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Further experiments with *Phytoseiulus riegeli* Dosse as a predator of *Tetranychidae*

In a previous publication (BRAVENBOER and DOSSE 1962) some results have been described of *Phytoseiulus riegeli* as a predator of *Tetranychus urticae* and *T. cinnabarinus*. The experiments showed that this predator is very effective in glasshouse crops like cucumbers, grapes and peaches. The effectiveness is due to the fact that the life-cycle of the predator is considerably shorter than that of the prey. Besides this the predator in very active and can run fast, which means that its searching capacity is very great.

The research carried out during the last years was mainly directed to population dynamics. The experiments were done in caged peach trees. To study the development of the populations of both prey and predator, spider mites were introduced in different numbers on the peach trees. The predator was released 0, 10 and 20 days after the introduction of *T. cinnabarinus*. Every week the population-densities were counted by means of a binocular microscope. In table 1 the results of some of these experiments are given.

TABLE I. - *Development of the populations of* T. cinnabarinus *and* P. riegeli

Population densities per 10 leaves at the beginning of the experiment		Maximum population densities per 10 leaves reached during the experiment		Time lapse between the introduction of P. riegeli and break-down of the population of T. cinnabarinus
T. cinnabarinus	*P. riegeli*	*T. cinnabarinus*	*P. riegeli*	
10	1	220	28	28 days
150	1	150	15	21
240	1	1600	310	42
350	1	1500	500	42
450	1	7500	1800	49
2200	1	13000	900	49

It is obvious that *P. riegeli* can reduce any population of *T. cinna-barinus* to very low levels within relatively short time. There is no direct relation between the population densities at the beginning of the experiment and the maximum population densities reached. This is on one hand caused by the fact that at low densities of both prey and predator the maximum predation is not reached, whilst on the other hand at high densities of the prey overcrowding is the limiting factor for the development of the prey. To prevent economic damage to the crop the ratio between prey and predator should not be higher than $\pm$ 300 : 1.
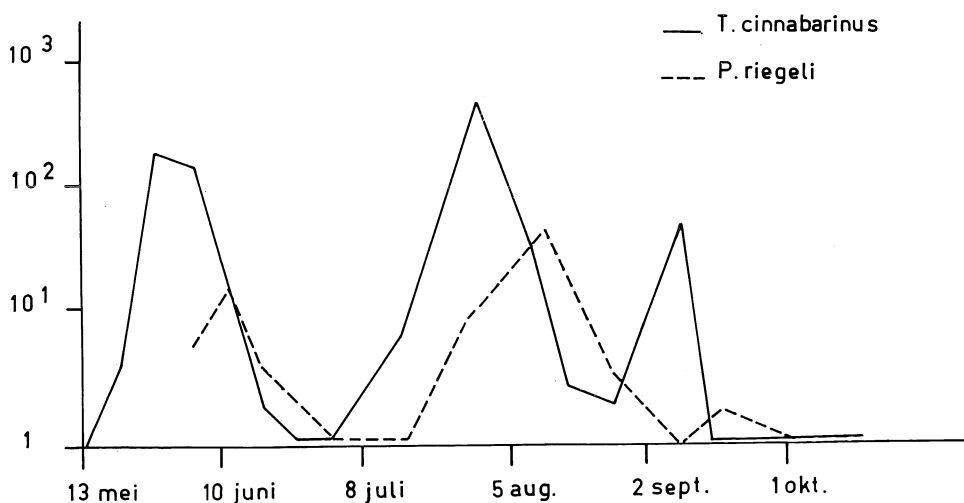
number of individuals per 20 leaves

Fig. 1 - Development of populations of *T. cinnabarinus* and *P. riegeli.*

In some of our experiments more than one peak in the populations of T. *cinnabarinus* and *P. riegeli* was obtained if the predator was released early in the growing season of the peach. Figure 1 is an example of a case in which the population of *T. cinnabarinus* rose three times to a certain level and was eliminated again by *P. riegeli* without any interference. This also shows the extreme efficiency of the predator very clearly.

The introduction of *P. riegeli* into practice looks most promising in cucumber growing under glass. However, besides red spider other pests and diseases like cucumber mildew (*Sphaerotheca fuliginea*),

white fly (*Trialeurodes vaporariorum*) and aphids have to be controll-
ed. Knowledge about the influence of pesticides on *P. riegeli* is there-
fore necessary. To get better information about this several insecti-
cides and fungicides were tested both under laboratory conditions and
in the field. All the organic phosphorous compounds like parathion,
diazinon, mevinfos etc. proved to be toxic; some of them were even
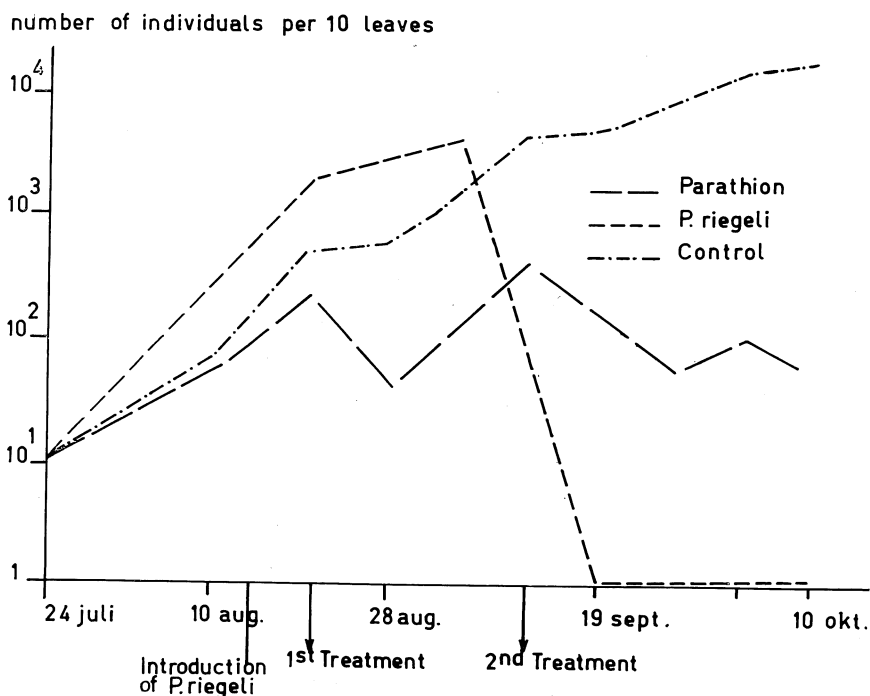
number of individuals per 10 leaves

Fig. 2 - The effect of parathion and of *P. riegeli* on populations of *T. cinnabarinus*.

toxic to the eggs of *P. riegeli*. Other insecticides such as DDT, lindane
and pyrethrum do not look very promising. The specific acaricides
Kelthane and Dimite are relatively safe, while ovicides like tedion are
completely safe. Of the aphicides only nicotine proved to be harmless
to *P. riegeli*. For the control of cucumber mildew both Karathane and
Morestan are used in practice. In an integrated spray program only
Karathane can be used, as Morestan is harmful to *P. riegeli*.

In addition to the population dynamics studies comparisons were
made between chemical and biological control of *T. cinnabarinus* on

peach trees. From these experiments two examples are given in fig. 2 and fig. 3. In fig. 2 the effect of parathion is compared with that of *P. riegeli*. It is evident that two treatments with parathion with an interval of 3 weeks are less effective than *P. riegeli*. Two treatments with Kelthane with an interval of 3 weeks can be as effective as the predator, although it took more time in this experiment to bring *T.*
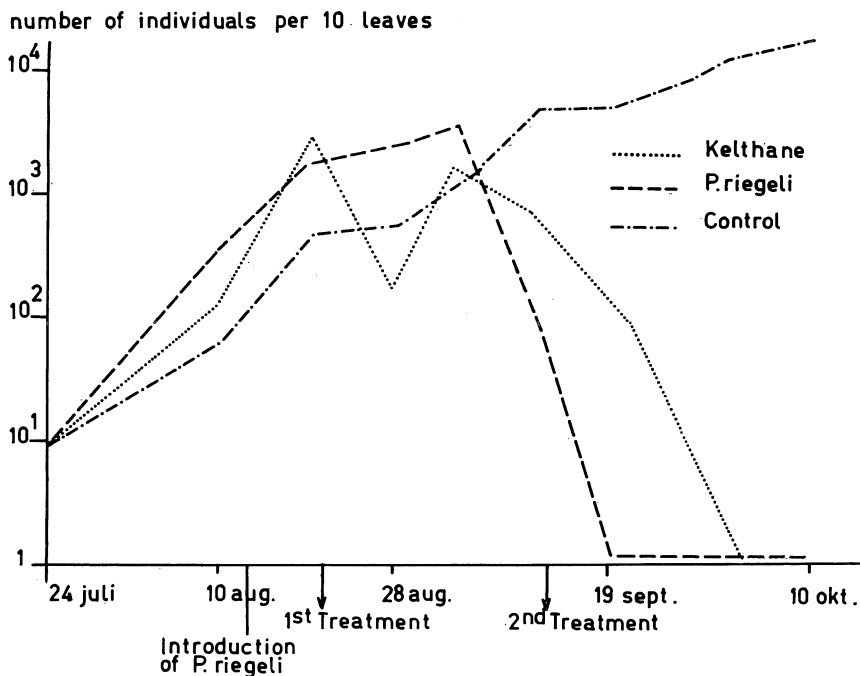
number of individuals per 10 leaves

Kelthane
P. riegeli
Control

24 juli   10 aug.   28 aug.   19 sept.   10 okt.

1st Treatment   2nd Treatment

Introduction
of P. riegeli

Fig. 3 - The effect of Kelthane and of *P. riegeli* con populations of *T. cinnabarinus.*

cinnabarinus on a sufficient low level with Kelthane than with *P. riegeli* (fig. 3).

The results of these experiments show that *P. riegeli* can be used very succesfully for the control of spider mites in glasshouse crops. The introduction into practice must be handled with great care, however, as disappointing results are to be expected if the grower is not fully aware of what has to be done to benefit the good possibilities of this efficient predator.

SUMMARY

Population dynamics studies showed that the predator *Phytoseiulus riegeli* can control any population of *Tetraniychus cinnabarinus*. Only few of the pesticides used up to now are harmless to *P. riegeli* as was found in studies on the effect of insecticides and fungicides on this predator.

RIASSUNTO

Le osservazioni sulla dinamica delle popolazioni di Acari dimostrano che il predatore *Phytoseiulus riegeli* riesce a contenere le popolazioni di *Tetranychus cinnabarinus*.

Gli studi sull'effetto che verso tale predatore hanno gli insetticidi e i fungicidi hanno posto in rilievo che soltanto pochi degli antiparassitari attualmente impiegati risultano innocui per il *P. riegeli*.

LITERATURE CITED

BRAVENBOER L., DOSSE G., 1962 - *Phytoseiulus riegeli* Dosse als Prädator einiger Schadmilben aus der *Tetranychus urticae* Gruppe. *Entomologia exp. appl.* 5, 291-304, 6 figg., 6 tab..