# Notes brèves

## THE EFFECT OF OPERATOR AND MEASURING SYSTEM ERROR ON THE MORPHOMETRICAL VARIABILITY OF ONE NEMATODE SPECIMEN

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Frederick and Tarjan (1978) reported coefficient of variation (CV) values were less when one observer, rather than when several observers, obtained measurements from the same nematode specimen. However their two sets of CV values were obtained for two different nematode specimens and are therefore not strictly comparable. Nevertheless the trend reported by Frederick and Tarjan (1978) was supported by an analysis of data obtained from an exercise reported here.

Participants attending a European Science Foundation-financed Taxonomy Workshop at Wageningen, The Netherlands were asked to record several measurements, using a microscope at that laboratory, from one female specimen of *Xiphinema incognitum*. Also the author obtained measurements of the same *X. incognitum* specimen on ten separate occasions using a microscope at the SHRI. The results obtained were used to identify between operator, within operator and rounding error variability.

The mean, range and CV percentage for each measurement and ratio obtained from the *X. incognitum* specimen, by the ten participants and by the author, are given in Table 1. Between observer variability was identified by comparing the variance ($SD^2$) of measurements made by the author with that of measurements made by ten observers. No significant observer effects were detected for body length, body length minus tail length and ratios b, c′, V, V′ and S. However all other measurements and ratios were significantly ( $< 0.05$) more variable when ten observers, than when only one observer on ten occasions, recorded the data.

The measurement error, when using an eyepiece graticule for measurement purposes, is uniformly distributed between $\pm$ 0.5 of the measurement of one eyepiece graticule division. Therefore, variability caused by rounding error when using an eyepiece graticule is calculated as one twelth of the measurement of one graticule division (Noble, 1964). Rounding errors contributed less than ten per cent to the sample SD values except for body length and body width at the spear base where rounding error contributed one third and almost two thirds to these sample SD values respectively. Rounding errors were not calculated for the measurements obtained by the ten observers or for body length minus tail length and the ratios obtained by the author as more than one magnification was used or at least two rounding errors were present.

Within operator error variability was obtained by subtracting the rounding error from the sample $SD^2$ values. However as rounding error contributed only a small variability, with occasional exceptions, the CV values presented in Table 1 can be used directly to evaluate the variability present in the data.

The effect of temperature on measurement variability was examined by recording measurements from one female specimen of *X. diversicaudatum* on ten occasions at 2, 20 and 38°. The microscope and slide containing the *X. diversicaudatum* specimen were allowed to equilibrate in the hot and cold environments overnight before being used. No significant differences were present in the data recorded at the three temperatures. Therefore it is concluded that within the temperature range 2 to 38° temperature had no effect on measurement variability.

The average CV value, calculated for the measurements and ratios obtained by fourteen nematologists who each measured the same structures in a specimen of *Pratylenchus coffeae* using the microscope measuring systems available in their own laboratories, was 4.5 percent (Frederick & Tarjan, 1978). In the exercise with *X. incognitum*, ten observers and a single measuring system, the average CV value obtained for the measurement and ratios used was 8.8. percent. Limited time and the use by the participants of an unfamiliar microscope measuring system probably contributed most to the larger mean CV value obtained in the *X. incognitum* exercise. However the measurement of several structures used in the taxonomy of nematodes appear likely to be less variable when one observer

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Table 1

Measurements and ratios obtained from one female specimen of *Xiphinema incognitum* by ten observers and by one observer on ten occasions

| | *Ten observers* | | *One observer on 10 occasions* | | | | |
|---|---|---|---|---|---|---|---|
| *Measurements and ratios* | *Mean * (range)* | *CV %* | *Mean * (range)* | *CV %* | *Magnification X* | *Eyepiece graticule one division* | *round-off errors* |
| Body (mm) | 1.79 (1.7-1.98) | 4.9 | 1.77 (1.74-1.79) | 1.5 | 63 | 0.052 ** | 0.0043 |
| Body minus tail (mm) | 1.77 (1.67-1.95) | 5.0 | 1.74 (1.71-1.77) | 1.5 | 63/397 *** | 0.052 ** 1.8**** | |
| Tail (µm) | 30 (25-44) | 18.3 | 27 (23-27) | 2.4 | 397 | 1.8 | |
| Odontostyle (µm) | 89 (78-104) | 7.3 | 94 (92-97) | 1.3 | " | " | 0.15 |
| Odontophore (µm) | 52 (47-59) | 7.3 | 39 (38-40) | 2.5 | " | " | " |
| Spear (µm) | 142 (120-163) | 6.5 | 134 (132-135) | 0.88 | " | " | " |
| Ant. to vulva (µm) | 904 (850-990) | 4.5 | 863 (842-895) | 3.2 | 63 | 52 ** | 4.33 |
| Ant. to oesoph. and intest. junction (µm) | 308 (241-366) | 10.8 | 307 (300-313) | 2.2 | 252 | 2.9 | 0.24 |
| Width at spear (µm) | 33 (29-45) | 11.9 | 31 (31-32) | 1.4 | 397 | 1.8 | 0.15 |
| Width at vulva (µm) | 44 (39-56) | 10.8 | 41 (41-43) | 2 | " | " | " |
| Width at anus (µm) | 27 (22-33) | 10.4 | 27 (25-29) | 3.5 | " | " | " |
| a | 41 (31-47) | 10.8 | 43 (40-44) | 3.3 | | | |
| b | 5.9 (5-7.5) | 11.3 | 5.8 (5.6-6) | 2.8 | | | |
| c | 61 (39-73) | 16.7 | 66 (64-72) | 3.6 | | | |
| c′ | 1.1 (0.9-1.3) | 10.5 | 1 (0.9-1.1) | 5.7 | | | |
| V | 51 (49-53) | 2.5 | 49 (47-51) | 3.5 | | | |
| V′ | 52 (50-55) | 2.9 | 50 (48-52) | 3.5 | | | |
| S | 4.3 (3.8-4.7) | 6.3 | 4.3 (4.2-4.4) | 1.8 | | | |

* n = 10.

** Eyepiece graticule not used ; figure represents one division on a cartographere measuring wheel, used to obtain the length of the structure.

*** Different magnifications used for measuring separate structures.

**** Values refer to the different magnifications used.

makes several observations, rather than when several observers each make one observation, of the same structure.

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## EFFECT OF THE NEMATODES *HIRSCHMANNIELLA ORYZAE* AND *H. SPINICAUDATA* ON THE $N_2$ FIXATION IN THE RICE RHIZOSPHERE

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Nitrogen is one of the most important factors affecting rice production. Biological $N_2$ fixation by heterotrophic organisms in the rhizosphere is thought to contribute to some extent to the nitrogen in the rice plant (Willis & Green, 1948 ; Rinaudo, Balandreau & Dommergues, 1971 ; Yoshida & Ancajas, 1973). A nitrogen balance study done in 1979 at the International Rice Research Institute, Los Baños, Philippines (App, pers. comm.), showed that the nitrogen input in a Maahas clay soil from nitrogen fixation associated with the rice plant, could constitute 18 to 43% of nitrogen in the plant at harvest.

Rice *(Oryza sativa* L.*)* is a preferred host of most nematode species of the genus *Hirschmanniella*. *H. oryzae* occurs most frequently in all countries where rice is grown. *H. spinicaudata* is common in West Africa and has been reported once in Venezuela. In West Africa a geographical gradient is observed in the distribution of both species : *H. spinicaudata* is highly prevalent in humid areas, whereas *H. oryzae* is found mostly in the Sahelian regions (Fortuner & Merny, 1979). Both nematodes depress and delay tillering and flowering of rice, and reduce root and shoot growth and grain yield (Babatola & Bridge, 1979).

This paper presents the results of a preliminary laboratory experiment set up to evaluate the effect of *H. oryzae* and *H. spinicaudata* on $N_2$ fixation in the rice rhizosphere.

The soil used was a typical sandy soil of Central Senegal (vernacular name : Dior), with C and N contents of 0.3 and 0.027% respectively, pH 7.5, inoculated with a nitrogen fixing strain *Azospirillum* DK 93 previously shown to enhance $N_2$ ($C_2H_2$) fixation in the rhizosphere of rice cv. Moroberekan (Rinaudo, Gauthier & Dommergues, 1979). Pregerminated seeds of rice cv. Moroberekan were placed in 14 × 220 mm Pyrex tubes containing 27 g of soil which was afterward waterlogged (one seed per tube). There

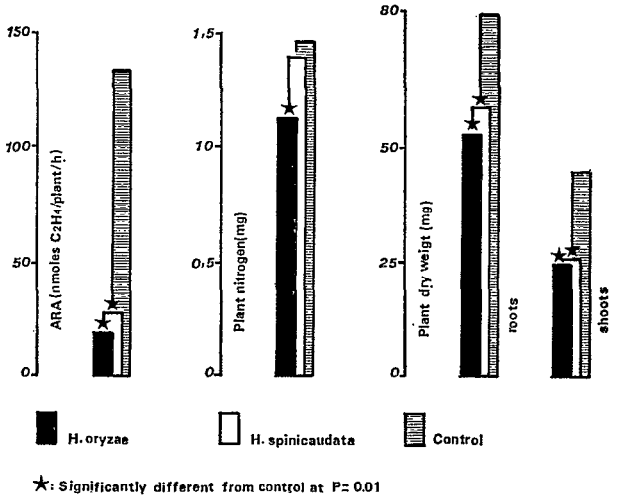


Fig. 1. Effect of infestation of soil with *H. oryzae* and *H. spinicaudata* on rhizospheric acetylene reduction activity (ARA), and plant growth of three-week-old rice seedlings (cv. Moroberekan).

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