SAMPLING THE TWOSPOTTED SPIDER MITE *TETRANYCHUS URTICAE* (ACARI: TETRANYCHIDAE), ON COMMERCIAL STRAWBERRIES

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A simple, quick and unbiased sampling method has been developed for *Tetranychus urticae* Koch on strawberries (Raworth 1986). The method was based on the relationship between the mean number of *T. urticae*/leaflet (mtl) and the proportion of leaflets without *T. urticae* ($\hat{p}_o$). Data from small experimental field plots (7x7m) were used to develop the method. This note describes work conducted to determine if the method could be applied to large scale commercial fields.

Ten commercial strawberry fields, 0.2 – 5 ha in size, located between Ladner and Agassiz, British Columbia were sampled at 1-2 week intervals from 15 May to 8 July 1986. Two people collected a representative sample of mature, fully opened leaflets along non-overlapping, parallel, diagonal transects. One leaflet was picked every third or fifth row depending on field width. Headband magnifiers (1.5x magnification) were used to examine the leaflets for the presence or absence of *T. urticae*. Once 200 leaflets were sampled, $\hat{p}_o$ was calculated and Table 2 from Raworth (1986) was used to determine sample size such that the precision of the estimate of mtl was maintained at 1 S.E. < 0.2(mtl) for most samples. Accordingly, an additional 100 or 200 leaflets were picked and examined if $\hat{p}_o$ exceeded 0.5 or 0.65, respectively. The final estimate of $\hat{p}_o$ was calculated and the time taken to complete the sample was noted.

An estimate of mtl could be derived from $\hat{p}_o$, but only if a valid relationship between mtl and $\hat{p}_o$ still existed given the sampling method described above. To test this assumption, each sample was stored at 4°C and then examined with a stereomicroscope at 10x magnification to determine mtl. The relationship between mtl and $\hat{p}_o$ was compared with Raworth's (1986) relationship derived from small field plots (Fig. 1). In the latter study, mtl and $\hat{p}_o$ were determined by examination of individually bagged leaflets at 15x magnification. There was no statistical difference ($p > 0.05$) between the slopes or intercepts of the two regressions. This suggests that the sampling method described can be used to provide valid estimates of mtl. The overall regression for Figure 1 may be used to generate a table of $\hat{p}_o$, with associated mtl, sample sizes and standard errors as described in Raworth (1986), given: regression residual mean square (RMS)= 0.4167; number of estimates of mtl and $\hat{p}_o$ (NEMP0)=104; mean of $\log_e(-\log_e(\hat{p}_o))$ (MLP0)= −0.3511; sum of squared deviations of $\log_e(-\log_e(\hat{p}_o))$ (SSDLP0)= 173.8; regression intercept Fig. 1 (IMP0)= 2.144; slope Fig. 1 (SMP0)=1.351; intercept of the mean-variance relationship (Raworth 1986) (IMV)= 2.306; slope of the mean-variance relationship (SMV)= 1.644; and an algorithm written in FORTRAN (Appendix 1).

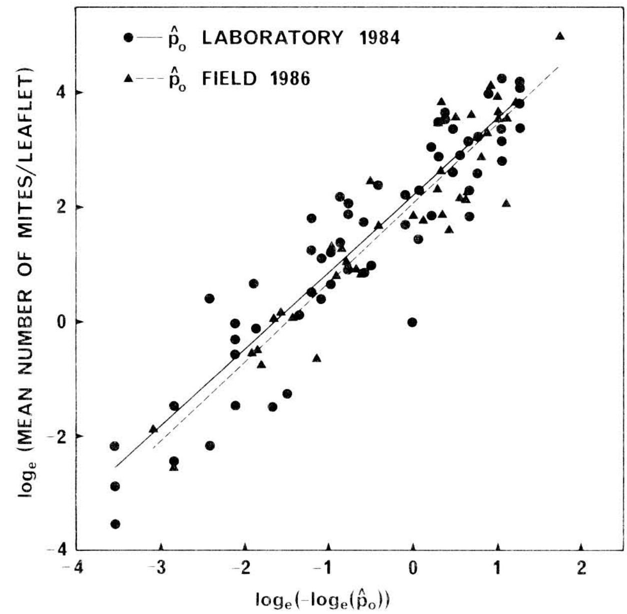

FIG. 1. Mean number of *Tetranychus urticae*/strawberry leaflet (mtl) as a function of the proportion of leaflets without *T. urticae* ($\hat{p}_o$). Overall regression: Y = 2.144 + 1.351 X (r = 0.939, 102df).

The time taken to sample a field to determine $\hat{p}_o$ increased with the number of leaflets examined (Eq. 1). The density of *T. urticae* also affected the sample time significantly ($p<0.05$) (Eq. 2). The higher the density the easier it was to see *T. urticae*, so that less time was used examining each leaflet.

$$Y = -1.48 + 0.150\ X\ (r=0.858,\ 33df) \quad [1]$$

$$Y = 4.92 + 0.137\ X - 0.127\ X_1\ (R=0.884,\ 32df) \quad [2]$$

where Y = sample time in minutes
X = total number of leaflets sampled by 2 people
X_1 = mean number of *T. urticae*/leaflet

These data suggest that the density of *T. urticae* may be determined in commercial fields by examining leaflets for the presence or absence of *T. urticae*. The sampling time of about 1h/200 leaflets/person was much less than that needed to collect the leaflets and examine them with a stereomicroscope in the laboratory, a procedure that took up to 10h/200 leaflets/person depending on the density of *T. urticae*.

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Reference

Raworth, D.A. 1986. Sampling statistics and a sampling scheme for the twospotted spider mite, *Tetranychus urticae* (Acari: Tetranychidae), on strawberries. *Can. Ent.* **118**: 807-814.

Appendix 1

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      REAL P0,MEAN,PROP,PROP1,A,B,C,D
     2RMS,NEMP0,MLP0,SSDLP0,IMP0,SMP0,IMV,SMV
      INTEGER NUMS(10)
      READ(5,*)RMS,NEMP0,MLP0,SSDLP0,IMP0,IMV,SMV
      P0=0.05
      DO 100 ITIME=1,19
      MEAN=EXP(IMP0+SMP0*(LOG(-1.0*(LOG(P0)))))
      A=RMS*((1.0/NEMP0)+((((LOG(-1.0*(LOG(P0))))
     2-MLP0)**2)/SSDLP0))
      B=((SMP0**2)*(1.0-P0))/(P0*((LOG(P0))**2))
      C=IMV*(MEAN**(SMV-2.0))
      PROP=0.1
      DO 50 I=1,10
      PROP1=((LOG(PROP*MEAN+MEAN))/LOG(MEAN))-1.0
      D=(PROP1*(LOG(MEAN)))**2
      IF(D.GT.A)GOTO 10
      NUMS(I)=999999
      GOTO 20
10    NUMS(I)=IFIX((B+C)/(D-A))
20    PROP=PROP+0.1
50    CONTINUE
      WRITE(6,90)P0,MEAN,NUMS
90    FORMAT(' ',F5.2,F8.3,I10,I8,8I5)
      P0=P0+0.5
100   CONTINUE
      STOP
      END
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MECHANICAL PENCILS FOR MICRODISSECTION

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Abstract

Replacing the lead of a 'fine line' mechanical pencil with an entomological pin produces a convenient, adjustable probe for microdissection work.

The range of fine lead (0.5 mm) mechanical pencils currently on the market offer an excellent alternative to homemade handles for microdissection probes. Replacing the lead with an entomological pin of appropriate size results in a comfortable, well-balanced tool with a probe length which is readily adjustable to suit the user or application (Fig. 1).

The cheapest all-plastic leadholders may require up to a No. 5 pin for the chuck to grip adequately, but a moderately-priced pencil with a metal ferrule can grip a No. 2 or even No. 1 pin firmly. Because the pin is retractible (unless bent) probes may be handled easily and safely when not in use. It is not usually necessary to clip the head from the pin unless an extra long reach is desired.