JOURNAL OF PLANT PROTECTION RESEARCH
Vol. 40, No. 1 2000

EFFECT OF PLANT GROWTH-PROMOTING RHIZOBACTERIA (PGPR) ON DEVELOPMENT OF SPIDER MITE POPULATIONS ON GLASSHOUSE CUCUMBER AND TOMATO

ANNA TOMCZYK, MAŁGORZATA KIEŁKIEWICZ

WARSAW AGRICULTURAL UNIVERSITY, DEPARTMENT OF APPLIED ENTOMOLOGY, NOWOURSYNOWSKA 166, 02-787 WARSZAWA, POLAND

Abstract. The influence of PGPR on the susceptibility of glasshouse cucumber and tomato to spider mites was studied. It was found that plants treated with PGPR suppressed the development of mite populations on both studied crops. The effect was more evident for cucumber, as compared to tomato plants. Mite population was smaller by more than 40% on the leaves of the susceptible cucumber cultivar, Corona growing in the presence of rhizobacteria, as compared to that without bacteria. The development of spider mite population on the bacterized susceptible tomato cultivar, Romatos was more inhibited on young leaves (43%) than on older ones (34%). As the injury of plants progressed the level of inhibition was decreased.

Key words: *Tetranychus cinnabarinus*, cucumber, tomato, plant growth-promoting rizobacteria (PGPR)

I. INTRODUCTION

A few years ago some scientific centres undertook research on the crop resistance against diseases, inducted by bacteria associated with the rhizosphere and classified as plant growth-promoting rhizobacteria (PGPR). Mainly *Pseudomonas* and *Serratia* strains were tested in this respect. Recently it was found that some pests can be also suppresed on crop grown in the presence of PGPR. Cucumber beetles were limited in numbers on bacterized field cucumber (Zehnder et al. 1996). Also under glasshouse conditions there was a reduction of aphid populations on PGPR-treated tomato plants (Zehnder et al. 1996). The hitherto studies revealed some differences in the metabolism between plants growing in the presence of PGPR and non-bacterized, related to the resistance of those plants against pathogens or pests (Borowicz et al. 1992; Cook et al. 1995; Zehdner et al. 1996).

II. MATERIAL AND METHODS

The experiments was started in the end of February, under glasshouse conditions. Seeds of two cultivars of glasshouse cucumber – Corona and Aramis, and the seeds of tomato cv. Romatos were soaked for 20 min in suspension of PGPR (isolate P-112 of *Pseudomonas* spp. derived from rhizosphere of cucumber seedlings). The inoculum used contained 3×10^9 bacterial cells in 1 cm^3 of suspension. The seeds were sown into peat blocks, then the seedlings were placed into rings with peat substrate.

In due course the plants were initially infested with females of *Tetranychus cinnabarinus*. Each cultivar of both crops was represented by two groups of plants: bacterized (obtained from bacteria-treated seeds – ten plants) and control (non-bacterized – ten plants). Cucumber plants at the stage of 3 leaves were initialy infested witch 15 mites per plant, placing 5 specimens per leaf. Each tomato plant was supplied witch 10 females equally divided between two compound leaves growing directly above and below the first truss.

The development of pest populations on cucumber and tomato plants was observed during 7-8 weeks at 7-10 day intervals.

III. RESULTS

Records reflecting the mite quantity over the research period on cucumber and tomato are presented in Figs. 1 and 2, respectively. During the first four weeks the number of mobile

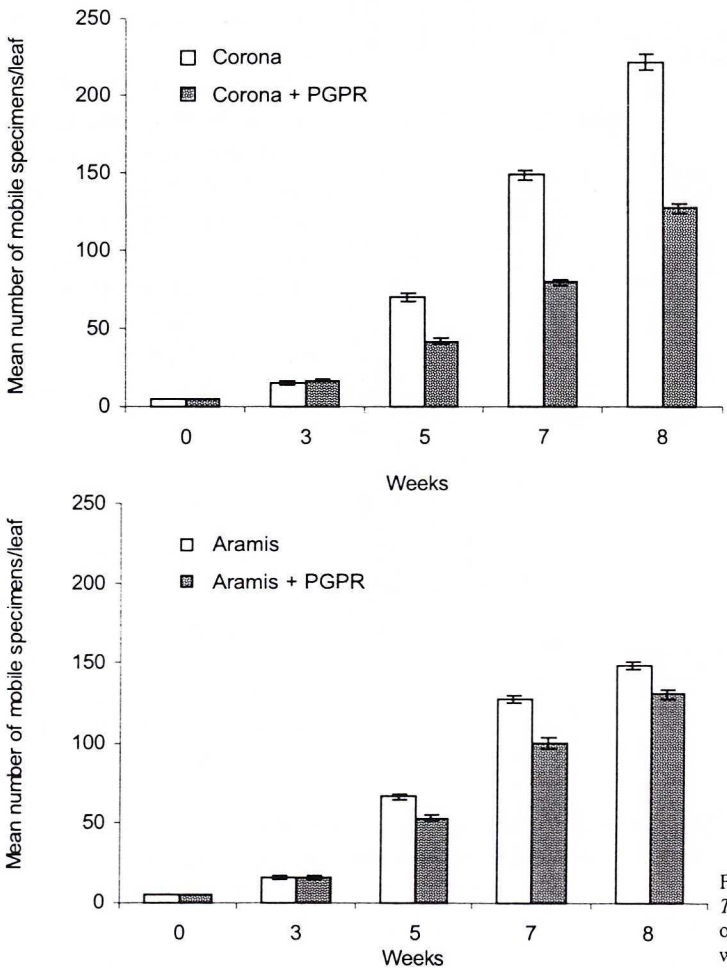

Fig. 1. The development of *T. cinnabarinus* population on cucumber plants treated with PGPR and untreated

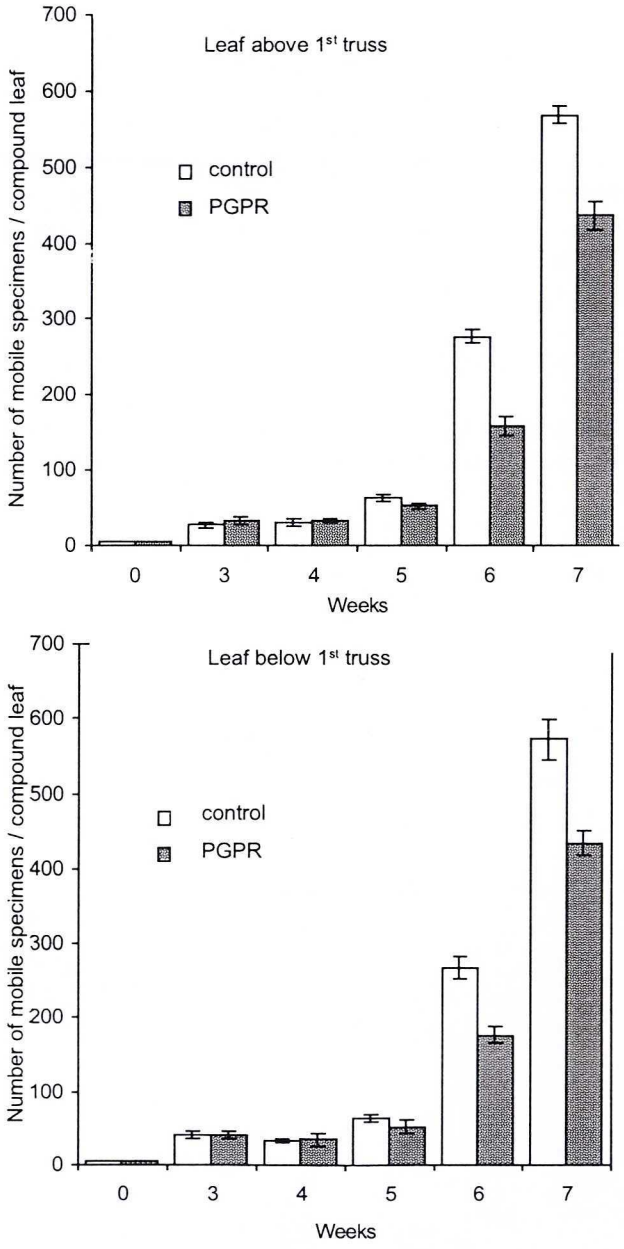

Fig. 2. The development of *T. cinnabarinus* population on tomato plants treated with PGPR and untreated

mites on both crops was comparable between bacterized and control plants. After the 5th week, however, there was an evident inhibition in the development of pest population on PGPR-treated plants. Although on both cucumber cultivars the mites declined in numbers as compared to the control, this reduction was more pronounced on cv. Corona, exceeding 40% (Fig. 1). Also on tomato (Fig. 2) the pest on bacterized plants was less numerous than on control and after 6 weeks this difference reached 43% for young leaves (above 1st truss) and 34% for older ones (below 1st truss). A week later, when the plant injury progressed, the relevant difference declined to 24%.

IV. DISCUSSION

The data obtained show that *Tetranychus cinnabarinus* populations were distinctly smaller on both PGPR-treated plants (cucumber and tomato) as compared to those non-bacterized. Such an effect was especially pronounced on cucumber cv. Corona which is more susceptible to spider mite feeding than the other tested cultivar, Aramis.

On the susceptible tomato cultivar, Romatos an inhibiting effect on spider mite population was more evident for young leaves (above 1st truss) than for older ones (below 1st truss). As the extent of plant injury increased, the level of inhibition was reduced.

It seems that the presence of plant growth-promoting rhizobacteria within the root zone of glasshouse cucumber and tomato may induce certain changes in a plant which result in lowering its susceptibility to spider mites. The reduction in number of some insect species feeding on PGPR – treated plants was found by other authors (Zehnder et al. 1996).

IV. LITERATURE

1. Borowicz J.J., Pietr S.J., Stankiewicz M., Lewicka T., Żukowska Z. 1992. Inhibition of fungal cellulase, pectinase and xylanase activity by plant growth-promoting fluorescent *Pseudomonas* spp. Bull. OILB-SROP 15 (1): 103-106.
2. Cook R.J., Thomashow L.S., Weller D.M., Fujimoto D., Mazzola M., Bangera G., Kim D.S. 1995. Molecular mechanisms of defence by rhizobacteria against root disease. Proc. of the National Academy of Sciences of the USA 92 (10): 4197-4201.
3. Zehnder G.W., Yao C., Kloepper J.W., Murphy J., Tuzun S., Wei G., Shelby R., Chambliss O. 1996. Rhizobacteria-induced crop resistance against insect-vectored disease pathogens of vegetables. Proc. of XX International Congress of Entomology, p 722.

Anna Tomczyk, Małgorzata Kiełkiewicz

WPŁYW BAKTERII STREFY KORZENIOWEJ (PGPR), WSPOMAGAJĄCYCH WZROST, NA ROZWÓJ POPULACJI PRZĘDZIORKÓW W UPRAWACH OGÓRKÓW I POMIDORÓW SZKLARNIOWYCH

STRESZCZENIE

Nasiona dwóch odmian ogórka szklarniowego – Corona, Aramis oraz pomidora odmiany Romatos moczono przez 20 minut w zawiesinie bakteryjnej wybranego szczepu *Pseudomonas* sp. i wysiewano do podłoża. Uzyskane rośliny porażano samicami *T. cinnabarinus* i obserwowano rozwój populacji szkodnika przez okres 7-8 tygodni. W ciągu pierwszych 4 tygodni liczebność stadiów ruchomych *T. cinnabarinus* na roślinach uprawianych w obecności bakterii była podobna do liczebności populacji na roślinach kontrolnych. Po 5 tygodniach żerowania przędziorków zaobserwowano wyraźne ograniczenie rozwoju populacji *T. cinnabarinus* na roślinach rosnących w obecności bakterii, w porównaniu z kontrolą. Liczebność populacji szkodnika zmniejszyła się na odmianie Corona o ponad 40%, a na mniej podatnej odmianie Aramis o kilka procent. W przypadku badanej odmiany pomidora stwierdzono ponad 20% obniżenie liczebności populacji *T. cinnabarinus* na roślinach rosnących w obecności bakterii z grupy PGPR, w porównaniu z roślinami wolnymi od bakterii.