Evidence for *Pratylenchus coffeae* Races in Differential Reproduction on Fifteen Cultivars
(Nematoda: Pratylenchidae)

Takayuki Mizukubo*

The reproduction of three populations of *Pratylenchus coffeae* from Saitama, Mie, and Miyazaki Prefectures in Japan differed on 14 test crops. The Miyazaki population reproduced significantly more \((P \leq 0.05, \text{LSD})\) than the Mie population on seven crops (radish, kidney bean, tomato, eggplant, chrysanthemum, and two susceptible cultivars of sweet potato), but less \((P > 0.05, \text{LSD})\) on seven crops (cucumber, tobacco, lima bean, cow pea, carrot, spinach, and okura). However, except in the sweet potato cultivars and eggplant, the Miyazaki population did not differ from the Saitama population in reproduction. Five populations of *P. coffeae* from Saitama, Mie, Nagasaki, Miyazaki, and Okinawa differed in reproductive fitness on susceptible (Koganesengan and Norin 2) and resistant (Minamiyutaka) sweet potato cultivars. Miyazaki and Okinawa populations were distinguished from Saitama, Mie, and Nagasaki populations by the significantly higher reproduction \((P \leq 0.05, \text{LSD})\) on susceptible sweet potato cultivars. The latter three populations propagated poorly on all the sweet potato cultivars, suggesting that sweet potato was a poor host for these populations. The results are evidence for the presence of physiological races among the Japanese *P. coffeae* populations. Jpn. J. Nematol. 25 (2): 85-93 (1995: publ. 1996).

Key word: reproduction, host range test, sweet potato, physiological races.

INTRODUCTION

*Pratylenchus coffeae* (Zimmerman, 1898) is a well documented pest of sweet potato (5, 12, 13, 40), taro (17, 21, 22, 24, 25, 32, 33, 34, 35, 36), potato (5, 7, 38), elephant-foot (*Amorphophallus konjac* C. Koch) (23), upland rice (11), and soy bean (10) in Japan. This species has been widely recovered throughout Japan except for Hokkaido, the northernmost island of Japan (6). *Pratylenchus coffeae* in Miyazaki Prefecture caused yield reduction of nearly 30% on susceptible sweet potato (4). Japanese breeding programs for nematode resistance in sweet potato have given equal importance to *P. coffeae* and *Meloidogyne incognita* (9). Even so, injury to sweet potato caused by this nematode has only been recognized in Miyazaki and Kagoshima of Kyushu Island in southwest Japan. This could be due to environmental factors such as differences in soil or temperature but it is also possible that some physiological races (37) or pathotypes have developed in this species. The host ranges of *P. coffeae* populations from geographically distinct locations in Japan have not yet been experimentally compared. The only available reports on this subject were based on restricted demes (local populations) from Kyushu (4, 12, 38). Physiological

---

*Laboratory of Plant Nematology, Department of Recalcitrant Disease and Pest Management, Kyushu National Agricultural Experiment Station, Suya 2412, Nishigoshi, Kikuchi-gun, Kumamoto, 861-11 Japan.
races of this species are still unknown. Races or pathotypes have been major topics in researches on root-knot nematodes (Meloidogyne spp.), cyst nematodes (Heterodera spp. and Globodera spp.), Ditylenchus dipsaci, Tylenchulus semipenetrans, Aphielenchoides besseyi, and Bursaphelenchus xylophilus (29). Conversely, nematologist have only recently described races in Pratylenchus spp. (8, 26, 27, 28).

The objective of this study is to determine if host range and reproduction differ in geographically separate populations of P. coffeae. The results of this study will contribute to identifying possible races of P. coffeae.

MATERIALS AND METHODS

Five populations of P. coffeae originating from different geographic locations were tested (Table 1). The populations were reared monoxenically on lucerne (Medicago sativa) callus (20) and maintained at 25°C for about one year except for the Mie population, which had been maintained on callus for nearly 15 years. Species identifications were made by the author based on nematode morphology. Nematode inocula were obtained from callus using autoclaved BAERMANN funnels (19) for aseptic nematode extraction. Nematodes recovered after 24-hours-extraction were centrifuged (1 min. at 1,380 G) three times with tap water to remove residual culture medium.

Reproduction on 14 crops (greenhouse bench experiment): Reproduction was examined on the following 14 crops: cow pea (Vigna sinensis cv. California Blackeye, Chas. H. Lilly Co., USA), lima bean (Phaseolus limensis cv. Henderson Bush, Northrup King Co., USA), kidney bean (Phaseolus vulgaris cv. Peak Light, Sakata Co., Japan), tomato (Lycopersicum pimpinellifolium cv. Pritz MR), eggplant (Solanum melongena cv. Kokuyo, Takii Co., Japan), tobacco (Nicotiana tabacum cv. NC95), sweet potato (Ipomoea batatas cv. Koganesengan and Norin 2: susceptible to P. coffeae), cucumber (Cucumis sativus cv. Seiryo-Shiroibo, Takii Co.), carrot (Daucus carota cv. Harumaki-Kinkogosun, Sakata Co.), radish (Raphanus sativus cv. Tokinashi, Takii Co.), spinach (Spinacia oleracea cv. Kokuyo-Minsterland, Takii Co.), okra (Abelmoschus esculentus, unknown cultivar of Atariya Co., Japan), chrysanthemum (Chrysanthemum morifolium, unknown cultivar of the Higo-group). Two separate greenhouse experiments were conducted to compare the reproduction of the populations from Saitama, Mie, Miyazaki. Seeds were germinated on filter paper in petri dishes for 48 hours. When radicles were 2-15 mm long, seedlings were planted in

Table 1. Origin of five Pratylenchus coffeae populations.

<table>
<thead>
<tr>
<th>Populations</th>
<th>Geographic origin</th>
<th>Host</th>
<th>Raised from</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saitama</td>
<td>Urawa City, Saitama</td>
<td>Taro (Colocasia esculenta SHOTT)</td>
<td>1♀</td>
<td>TU</td>
</tr>
<tr>
<td>Mie</td>
<td>Unknown Town, Mie</td>
<td>Unknown</td>
<td>1♀8♂</td>
<td>KO</td>
</tr>
<tr>
<td>Nagasaki</td>
<td>Omura City, Nagasaki</td>
<td>Taro (Colocasia esculenta SHOTT)</td>
<td>1♀</td>
<td>TM</td>
</tr>
<tr>
<td>Miyazaki</td>
<td>Nishigoshi Town, Kumamoto (originally introduced from Miyakonojo, Miyazaki for the field research)</td>
<td>Buckwheat (Fagopyrum esculentum MOENCH)</td>
<td>1♀</td>
<td>TM</td>
</tr>
<tr>
<td>Okinawa</td>
<td>Ishigaki City, Okinawa</td>
<td>Pumpkin (Cucurbita moschata DUHESNE)</td>
<td>1♀1♂</td>
<td>TM</td>
</tr>
</tbody>
</table>

TU=Saitama Horticultural Experiment Station, Tsurugashima Branch (Courtesy of Mrs. Tomoko UEDA); TM=Author's collection; KO=Shionogi Co., Ltd. (Courtesy of Dr. Katsuaki OHBA)
plastic pots (9 cm top diam., 6.5 cm bottom diam., and 9 cm deep) containing 200 g autoclaved andosol from a field of the Kyushu National Agricultural Experiment Station. Sweet potato vine cuttings and chrysanthemum stem cuttings with a single leaf were planted in vermiculite containers for one week and two weeks, respectively, then were transplanted to plastic pots. Plants were inoculated with 500 mixed stage nematodes in 1 ml tap water suspension through a hole of 2 cm deep and 2 cm from the base of the stem. Radish, tomato, cucumber, kidney bean, lima bean and cow pea were inoculated 37 days after seeding and subsequently maintained in a greenhouse for 60 days (May 21 to July 19). Eggplant, tobacco, sweet potato, carrot, okra and chrysanthemum were inoculated 57 days after seeding and/or planting, then maintained in a greenhouse for 60 days (July 10 to August 8). Soil temperatures for the greenhouse experiment were not monitored. Treatments were arranged in a randomized complete block design with 3 replications. Plants were watered lightly after inoculation and as needed thereafter. Nematode reproduction was evaluated 60 days after inoculation. Soil samples were passed through a 1 mm-pore-sieve (16 mesh) to remove roots. Nematodes in soil from each pot were extracted from two 20 g soil samples for 48 hours by the BAERMANN funnel technique and the average of the two counts was used as a datum. Data were transformed to log10 (x + 1) and analyzed using Analysis of Variance (ANOVA). The means were compared using the Least Significant Difference (LSD) procedure (P ≤ 0.05). The nematode reproduction index (Pf/Pi = final nematode numbers from BAERMANN funnel extraction divided by the number of nematodes in initial inoculum) was also calculated.

Reproduction on susceptible and resistant sweet potato cultivars (growth chamber experiment): A temperature controlled growth chamber test was conducted to compare the reproduction of the populations from Saitama, Mie, Nagasaki, Miyazaki, and Okinawa on three sweet potato cultivars with different resistance reactions to *P. coffeae*, i.e., cv. Koganesengan (susceptible), cv. Norin 2 (susceptible), cv. Minamiyutaka (resistant). Treatments were replicated three times in a completely randomized design for each cultivar. Plants were grown in chambers for 55 days. Temperature was programmed to fluctuate between 26°C (for 11 hours dark period) and 32°C (for 13 hours lighted with 24,000 lux) with a 30°C average temperature throughout the period of growth. The average soil temperature monitored during the growth period was 28.0°C. Nematodes were extracted from three 20 g soil samples taken from each pot using the BAERMANN funnel technique for 72 hours. Other methods were similar to those described in the greenhouse test.

RESULTS

Reproduction on 14 crops (greenhouse bench experiment): Cucumber and Norin 2 (susceptible sweet potato cultivar) had average final soil nematode numbers (soil Pf) for the three *P. coffeae* populations greater than the initial inoculum (Pi). All other crop cultivars had average soil Pf/Pi ≤ 1 (Table 2). The Miyazaki population had the highest average soil Pf for all 14 crop cultivars and had the highest Pf for the seven crops in which a significant difference existed between the three *P. coffeae* populations (P ≤ 0.05). The soil Pf of the Miyazaki population was also larger than the Pi for 7 of the 14 crops. The soil Pf exceeded the Pi of the Saitama population only for cucumber, and the Mie populations had no soil Pf that exceeded the Pi. In particular, the Miyazaki population had a Pf for the two sweet potato cultivars, Norin 2 and Koganesengan, greater than the Pi indicating these two cultivars were hosts of this population. However, the Mie
Table 2. Final soil nematode number (Pf(P)) and Pf/Pi of three populations of Pratylenchus coffeae from different geographic locations in Japan on 14 crops 60 days after inoculation.

<table>
<thead>
<tr>
<th>Crops</th>
<th>Miyazaki</th>
<th>Saitama</th>
<th>Mie</th>
<th>LSD</th>
<th>AVG for cultivars</th>
<th>LSD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pf (Pf/Pi)</td>
<td>Pf (Pf/Pi)</td>
<td>Pf (Pf/Pi)</td>
<td></td>
<td>Pf (Pf/Pi)</td>
<td></td>
</tr>
<tr>
<td>Cucumber</td>
<td>2.37 (6.71)</td>
<td>2.24 (3.55)</td>
<td>1.51 (0.69)</td>
<td>n.s.</td>
<td>2.04 (3.65)</td>
<td></td>
</tr>
<tr>
<td>Radish</td>
<td>1.71 (1.02)</td>
<td>1.45 (0.61)</td>
<td>1.00 (0.19)</td>
<td>0.69</td>
<td>1.39 (0.61)</td>
<td></td>
</tr>
<tr>
<td>Cow pea</td>
<td>1.80 (1.84)</td>
<td>1.02 (0.23)</td>
<td>1.14 (0.27)</td>
<td>n.s.</td>
<td>1.32 (0.78)</td>
<td></td>
</tr>
<tr>
<td>Kidney bean</td>
<td>1.83 (1.43)</td>
<td>1.40 (0.64)</td>
<td>0.52 (0.05)</td>
<td>1.01</td>
<td>1.25 (0.71)</td>
<td></td>
</tr>
<tr>
<td>Spinach</td>
<td>1.20 (0.37)</td>
<td>1.24 (0.40)</td>
<td>1.11 (0.30)</td>
<td>n.s.</td>
<td>1.18 (0.36)</td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td>1.66 (1.02)</td>
<td>1.22 (0.32)</td>
<td>0.23 (0.02)</td>
<td>0.77</td>
<td>1.04 (0.45)</td>
<td></td>
</tr>
<tr>
<td>Eggplant</td>
<td>1.43 (0.59)</td>
<td>0.54 (0.07)</td>
<td>1.00 (0.19)</td>
<td>0.73</td>
<td>0.99 (0.29)</td>
<td></td>
</tr>
<tr>
<td>Chrysanthemum</td>
<td>1.19 (0.50)</td>
<td>1.13 (0.18)</td>
<td>0.38 (0.04)</td>
<td>0.73</td>
<td>0.90 (0.24)</td>
<td>n.s.</td>
</tr>
<tr>
<td>Koganesengan</td>
<td>1.89 (1.85)</td>
<td>0.29 (0.02)</td>
<td>0.52 (0.07)</td>
<td>1.13</td>
<td>0.90 (0.65)</td>
<td></td>
</tr>
<tr>
<td>Norin 2</td>
<td>2.17 (3.14)</td>
<td>0.06 (0.00)</td>
<td>0.44 (0.04)</td>
<td>0.75</td>
<td>0.89 (1.06)</td>
<td></td>
</tr>
<tr>
<td>Tobacco</td>
<td>1.39 (0.50)</td>
<td>0.79 (0.18)</td>
<td>0.47 (0.04)</td>
<td>n.s.</td>
<td>0.88 (0.24)</td>
<td></td>
</tr>
<tr>
<td>Carrot</td>
<td>0.55 (0.05)</td>
<td>0.48 (0.04)</td>
<td>0.20 (0.01)</td>
<td>n.s.</td>
<td>0.41 (0.04)</td>
<td></td>
</tr>
<tr>
<td>Lima bean</td>
<td>0.43 (0.04)</td>
<td>0.12 (0.01)</td>
<td>0.06 (0.00)</td>
<td>n.s.</td>
<td>0.20 (0.02)</td>
<td></td>
</tr>
<tr>
<td>Okra</td>
<td>0.22 (0.02)</td>
<td>0.10 (0.01)</td>
<td>0.00 (0.00)</td>
<td>n.s.</td>
<td>0.10 (0.01)</td>
<td></td>
</tr>
<tr>
<td>AVG for populations</td>
<td>1.42 (1.36)</td>
<td>0.86 (0.45)</td>
<td>0.61 (0.14)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Number of nematodes extracted from 20 g soil by the BAERMANN funnel technique for 48 hours. Data are means of three replications that are transformed to log₁₀(x+1) for analysis.

Table 3. Final soil nematode number (Pf(P)) and Pf/Pi of five populations of Pratylenchus coffeae on Koganesengan, Norin 2, and Minamiyutaka sweet potato cultivars 55 days after inoculation.

<table>
<thead>
<tr>
<th>Sweet potato cultivars</th>
<th>Okinawa</th>
<th>Miyazaki</th>
<th>Saitama</th>
<th>Mie</th>
<th>Nagasaki</th>
<th>LSD</th>
<th>AVG for cultivars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pf (Pf/Pi)</td>
<td>Pf (Pf/Pi)</td>
<td>Pf (Pf/Pi)</td>
<td>Pf (Pf/Pi)</td>
<td>Pf (Pf/Pi)</td>
<td></td>
<td>Pf (Pf/Pi)</td>
</tr>
<tr>
<td>Koganesengan</td>
<td>2.77 (13.43)</td>
<td>2.00 (1.98)</td>
<td>0.43 (0.05)</td>
<td>0.61 (0.10)</td>
<td>0.12 (0.01)</td>
<td>1.14</td>
<td>1.18 (3.11)</td>
</tr>
<tr>
<td>Norin 2</td>
<td>2.71 (10.56)</td>
<td>1.76 (1.44)</td>
<td>0.52 (0.05)</td>
<td>0.37 (0.03)</td>
<td>0.35 (0.03)</td>
<td>0.85</td>
<td>1.14 (2.42)</td>
</tr>
<tr>
<td>Minamiyutaka</td>
<td>1.46 (1.08)</td>
<td>1.09 (0.23)</td>
<td>0.28 (0.02)</td>
<td>0.22 (0.02)</td>
<td>0.42 (0.03)</td>
<td>1.11</td>
<td>0.69 (0.28)</td>
</tr>
<tr>
<td>LSD (P ≤ 0.05)</td>
<td>n.s.</td>
<td>0.90</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVG for populations</td>
<td>2.31 (8.36)</td>
<td>1.62 (1.22)</td>
<td>0.41 (0.04)</td>
<td>0.40 (1.45)</td>
<td>0.29 (0.81)</td>
<td>1.57</td>
<td></td>
</tr>
</tbody>
</table>

*Number of nematodes extracted from 20 g soil by the BAERMANN funnel technique for 72 hours. Data are means of three replications that are transformed to log₁₀(x+1) for analysis. **Susceptible cultivars to P. coffeae.

The reproduction on the susceptible and resistant sweet potato cultivars (growth chamber experiment): The average soil Pf/Pi values for the three sweet potato cultivars were all less than 1. Only Norin 2 and Koganesengan had soil Pf/Pi > 1 for the Okinawa and Miyazaki populations (Table 3). The Saitama, Mie, and Nagasaki populations had soil Pf/Pi values of 0.10 to 0.02. These facts indicated that Norin 2 and Koganesengan were clearly hosts for only the Okinawa and Miyazaki populations. The clear differences in reproduction between populations of P. coffeae on the three sweet potato cultivars suggest the existence of races in this species. The
Okinawa population had the highest reproduction on all cultivars followed by the Miyazaki, Saitama, Mie, and Nagasaki populations, respectively. Only the Saitama, Mie, and Nagasaki populations did not differ from each other in Pf on any of the 3 cultivars (P > 0.05) suggesting they belong to the same group so far as the reproduction on sweet potato is concerned. The soil Pfs of Okinawa and Miyazaki populations differed somewhat by Norin 2 (P ≤ 0.05) suggesting that although the two populations are distinct from the Saitama, Mie, and Nagasaki group they may also differ from each other.

DISCUSSION

Host range tests and/or host determination for P. coffeae have been examined repeatedly in Japan. All the examinations were, however, based solely on populations from Kyushu (4, 12, 38, GOTOH and OHSHIMA, 1964 (unpublished report)). KOZAKA (12) tested 17 crops by an inoculation method and reported that tomato, eggplant, tobacco, potato, taro, and sweet potato were good hosts. YOKOO (38) tested 31 cultivars by an inoculation method. He concluded that 10 cultivars (wheat, lowland rice (glutinous variety), radish, melon, kidney bean, soy bean, tomato, potato, pickled green, and broad bean) were good hosts. GOTOH and OHSHIMA (1964 unpublished report) tested 37 cultivars and concluded 24 cultivars (sweet potato, maize (three cultivars), cabbage, radish (three cultivars), cauliflower, garden pea, sweet pea, sautwicken, edible burdock, parsley, pumpkin (three cultivars), Benincasa hispida, cucumber, red pepper (two cultivars), stone leek, Crocus sativus, and Rodgersia podophyll) were hosts of P. coffeae. GOTO (4) reported that 81 plant species from 48 genera in 21 families were host of P. coffeae. He surveyed 153 plant species from fields recording root symptoms and inspecting roots for nematode inside root tissues. Thirty-seven of the plants were tested in pot experiments. Plant species that had been determined to be non-hosts or poor hosts of P. coffeae did not agree throughout these examinations. The inconsistent conclusions were attributed to possible differences in susceptibility of the test cultivars used by the respective authors (4).

The inconclusive results of previous reports on P. coffeae may be attributed to 1) inocula of unknown identity, 2) vaguely defined criteria of host plants, 3) lack of critical data such as number of nematodes inside or outside roots. Many of the studies mentioned lack critical information including description of methods and therefore cannot be easily compared. This situation requires a reexamination of host plants for P. coffeae in a more detailed manner.

The present examination did not establish a criteria for hosts, poor hosts, or non-hosts. The only criteria for the present study was reproduction of the populations on the test plants. The relative resistance (or susceptibility) of a host can be assessed by the relationship between the initial (Pi) and final (Pf) number of nematodes on a host plant (30). This measure has been used to describe successful reproduction of Pratylenchus species on host plants when Pf/Pi > 1 as was employed by GRIFFIN (8). The BEARMANN funnel technique had an extraction efficiency for Meloidogyne incognita juveniles and Helicotylenchus spp. of 22.4% and 16.0% after 48 hours and 24.5% and 18.7% after 72 hours respectively of total nematodes in soil (direct examination), when extracted from 10 g andosol (volcanic ash) at 20°C using the BAERMANN funnels of about 9 cm diameter (18). The number of Pratylenchus species per 1 g of soil was not significantly different (P > 0.05) when the extraction from 10 g and 20 g soil at 25°C was compared using identical funnel and filter paper used in the above experiment (unpublished data, MIZUKUBO). Considering that
the present study employed identical soil, funnel, and filter paper as Minagawa (18) except that 20 g of soil were placed on the funnels at 25°C, the present extraction efficiency of *P. coffeae* was to be under 25%. The culturing period of 55 and 60 days were enough for *P. coffeae* to pass through two generations, since Gotoh (5) observed that, at 25-30°C, *P. coffeae* passed one generation in 27 days. Accordingly, as far as nematodes outside roots are concerned, the soil Pf based on the Baermann funnel technique from soil would be at most only 25% of the true soil Pf. In addition to the error associated with the soil extraction method, the present study did not extract nematodes from inside roots. MacGuidwin (15) estimated that about 80% of *Pratylenchus scribneri* were inhabiting inside host roots and only 20% in soil. Although the percent of nematodes present in roots is not known for *P. coffeae*, it is quite possible that the populations inside roots would be more than twice the numbers outside roots. In the present study it is impossible to know if low number of nematodes in soil was due to unsuccessful reproduction or due to nematodes being present in roots with few present in soil. Because of this only host plants with a soil Pf/Pi >1 can be clearly identified as hosts. The host status of plants with soil Pf/Pi < 1 cannot be clearly defined in this study although the low extraction efficiency of the Baermann funnel technique suggests that plants with a soil Pf/Pi > 0.25 are likely hosts.

Loof (14) reported indication of *Pratylenchus neglectus* physiological races from the Netherlands. Olthof (26) mentioned races of *P. penetrans* based on their different reproduction on tobacco. Perry *et al.* (27) demonstrated that *P. penetrans* and *P. fallax* (sibling species of *P. penetrans*) could be separated on the basis of biological species concept. Recent analyses of reproductive fitness, DNA electrophoresis, or virulence within species of *Pratylenchus* from different geographic locations demonstrated several geographic and genetic types with different reproduction on fruit rootstocks in *P. vulnus* (28) and different physiological types in virulence on alfalfa in *P. neglectus* (8).

It was clear that the reproductions of *P. coffeae* populations plainly differed depending on the crop. The Miyazaki population showed significantly (*P* ≤ 0.05, LSD) higher reproduction than Mie in 7 out of 14 cultivars. However, except in sweet potato cultivars, the Miyazaki population did not differ from the Saitama population. This result is interesting because the injury to sweet potato by *P. coffeae* has never been documented in Honshu, although *P. coffeae* is considered to be a serious pest of sweet potato in southern Kyushu. The Miyazaki and Okinawa populations could be distinguished from Saitama, Mie, and Nagasaki populations by the significantly (*P* ≤ 0.05, LSD) higher reproduction on susceptible sweet potato cultivars in the second examination (Table 3). The latter three populations propagated less on sweet potato cultivars even on the susceptible ones, suggesting that sweet potato was a poor host for these populations. Also, it is possible to assume that the Okinawa population may be more adapted to sweet potato than the Miyazaki population, as this population had significantly (*P* ≤ 0.05) greater reproduction on Norin 2. Again, the Okinawa population had comparatively high reproduction on the resistant sweet potato cultivar, while the Miyazaki population reproduction was lower (*P* > 0.05).

The results of this study help to explain why injury to sweet potato has been restricted to southern Kyushu. Though little injury has been reported in the Okinawa islands, there has been less research on nematode pests of sweet potato there. It is not clear at present what is responsible for the distribution of the physiological races to *P. coffeae* in Japan. Awareness of the sweet potato injury caused by *P. coffeae* in Miyazaki goes back to 1945 (12). It is unlikely that
these sweet potato parasiting "physiological races" were introduced into Japan (37), since sweet potato injury by *P. coffeae* has not been reported outside of Japan (31). If so, *P. coffeae* in Miyazaki might have adapted to sweet potato after immoderate continuous cropping. "Plant-nematode interaction reflects a series of changes imposed on the biota by man" (37), reduced plant diversity, and sequential cultivation can encourage changes in the nematode. YEATES (37) also postulated a 'founder effect' of the restriction of the host plant and nematode-gene-pool as a result of establishing populations from few colonizers. It is unknown why this race has not in appeared cooler regions of Japan. The present study is incomplete because of the lack of a virulence assessment, estimation of respective optimal temperatures of reproduction and virulence in the populations, and the observation of the population dynamics inside root. The effect of temperature on optimal reproduction would be of particular importance when understanding the physiological races of *P. coffeae*, since the optimal reproduction is often a function of the nematode-host plant relationship (2) and higher temperature than optimum lowers the reproduction of *Pratylenchus* spp. (1, 16).

ACKNOWLEDGEMENT

I would like to thank Dr. K. OHBA of the Shionogi Co., Shiga and Mrs. T. UEDA of the Saitama Horticultural Experiment Station, Tsurugashima Branch, for providing nematodes. I also would like to thank Mr. Z. SANO of the Kyushu National Experiment Station, Kumamoto, for advice during the study and Dr. J. T. GASPARD of the Nematech Co., Tsukuba, for his comments and improving the manuscript.

LITERATURE CITED


10) KAWAGOE, H. & GOTO, S. (1960) Studies on the root lesion nematodes to sweet potato. (4) Injury on
32) TORIGOE, H. (1994) Control of the root-lesion nematode (Pratylenchus coffeeae) on taro by crop


Accepted for publication: October, 1995

和文摘要

15種作物に対する増殖の差異からみた
ミナミネグサレンセンチュウのレースの証拠

永久保隆之

埼玉、三重および宮崎県から得られたミナミネグサレンセンチュウの3系統の増殖は14種の作物で異なった。宮崎系統は7作物（ダイコン、インゲン、ミニトマト、ナス、キクおよび感受性のサツマイモの2品種）で三重系統より有意に大きな増殖（P≤0.05）を示した。しかし、宮崎系統の増殖は、サツマイモの2品種とナスの他は埼玉の系統と異ならなかった（P>0.05）。埼玉、三重、長崎、宮崎および沖縄県に由来する5系統はサツマイモの本線虫感受性品種（コガネセンカンおよび農林2号）と抵抗性品種（ミナミユタカ）における増殖が異なった。宮崎と沖縄の系統は、サツマイモの感受性品種において著しく増殖することから、埼玉、三重および長崎の系統と区別された。後3者は、本線虫に感受性のサツマイモ品種でも増殖しなかったため、サツマイモがこれらの系統の非寄主植物であることが示唆された。このことから、ミナミネグサレンセンチュウに生理的レースが存在することが明らかになった。