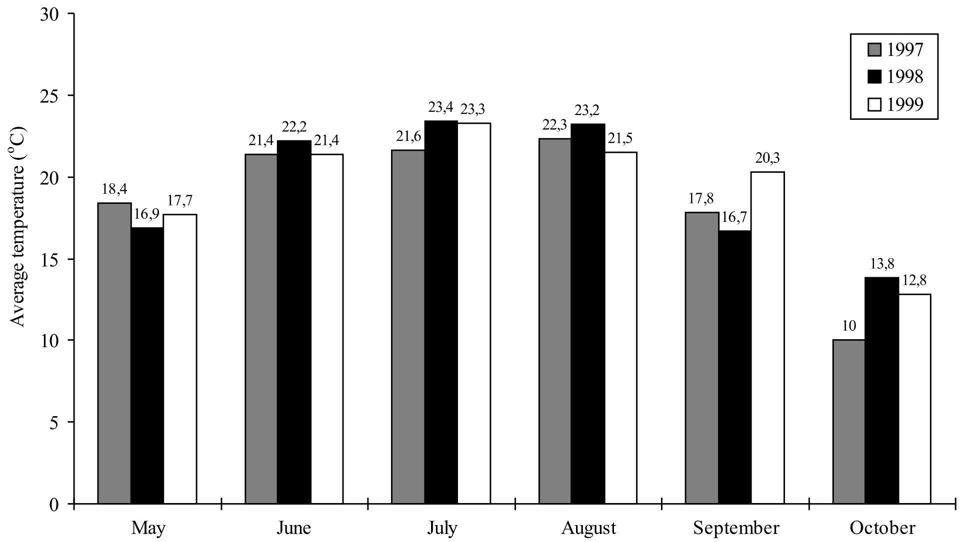


Fig. 2. The mean temperatures from May to October during 1997–1999

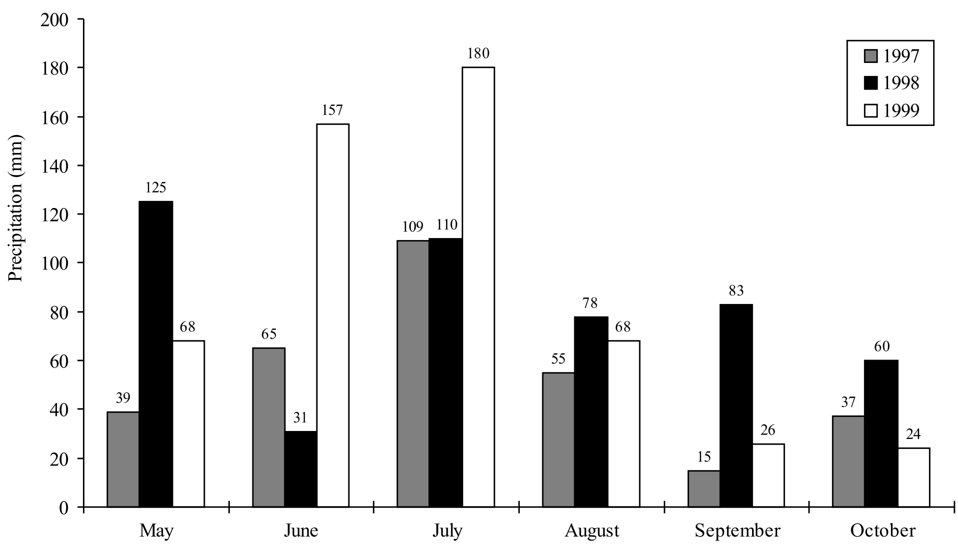


Fig. 3. The mean temperatures from May to October during 1997–1999

General dynamics

The deutogynes leaves their hibernating shelters in spring before immediately bud burst and at the bud burst. The pest density is low at this time. The first summer forms (protogyne) appear in the first half of May and protogynes relieve deutogynes until the end of May completely. The mite population increases slightly until the beginning of July and from this time a rapid increases occurs. The maximum density is reached from the beginning of August to the middle of September. At this time, in accordance with the observations of Carmona (1978) the first deutogynes are detected. At this time the deutogynes start to move towards the hibernating shelters and so the mite damage on leaves rapidly decreases during September and is very low in October. The first appearance of deutogynes in summer appears to depend not only on the environmental conditions such as morphological and physiological modifications of the foliage (Kreiter and Planas, 1987) but also depends on the number of mites. In those years when the mite density is high, deutogynes appear sooner than when the population levels are lower. It was observed by Carmona (1978) and he attributed it to a reduction of the foliage in the heavily infested vineyards. A large number of mites feeding on the same leaf accelerates the process of tissue hardening. This makes mite feeding difficult and is responsible for deutogyne development in eriophyid mites, as noted by Keifer (1975).

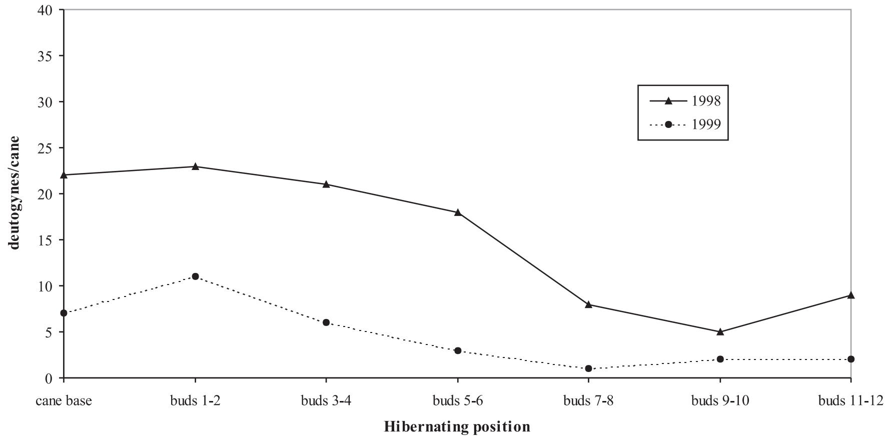
The results of the three years show that the high temperature, the low level of precipitation and the low relative humidity have a large influence on *Calepitrimerus vitis* population. The warm, dry summers result in an increase of mite population.

Distribution of hibernating females in the buds of canes

The results of bud washing obtained in winters of 1998–1999 for deutogynes distribution on the cane are shown in *Fig. 4*. The first deutogynes appear in August and they start to move towards the hibernating shelters.

In *Fig. 4* it can be seen that the distribution of mites within the cane is the same in 1998 and 1999, but there is a difference in the number of hibernating mites in 1998 and 1999. The cane base with the two year old wood and the first two bud pairs (buds 1–4) tend to shelter higher number of mites than the others. The most females are found at the cane base and in buds 1–4. But it is interesting to think about pruning. If we apply a “short pruning” procedure on the canes and remain only first 2 buds on every cane in the vineyards, we achieve a great reduction in the number of mites as the upper buds (buds 3–12) contain 45–57% of hibernating females. Consequently the short pruning is suitable for reducing the number of deutogynes. But in case of “long pruning” the canes are remained as long as of 10–12 buds and so the number of hibernating mites remains high which may cause spring damage.

If these results are compared to those from other countries the following can be found. In Portugal there are similar results to ours, the first buds tend to shelter higher number of mites (Carmona, 1978). In Switzerland and Spain the central buds (5–6, 7–8, 9–10) tend to shelter higher numbers of mites (Baillod and Guignard, 1986; Pérez-Moreno and Moraza-Zorrilla, 1998). In France high numbers of mites were found in the buds and



1998	21%	22%	20%	17%	7%	5%	8%
1999	22%	34%	19%	10%	3%	6%	6%

Fig. 4. The mean number of deutogynes at the cane base and in the buds in 1998–1999

reduced population were found under the bark at the cane base (Gay-Bellile, 1977). In Germany in accordance with the observation of Schruft (1966) deutogynes were exclusively located in the buds.

In Hungary Sántha (1981) and Petter (1984) publish information on the distribution of hibernating females within the cane. According to the former author small portion of mites hibernates in buds and great portion of mites hibernates at the cane base and the two year old woody bark. 100% of hibernating females were found at the cane base and in the first 5 buds. There was no found mites in the upper buds. According to the latter author the mite population is located at the cane base and in the first 5 buds, exception of Sylvoz cultivation system, where without exception the hibernating mites appear again in buds 7–10.

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