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Preliminary results of rearing two-spotted spider mites in the laboratory

The two-spotted spider mites have become the most serious pests of some important crops such as cotton, truck crops and fruit-trees in Turkey. There has been an intensive activity on the part of the growers as well as of the Plant Protection Organization to control them. The results, however, have not always been successful. An acaricide proving to be very effective in one locality could be of little or no value in an other.

This might be due to the differences in either environmental factors, or species involved, or both. The complexity of these mites and the existence of a considerable difference in susceptibility to acaricides among the strains (HUSSEY and PARR, 1958) led me to think the second case to be the most probable one. Then I undertook a study to distinguish the forms or species, if any, as had been done by several workers in other parts of the world such as KEH (1952), DAVIS (1952), DOSSE (1952 and 1963), NEWCOMER (1954), PRITCHARD and BAKER (1952), BAKER and PRITCHARD (1953), BOUDREAUX (1956), VAN DE BUND and HELLE (1960), HELLE and VAN DE BUND (1962), BOUDREAUX and DOSSE (1963), DOSSE and BOUDREAUX (1963) and DOSSE and NUBER (1963).

I was unable to find any constant morphological differences among the specimens sent to me from various localities in the alcohol. The form of the dorsal integumentary folds, suggested by BOUDREAUX (1956) and BOUDREAUX and DOSSE (1963) as a complementary taxonomic trait, was not typical enough for any specimen, either. Then, I realized the necessity of performing crossings and collected living material from different regions. I reared them separately on beans in pots or on bean leaves bedded on wetted cotton in Petri-dishes.

The brownish red mites collected from Adana (Southern Turkey) had all the morphological characteristics of *Tetranychus telarius* Koch

(*T. cinnabarinus* Boisduval) given by BOUDREAUX (1956) except that the color was not true carmine like that demonstrated by VAN DE BUND and HELLE (1960). The offsprings obtained from this material for several generations were all of the same type as their parent stock.

The green mites have a large distribution area and host list in Turkey. Those which I used for rearing were collected from Ankara (Middle Anatolia) on *Hibiscus* sp. and *Cucurbita pepo*. They were definitely *T. urticae* Koch in all the characteristics. It is worth pointing out here that they could be reared throughout the winter in room temperature without any winter form appearing. When the individuals in the state of diapause outside were taken to the laboratory, they gradually changed into summer form and layed eggs. This has always been the case since my first observation in 1951 (DÜZGÜNES 1954). There are similar (NUBER, 1961) as well as contrary (LINKE, 1953 and BRAVENBOER, 1959) findings to this.

The third type of mites I reared was collected from *Lamium* sp. in Ankara on March 11, 1965. There were only three females with their eggs on the same leave. One of the females was reddish brown, the other brownish black and the third orange. The orange female became reddish brown before egg laying in the laboratory. The eggs were of various color from yellowish and reddish brown to dark brown. Each female and the eggs were transmitted to separate been leaves. The most interesting fact which I like to report here is that the new individuals reared in the laboratory had a large variation in color as well as in spots. There were reddish brown, brownish black and blackish individuals. The spots of some individuals were distributed laterally, they may be large or small. In other individuals there was a single spot covering the upper half of the body (behind gnathosoma). It could also be possible to see a narrow spot following the median line, and a large spot extending to the entire body.

Three to five females from each color type were singled out and their offspring were obtained separately. Each of them segregated almost in the same fashion, except that the blackish females yielded more blackish offspring than their reddish brown and brownish black sisters. This type of rearing continued for 4 to 6 generations. In the later generations there also appeared some bright red individuals which were found to be steril. Out of 26 of them only 2 layed but few eggs which did not hatch. I like to point out here that no green individual has appeared among the offspring of this segregating material.

Later on I found this particular type of Tetranychid mites on other hosts in Ankara as well as in Izmir (Western Anatolia) and reared them in the laboratory with the same results just described.

As the second part of the study I tried to cross these three populations to check whether they were isolated. The crossings performed reciprocally between the green form and the brownish red form from the south yielded no hybrid females. This indicates that they are distinct species, the former being *T. urticae* Koch and latter *T. telarius* Koch (*cinnabarinus* Boisduval). The fact that some workers (HUSSEY and PARR, 1958) obtained few fertile hybrids between these species does not impart this conclusion.

The same result was obtained from the crossings between the green form (*T. urticae*) and the segregating population. This shows that *T. urticae* has nothing to do with this population. That no green individual was found among more than one thousand offspring obtained from the segregating types, is another indication of this fact.

When, however, the segregating mites were crossed with *T. telarius* Koch (*cinnabarinus* Boisduval), the resulting offspring were all fertile to both parents as well as among themselves. They were also showing variations in color and spots.

I could not find any other explanation for these results than that the segregating population was derived from *T. telarius* Koch (*cinnabarinus* Boisduval) through mutations. Although it is well known that this species is polytypic (PARR and HUSSEY, 1960), no single type of it has been described so far as showing segregation when intrabred, but my population is segregating. Besides, no type of *T. cinnabarinus* has been found outside the green house in continental climate, but my population was living outside even in March in Ankara which typical continental climate. Thus the population in question may be in a state of evolution. This should be shown by continuously following the changes in frequencies of different types occurring through segregation. This will be my future work.

I also like to report here that I found some green mites on *Platanus* sp. in Ankara. As this is a new host for *Tetranychus*, it would be interesting to see whether these mites are different from the green forms found on common hosts.

S U M M A R Y

The species of the genus *Tetranychus* have become the most serious pest of some important crops (cotton, truck crops and fruits) in Turkey. As the

same methods do not control the *Tetranychus* populations equally well in every region, a study was undertaken to see whether the populations in these regions were different. Each sample collected from different regions was first reared and propagated separately on beans in pots in the laboratory. All the offspring from the brownish red mites (*T. cinnabarinus*) which predominate in Southern Turkey have shown the same color pattern as their parents. So were the offspring of the green mites (*T. urticae*) collected from Middle Anatolia. It is worth indicating here that the green form did not show any tendency to hibernate as long as it found adequate food. This confirms my observations in 1954. Another form, which is brownish black to reddish brown, was found in Middle and Western Anatolia. They segregated in color. They gave offsprings varying in color from self-black to self-red. When each type of the offspring was separately reared, the reds were found to be sterile. Although some individuals layed eggs, they did not hatch. The blacks gave offspring of various color pattern with blacks being more frequent. The individuals resembling the parent stock segregated entirely in the same fashion.

The crossings performed reciprocally between the green and the brownish red forms were fruitless. All the offspring obtained were males. The same result was obtained from crossing between the green form and the brownish black-reddish brown form. However, the latters were fertile with brownish red form (*T. cinnabarinus*). The hybrids were also fertile when mated to either parental form as well as among themselves. They also showed variation in color pattern. It thus may be concluded that the brownish black reddish brown forms are the variates or the mutant forms of *T. cinnabarinus* which are not yet fixed genotypically.

RIASSUNTO

Le specie del gen. *Tetranychus*, divenuto in Turchia il più dannoso fitofago per alcune colture di notevole interesse (cotone, colture erbacee, fruttiferi), non risultano efficacemente combattute da identici metodi di lotta nelle varie regioni.

Al fine di accertare se si tratta di popolazioni differenti, l'A. ha allevato e riprodotto separatamente in laboratorio, su fagioli in vaso, campioni provenienti dalle diverse zone.

Tutta la discendenza del *Tetranychus cinnabarinus* (bruno), che predomina nel sud della Turchia, ha mostrato di possedere lo stesso colore della generazione parentale; lo stesso è avvenuto per la discendenza del *T. urticae* (verde) dell'Anatolia centrale. La forma verde non ha mostrato tendenza a ibernare fintanto che aveva adeguata disponibilità di alimento, a conferma di precedenti osservazioni effettuate nel 1954. Un'altra forma, di colore variante dal bruno-nero al bruno-rosso e reperita nell'Anatolia centrale e occidentale, ha dato discendenze varianti nel colore dal nero uniforme al rosso uniforme. Quando la discendenza veniva allevata in purezza, le forme rosse si mostravano sterili, mentre le forme nere fornivano discendenza di diverse sfumature di colore, con maggiore frequenza per le forme nere.

Gli individui simili alla generazione parentale disgiungevano nello stesso modo.

Gli incroci ottenuti reciprocamente tra forme verdi e forme brune non avevano seguito, poiché tutti i discendenti erano maschi. Lo stesso risultato fu ottenuto da incroci tra la forma verde e la forma bruno-nero o bruno-rosso. Tuttavia questi ultimi erano fertili se accoppiati con femmine bruno-rosse (*T. cinnabarinus*). Gli ibridi, essi pure fertili, mostrano variazioni di colore.

L'A. conclude che la forma bruno-nero e quella bruno-rosso, sono varianti o mutanti del *T. cinnabarinus* non ancora fissate genotipicamente.

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DISCUSSION

HELLE: Why did you use the expression "genotypically fixed". It appears to me you intend to express: "genotypically isolated".

DÜZGÜNES: It means that the population in question is still in state of evolution. Could be used "genotypically isolated" too.

