

USABILITY OF THE HENDERSON-MC BURNIE'S METHOD FOR ESTIMATION  
OF THE NUMBER OF ACTIVE STAGES AND EGGS OF THE SPRUCE SPIDER MITE,  
OLIGONYCHUS UNUNGUIS (JACOBI) ON SPRUCES

Wojciech Bogatko, Elżbieta Pała, Czesław Smolarek

Institute of Pomology and Floriculture, Skierniewice

The spruce spider mite, *Oligonychus ununguis* (Jacobi) is a serious pest of coniferous plants [2, 5].

In experiments on the effectiveness of pesticides for the control of this spider mite [1] it was necessary to apply a rapid and reliable method for the counting the number of mite's active stages and eggs. In numerous papers on the spruce spider mite, except one [3], there is a lack of data on the determination of the mite populations. It was done by the counting all the mites and eggs on the samples with a hand - lens or a stereoscopic microscope, probably. However this procedure for needles is difficult and takes much more time if to compare with the counting mites on leaves.

The most satisfactory method for the rapid estimation of the mite population on leaves is the use of a brushing machine applied by Henderson and Mc Burnie [4]. The effectiveness of this procedure gave 82 per cent for eggs and 88 per cent for active stages of the citrus red mite counted on orange leaves. Morgan et al. [6] found that 100 per cent of active stages and 98.9 per cent of eggs of the European red mite and of the flower mite were removed from the apple leaves. According to Putman [7] the effectiveness of the mite brushing machine depends on the species of mite, the development stage, structure of the brushed surface and the way of brushing.

In the paper of Fellini [3] the effectiveness of the mite brushing machine to the estimation of the spruce spider mite on Douglas fir needles was expressed as a percentage of mites which had not been removed after brushing. In all cases this percentage for the active stages and eggs was lower than four.

The aim of the work was to determine the Henderson - Mc Burnie's mite brushing machine for counting of the active stages and eggs of the spruce spider mite on spruces.

#### MATERIAL AND METHODS

Data were taken from the experiment on chemical control of the spruce spider mite on *Picea abies* var. *Nidiformis* conducted in 1982 in Skierniewice.

Each sample consisted of 5 twigs of 4 cm lengths taken from the lower parts of each plant. In the total amount 178 samples for active stages and 197 samples for eggs during season were taken.

Mites and eggs were counted under a stereoscopic microscope and further on the Henderson - Mc Burnie's mite brushing machine was used. The twigs were inserted between the whirling brushes and withdrawing their; first one and of the twig was brushed and next other one. The procedure was repeated three times. Vaseline was used on the glass disk as an adhesive. Counting disk were divided into 16 sectors of equal area and 12 annuli of equal width were used.

The effectiveness of the Henderson - Mc Burnie's method was expressed as a percentage of the active stages and eggs brushed after visual counts for five different levels of mite's and egg's number (1-25; <25-50; <50-100; <100; total).

The simulation of taking twigs of different length was done to determine the influence of sample size (multiple of 20 cm) on the dependence of two methods expressed by the value of correlation coefficient ( $r$ ).

The pseudorandom generator  $X_{n+1} = X_n 32768 \text{ mod } 16775723$  (see [8]) with stratified draw without return was used for simulation. According to multiple of basic sample (20 cm) different numbers of draws were done, the minimum being 25.

#### RESULTS AND DISCUSSION

The number of mobile forms in the sample oscillated from 1 to 369 and the number of eggs from 1 to 702. The total effectiveness of Henderson - Mc Burnie's method was very high (94.3%) for the active stages and smaller (68.5%) for the eggs (Table 1). Generally the percentage of brushed mites and eggs was slightly growing with the increasing levels of mites and eggs number (Table 1). The rank of the dependence of two methods is given by the correlation coefficient (Table 2).

In all cases analysed the correlation was very significant. It was a trend towards increase of the correlation coefficient together with the sample size.

Table 1

The effectiveness of Henderson - Mc Burnie's method at different number of mites and eggs

The number of mites and eggs	The percentage mites brushed after visual counts	The percentage of eggs brushed after visual counts
1-25	89.3	61.0
<25-50	88.2	69.2
<50-100	92.2	62.7
<100	98.9	69.8
Total	94.3	68.5

Table 2

The rank dependence of two methods of estimating the number of active stages and eggs of spruce spider mite

Sample size	Active stages		Eggs	
	number of draws	correlation coefficient (r)	number of draws	correlation coefficient (r)
20 cm	178	0.889**	197	0.909**
40 cm	89	0.940**	98	0.944**
60 cm	59	0.948**	65	0.947**
80 cm	44	0.973**	49	0.979**
100 cm	35	0.977**	39	0.970**
120 cm	29	0.958**	32	0.975**
140 cm	25	0.987**	28	0.980**

\*\*Significant at  $P = 0.01$ .

Henderson - Mc Burnie's method can be successfully used for estimation of the spider mite density on spruces. With the purpose to estimate the real number of eggs using this method it should be taken into consideration that more than 1/3 of eggs are not brushed. Henderson - Mc Burnie's method allowed to count the active stages and eggs of the spruce spider mite five times quicker when compared with the microscopic examination.

## REFERENCES

1. Bogatko W.: Ocena preparatów w zwalczaniu przędziorka sosnowca *Oligonychus ununguis* (Jacobi) na świerkach ozdobnych. Prace Inst. Sad. Rośliny Ozdobne, 1983.
2. Boyne J. V., Hain F. P.: Effects of constant temperature, relative humidity, and simulated rainfall on development and survival of the spruce spider mite (*Oligonychus ununguis*). Can. Ent. 115, 93-105, 1983.

3. Fellin D. G.: Sampling mites on Douglas - fir foliage with the Henderson - Mc Burnie machine. J. Econ. Ent. 60 (6); 1743-44, 1967.
4. Henderson C. F., McBurnie H. V.: Sampling techniques for determining populations of the citrus red mite and its predators. V. S. Dept. Agr. Corc. 671, 1943.
5. Kiełczewski B.: Common mite species of forest biotypes occurring on trees and accompanying certain insects. (Transl.) U. S. Dep. Commerce, Natn. Tech. Inf. Serv. No. TT 73-54038, p. 7 Springfield, Va. 1966.
6. Morgan C. V. G., Chant D. A., Anderson N. H., Ayre G. L.: Methods for estimating orchard mite populations, especially with the mite brushing machine. Can. Ent. 87 (5); 189-200, 1955.
7. Putman W. L.: Sampling mites on peach leaves with the Henderson - Mc Burnie machine. J. Econ. Ent. 59 (1), 224-5, 1966.
8. Zieliński G.: Generatory liczb losowych. WNT, Warszawa 1972.

Wojciech Bogatko, Elżbieta Pała, Czesław Smolarek

PRZYDATNOŚĆ METODY HENDERSONA - MC BURNIEGO DO OCENY LICZEBNOŚCI  
FORM RUCHOMYCH I JAJ PRZĘDZIORKA SOSNOWCA OLIGONYCHUS UNUNGUIS (JACOBI)  
NA ŚWIERKACH

S t r e s z c z e n i e

Oceniono przydatność aparatu szczoteczkowego Hendersona - Mc Burniego do liczenia form ruchomych i jaj przedziorka sosnowca oraz porównano tę metodę z oceną wizualną przy użyciu binokularu. Efektywność metody Hendersona - Mc Burniego wyniosła 94,3% dla form ruchomych oraz 68,5% dla jaj. W celu oceny zależności obu metod obliczono wartość współczynnika korelacji. We wszystkich analizowanych przypadkach stwierdzono wysoce istotną zależność obu metod. Zastosowanie metody Hendersona - Mc Burniego pozwalało na pięciokrotną oszczędność czasu w porównaniu z liczeniem przedziorków pod binokulem.

Войцех Богатко, Эльжбета Пала, Чеслав Смолярек

ПРИГОДНОСТЬ МЕТОДА ГЕНДЕРСОНА-МАКБЭРНИ В ОЦЕНКЕ  
ЧИСЛЕННОСТИ ПОДВИЖНЫХ ФОРМ И ЯИЧЕК СОСНОВОГО ПАУТИННОГО КЛЕЩА  
OLIGONYCHUS UNUNGUIS (JACOBI) НА ЕЛИ

Р е з ю м е

Оценивали пригодность щеткового аппарата Гендерсона-МакБэрни для считания подвижных форм и яичек соснового паутинного клеща и сравнивали этот метод с визуальной оценкой при использовании биноклярной лупы. Эффективность метода Гендерсона-МакБэрни составляла 94,3% для подвижных форм и 68,5% для яичек. Для оценки взаимозависимости обоих методов был исчислен коэффициент корреляции. Во всех анализируемых случаях установлена высокосущественная взаимозависимость обоих методов. Применение метода Гендерсона-МакБэрни позволяла сэкономить время гораздо более длинное при считании клещей под биноклярной лупой.