The effect of potato cyst nematodes and soil compaction on growth of some potato cultivars

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Summary

In the Netherlands potatoes are grown in a high cropping frequency and potato cyst nematodes are a major problem. To generate yield loss predictions for different growing conditions, more knowledge is necessary about damage mechanisms by potato cyst nematodes. Therefore, two experiments were conducted in which effects of nematodes and soil compaction on growth of potato cultivars differing in tolerance to potato cyst nematodes were studied. Special attention was paid to root growth and nutrient uptake.
From analysis of the individual aspects of potato growth it was concluded that nematodes induce a hormonal signal leading to reduced photosynthesis. This damage can be aggravated when reduced root length leads to nutrient deficiency.
Compaction also seems to induce a hormonal signal, but the mechanism involved differs from that with nematodes.

Samenvatting

In de intensieve aardappelteelt in Nederland vormen aardappelcysteaaltjes een van de belangrijkste problemen. Om schade door aaltjes bij verschillende groeiomstandigheden te kunnen voorspellen is meer kennis nodig over het schademechanisme. Daarom werden twee proeven gedaan waarin effecten bekeken werden van aaltjes en bodemverdichting op de groei van enkele cultivars welke verschilden in tolerantie voor aardappelcysteaaltjes. Hierbij werd vooral de invloed op de wortelgroei gevolgd.
Uit analyse van diverse componenten van aardappelgroei werd geconcludeerd dat aaltjes een hormonaal signaal induceren dat de fotosynthese reduceert. De schade kan verder vergroot worden als de wortellengte zodanig gereduceerd wordt dat nutriënttekorten optreden.
Verdichting lijkt ook een hormonaal signaal te induceren, maar het betrokken mechanisme verschilt van dat van aaltjes.

Acknowledgements

The authors would like to thank Margriet Boerma, Roland Velema and Jans Roosjen of the Hilbrandslaboratorium Assen, Esther Hendrikx and Rob van Haren of the Research Institute for Plant Protection (IPO-DLO), mr Kroesbergen of the Tillage Laboratory of the Agricultural University and Inneke Ammerlaan of AB-DLO for their cooperation with the experiments. Further we like to thank the people of the 'Proeftechnische Dienst', without whom it would not have been possible to collect such a large amount of data, the chemical laboratory of AB-DLO for all the analyses, and mr. Smit sr and jr for allowing us to use their fields. Further we like to thank Rinus van de Waart for his practical advice and Anton Haverkort and Joke Braber for their comments on this report and Loes Helbers for her assistance with typing the manuscript.

1 Introduction

In the Netherlands, potato cyst nematodes (PCN, *Globodera rostochiensis and G. pallida*) are a major problem in potato production. Nematicides are often used to reduce nematode population densities to prevent yield loss. From an environmental point of view the use of chemicals is hazardous, and legal measures have been taken to restrict their use in the near future. To maintain a high frequency of potato cropping at a high production level with less chemicals requires more knowledge about population dynamics and damage mechanisms by potato cyst nematodes. This knowledge may be useful to generate yield loss predictions for different growing conditions, and to look for non-chemical ways to prevent it. In 1990 the research programme 'Bodemgezondheid' was initiated in which AB-DLO, HLB, IPO-DLO, LEI-DLO and PAGV work together. The aim of this programme was to develop a decision support system for potato production on PCN-infested fields. Research at AB-DLO was focused on damage mechanisms.

Yield losses caused by PCN vary strongly between different sites (Trudgill, 1986). Trudgill et al. (1978) found more severe damage in sandy soil than in sandy loam. To understand how PCN damage interacts with other abiotic factors, the mechanisms by which the tuber yields of PCN-damaged plants are reduced must be known.

Two hypotheses on the damage mechanism have been proposed. Firstly, Schans (1991) found reduced leaf photosynthesis and transpiration rates of potato plants three days after inoculation with second stage juveniles of *Globodera pallida*. He suggested that the process of penetration and initiation of syncytia by *G. pallida* induces a messenger causing reduced photosynthesis and subsequently a lower yield (Schans and Arntzen, 1991). A second hypothesis is that PCN reduce growth and efficiency of the root system which affects nutrient uptake (Trudgill, Evans and Parrott, 1975a,b; Evans, Trudgill and Brown, 1977; Trudgill and Cotes, 1983). This leads to decreased top growth, less solar radiation intercepted by the leaves and lower yields. Trudgill et al. (1975a) found no indications that photosynthetic capacity per unit area was reduced by PCN. It is still unclear which mechanism is responsible for yield loss by PCN.

Cultivars differ in their tolerance of PCN. Cultivars with large root systems are more tolerant to PCN (Evans & Haydock, 1990). Potato roots are sensitive to soil structure and root system size is strongly reduced by soil compaction (Boone, Bouma & De Smet, 1978). We therefore expect that the root system of tolerant cultivars is only reduced to critical lengths if PCN and compaction occur together. To study this, two experiments were conducted in 1991 and 1992 on a sandy soil in the Northeast of the Netherlands. Effects of soil compaction and nematodes on root dynamics of cultivars differing in tolerance to potato cyst nematodes were studied. Measurements of nutrient dynamics and photosynthesis were included to identify the major damage mechanisms.

In this report a complete description of experimental design and results is given, followed by a short discussion of the results.

Several aspects of this research will be discussed in more detail in the following articles:

- Ruijter, F.J. de, B.W. Veen & M. van Oijen (in prep.). Limitations of minirhizotrons as a tool for quantitative measurement of root growth in the field: literature review and additional experiments.
- Oijen, M. van, F.J. de Ruijter & R. van Haren (in prep.). Interaction between field-grown potato cultivars and cyst nematodes at three levels of soil compaction.
  I. Leaf area dynamics, photosynthesis and crop grwoth.
  II. Root length dynamics and nutrient uptake.
- Van Haren, R., M. van Oijen & F.J. de Ruijter (in prep.). Interaction between field-grown potato cultivars and cyst nematodes at three levels of soil compaction.
  III. Nematodes population dynamics in soil and roots.

2 Materials and Methods

2.1 Experimental design

Two experiments were carried out in 1991 and 1992 on farmer fields in Witten, in the North-east of the Netherlands. The experimental factors were:

- infestation level of *Globodera pallida* (low, high);
- level of soil compaction (loose, moderately compacted, severely compacted);
- cultivar (1991: Darwina, Elles; 1992: Darwina, Elles, Bintje, Mentor).

The experiments were done in a split-plot design with four replicates. Cultivars were grouped in split plots, within the main plots allocated to combinations of infestation and soil compaction levels. Plots were 4.5 m long and 3 m wide. Four periodic harvests of nine plants and one final harvest of twenty-four plants were carried out. Appendix 1 shows the layout of the field and of an individual plot. Appendix 2 lists the dates on which the levels of soil infestation and compaction were established and when measurements were carried out.

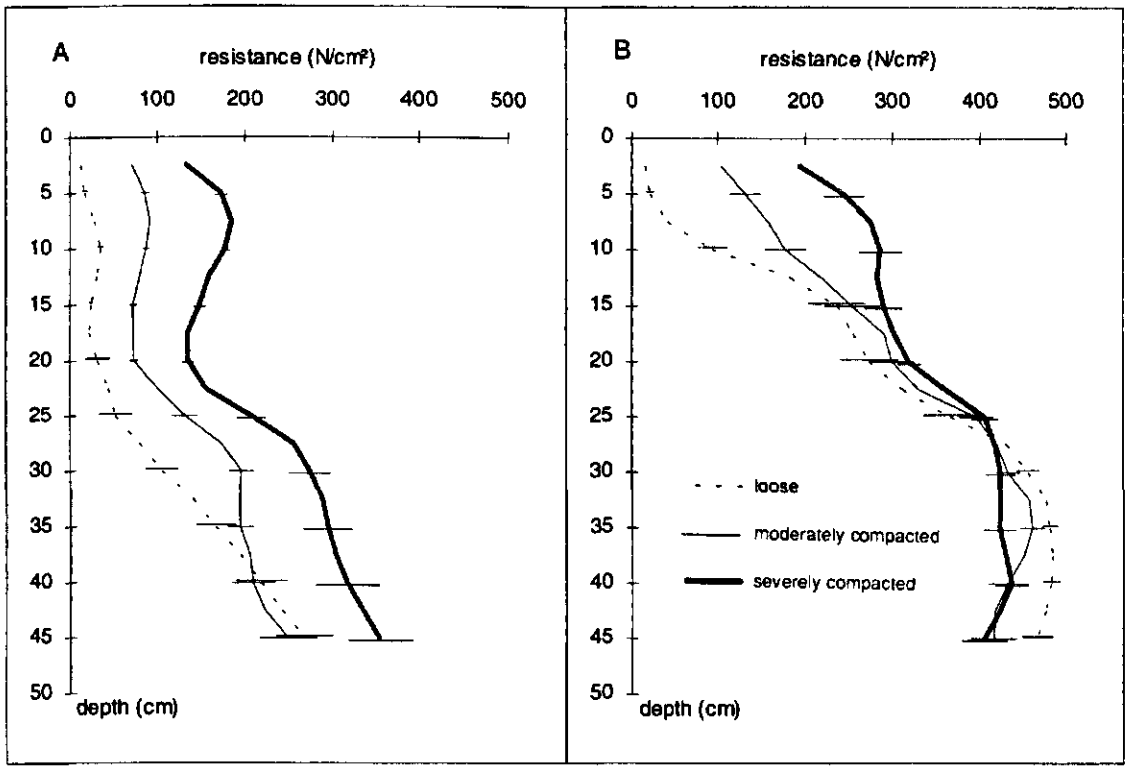

Figure 1 Cone penetration resistance (1 cm^2 cone) of the soil of three soil compaction levels at different depths. A: 27-06-1991 (n=48), B: 11-08-1992 (n=16).

2.2 Soil preparation

The soil was sandy with 4.8 % (1991) or 6.2 % (1992) organic matter and a pH-KCl of 4.9. The field was infested with potato cyst nematodes (*Globodera pallida*). A first brief sampling indicated population densities ranging from 20 to 60 larvae per gram soil. To obtain the low

infestation level the soil was fumigated with sodium methyldithiocarbamate (Monam 510 g/l: 400 l/ha in 1991, 600 l/ha in 1992). The unfumigated plots were tilled with the same machine without using any Monam. Soil samples to determine infestation level of potato cyst nematodes were taken before planting and after the final harvest .
The soil was compacted by driving once (moderately compacted) or three times (severely compacted) over the soil with a roller. The lowest compaction level was obtained by loosening the soil with a rotary cultivator.
Cone penetration resistance of the soil was measured several times with an Eijkelkamp penetrometer with a cone area of one cm^2. Fig. 1 shows that compaction levels differed in penetration resistance in the layer 0-35 cm for the 1991 experiment and only in the layer 0-15 cm for the 1992 experiment. With increasing depth, penetration resistance increased to about 400 N/cm^2 at 40 cm.
Bulk density of each soil treatment was measured at depths of 2-7 cm and 22-27 cm (Table 1). In the two years bulk density of similar treatments and depths were equal. This agrees well with the penetrometer measurements at the 2-7 cm layer. For the 22-27 cm layer however, bulk density differed between compaction levels, whereas at this depth in 1992 no difference in penetrometer resistance was found. A possible explanation is the low soil water content in the 22-27 cm layer in 1992 and the resulting high penetrometer resistance.

Table 1. Means (and standard deviations) of bulk density (g/cm^3 dry soil), water content ($g/100\ cm^3$) and pore size distribution (percentage of total soil volume) at two depths at three compaction levels

	layer 2-7 cm			layer 22-27 cm		
	loose	moderately compacted	severely compacted	loose	moderately compacted	severely compacted
Bulk density (g/cm^3)						
27/06/91[1]	1.26 (0.05)	1.42 (0.02)	1.47 (0.08)	1.30 (0.10)	1.36 (0.05)	1.42 (0.05)
04/09/91[2]	1.19 (0.08)	1.42 (0.07)	1.46 (0.07)	1.25 (0.08)	1.34 (0.04)	1.38 (0.05)
11/08/92[3]	1.26 (0.15)	1.42 (0.02)	1.51 (0.05)	1.33 (0.07)	1.36 (0.06)	1.41 (0.05)
Water content ($g/100\ cm^3$)						
27/06/91[1]	25.0 (1.0)	27.2 (1.0)	27.4 (0.8)	24.1 (1.7)	24.7 (0.9)	24.9 (2.1)
11/08/92[3]	19.6 (4.6)	22.3 (1.9)	22.2 (2.7)	13.4 (2.9)	15.2 (3.6)	14.8 (1.8)
Pore size (µm) distribution (%)[2]						
<6	12.6 (1.7)	14.8 (1.8)	15.3 (1.3)	15.6 (1.4)	16.7 (1.4)	16.7 (1.4)
6 - 15	3.5 (0.4)	3.2 (0.9)	3.6 (0.4)	3.7 (0.6)	3.4 (0.5)	3.8 (0.5)
15 - 30	4.0 (0.7)	3.8 (0.4)	6.1 (1.5)	4.1 (0.4)	5.6 (1.4)	3.8 (0.7)
30 - 60	8.3 (0.8)	7.6 (0.8)	8.2 (2.1)	8.2 (1.1)	5.7 (1.6)	7.4 (1.8)
60 - 150	9.0 (1.8)	7.7 (1.2)	3.3 (0.9)	8.2 (2.2)	3.0 (0.8)	7.0 (2.3)
150 - 300	3.0 (1.1)	3.4 (1.1)	0.8 (0.5)	1.9 (0.7)	1.0 (0.6)	1.5 (0.8)
>300	13.3 (3.8)	10.9 (2.9)	7.3 (1.8)	6.4 (0.7)	8.1 (1.9)	5.9 (1.5)
total	53.7 (3.2)	51.4 (3.1)	44.7 (2.6)	48.1 (1.6)	43.3 (2.6)	46.1 (2.1)

[1] n=4 [2] n=8 [3] n=6

In 1991 the water release characteristic of the soil between pF 1.0 and pF 2.7 was determined for the three compaction levels at two depths (2-7 cm and 22-27 cm). Fig. 2 shows the water content against the matric potential of the soil. As with the penetrometer measurements, differences in water content between compaction levels were greater in the 2-7 cm layer than in the 22-27 cm layer. The difference in water content between two pF values is the availability of water in that pF traject. Compaction reduced water content at pF=1.0 and increased water content at pF=2.7, indicating that compaction decreased availability of water.

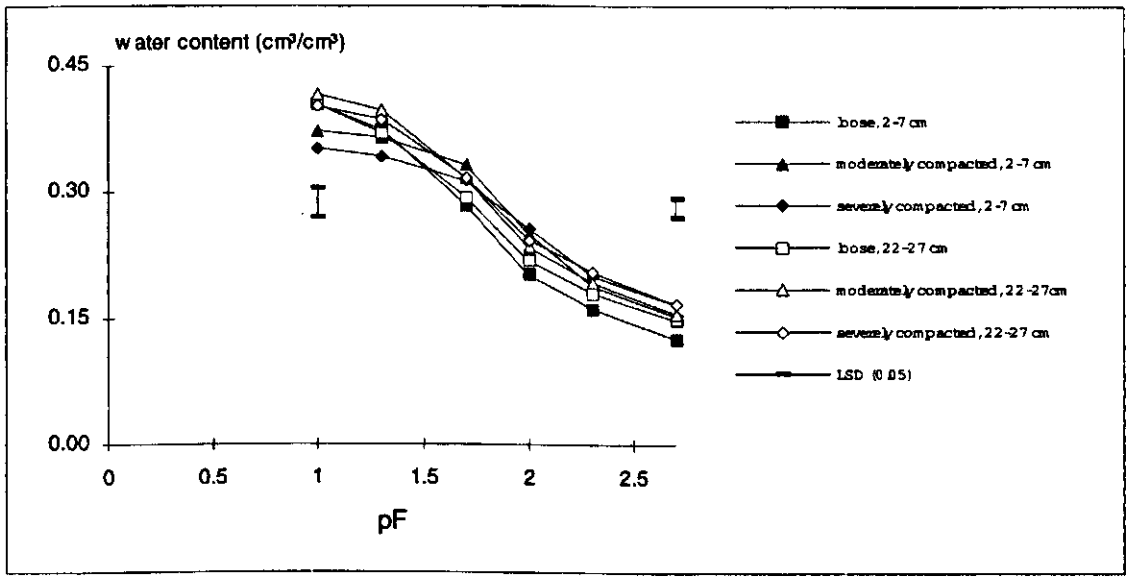

Figure 2 Water release characteristics of three soil compaction levels at two depths in the 1991 experiment.

In Fig. 3 the distribution of pore sizes for the different compaction levels and depths is given. Compaction mainly reduced the soil volume occupied by pores larger than 300µm. Total pore volume was decreased by compaction and this reduction was larger in the 2-7 cm layer.
After compaction fertilizer was broadcast and slightly incorporated in the soil. Fertilizer was applied according to current recommendations based on soil testing, resulting in pre-planting levels of N, P and K of respectively 230, 300 and 500 kg/ha in both years.

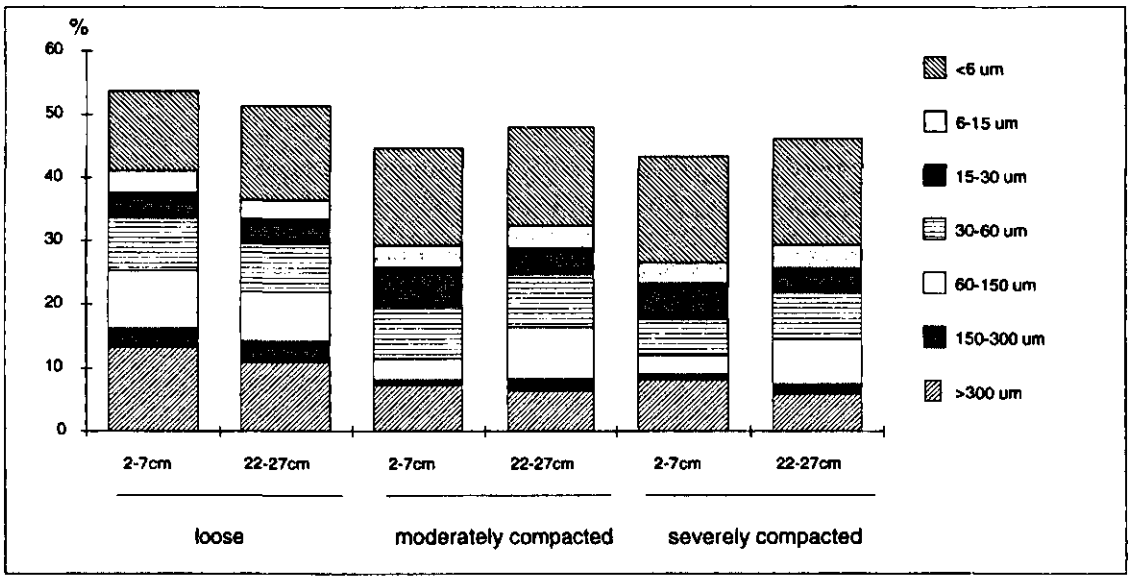

Figure 3 Pore size distribution of three soil compaction levels at two depths in the 1991 experiment (d1:2-7cm, d2:22-27cm).

2.3 Plant material

In 1991 the cultivars Darwina and Elles were planted, in 1992 the cultivars Darwina, Elles, Bintje and Mentor. These cultivars differed in earliness and in susceptibility and tolerance to potato cyst nematodes (Table 2).

Table 2. Ratings for earliness and for resistance and tolerance to potato cyst nematodes of the four cultivars

cultivar	earliness[1]	resistance[1]	tolerance[2]
Darwina	4.5	Ro1,2,3;Pa2	low
Elles	3.5	Ro1,2,3;Pa2	high
Bintje	6.5	-	intermediate
Mentor	4	-	low

[1] source: 67e beschrijvende rassenlijst voor landbouwgewassen, 1992.

[2] source: personal communication M. Boerma (HLB) and L. Molendijk (PAGV).

Seed tubers were planted in containers which were placed under an open-air rain shelter (1991) or in a greenhouse (1992). About four weeks after planting sprout cuttings were taken from the tubers and individual plants of the same size were selected. The sprout cuttings were planted in the field at a spacing of 25 cm x 25 cm. In 1991 soil water content was high and plants were not watered after planting. In 1992 plants were watered immediately after planting, and several times thereafter plots were irrigated to compensate for insufficient rainfall.

On 2 June 1991 plants were slightly damaged by frost, but no plants died.

2.4 Measurement of ground cover

Percentage ground cover was measured weekly. In 1991 a metal frame was used, divided in 100 equal squares. The dimensions of the frame (0.75 m x 0.75 m) were a multiple of the planting pattern. Estimates of ground cover were made by looking directly from above and counting the sections more than half filled with green leaves (Haverkort et al., 1991).
In 1992 percentage ground cover was estimated using portable equipment for measuring red and green reflectance of the crop (Uenk, 1992).

2.5 Growth of leaves, stems and tubers

Shoot and tuber growth were measured destructively four times during growth. At these harvests nine shoots per plot were cut off at the soil surface and stored at 4 °C. After root sampling, the underground part of the stem and the tubers were collected and stored at 4 °C. The next day stems and leaves were separated and the leaves divided into green, yellow and dead fractions. Stems and underground parts of the stems were combined. Tubers were washed and counted. After weighing, samples of stems, green leaves and tubers were taken for analysis of dry matter content, nitrogen, phosphate and potassium content. In 1991 the nitrate content of the green leaves was also measured. Another sample of the green leaves was used for leaf area measurements.
Crop photosynthesis of the cultivar Darwina was measured with a mobile field equipment (Louwerse and Eikhoudt, 1975). Photosynthesis in loose and severely compacted plots was measured at the two levels of nematode infestation twice each experimental year. Time between both measurements was four weeks.

2.6 Root measurements

Root growth was studied with minirhizotrons and with core samples. Minirhizotrons (glass tubes measuring 60 mm outside diameter, 4 mm thickness and 125 cm length) were placed vertically in the soil of the loose and severely compacted plots to a depth of about 80 cm.
A hole was made with an auger with a slightly smaller diameter than the minirhizotron and the minirhizotron was manually forced into the hole. To avoid water leaching into the soil along the tube, a piece of plastic was wrapped around the tube at the soil surface (in 1991 only). The part of the tube above the soil was covered with inside black and outside white plastic to exclude light and reduce solar warming. Heat transport was also inhibited by a foam rubber plug in the tube.
Roots were periodically observed with an endoscope during the experiments. The endoscope was stepwise lowered into the minirhizotron tube for observation at two cm intervals. After each 2-cm displacement roots were counted by rotating the endoscope and counting the roots passing a mark in the center of the ocular of the endoscope. Thus roots were counted along an imaginary horizontal line on the minirhizotron tube (Veen, 1986). In the 1992 experiment, roots were also counted along eight imaginary vertical lines, separated by two cm horizontal distance. A difference between the number of roots horizontally or vertically counted indicates a preferential growth direction of the roots (Veen, 1986).
Roots were also recorded by video, twice each year, to analyze root death. In 1991 the time between the video recordings was two weeks, in 1992 four weeks. For each year, the

recordings were analyzed using two monitors, one displaying images of the first recording and one displaying the images of the second recording. On the monitors a vertical line was drawn indicating identical positions. Only the roots crossing this line were observed. For every depth images of both dates were compared. The number of living roots at the first date was counted and the image of the second date was used to count the roots that had died between both recordings (Van Noordwijk, 1993). Roots were supposed dead when they had lost turgor. Changes in colour could not be used because these were not always present while roots clearly had lost turgor.
Video recordings were not used to measure root growth, as this was already done by endoscope.
In the 1991 experiment, soil cores were sampled with a 7-cm diameter auger at depth increments of 10 cm. Samples were taken at two positions with respect to the plant: one just beneath the plant (P position) and one between four plants (M position). Maximum sampling depth was 20 cm at the first harvest, 30 cm at the second harvest and 40 cm at the third and fourth harvest. At each combination of horizontal position and depth five (P position) or four (M position) samples were taken, mixed and reduced to one subsample of about 500 g. Sampling was carried out to a depth of 40 cm because from this depth on pure sand was found, containing no organic matter and having a high penetrometer resistance. Therefore it was not expected that roots would grow deeper than 40 cm.
In the 1992 experiment, a 3-cm auger was used. Sampling was carried out at the same positions (P and M) as in the 1991 experiment but the depth increments were 20 cm and two P samples or two M samples per plot and depth were combined to one sample of about 500 g. In the 1992 experiment, core samples were only taken of the loose and severely compacted plots at the second and fourth harvest.
In 1991, samples were stored at 4 °C for a few days before the roots were washed from the soil by hydropneumatic elutriation (Smucker et al., 1982). Washed roots were stored in 10 % alcohol solution at 4 °C before root length was estimated. In 1992, samples were stored for some months at -20 °C. After thawing, roots were recovered from the soil by the hydropneumatic elutriation method and stored in 10 % alcohol solution at 4 °C before further processing.
Root length was estimated by counting the number of intersects of the roots with a 2 cm x 2 cm grid, using the grid technique described by Tennant (1975). After determination of root length, roots were stored in FP 4:1 (4 % formaldehyde, 1 % proprionic acid; Southey, 1986) at 4 °C before counting the number of nematodes in the roots. The results on root nematode number will be reported in Van Haren et al. (in prep.).

2.7 Weather conditions

The summer of both experimental years was warm and dry but springs were different. In 1991, spring was relatively cold and rainy. In 1992, there was hardly any rain from planting onward. Therefore the 1992 experiment was irrigated five times, from July 1 weekly with about 30 mm water per time. Daily weather data of the KNMI (1991, 1992) were used for calculations of radiation interception.

3 Results and discussion

3.1 Percentage ground cover

In the 1991 experiment, the effect of compaction and nematodes on shoot growth became visible soon after planting. During growth these differences remained very clear. In the 1992 experiment the treatments had less effect.
The proportion ground cover (PGC) of the two experiments is shown in Fig. 4A en B. Measured data are given in Appendix 3. PGC increased from planting until full cover was reached, which was retained for some time before plants started to mature and PGC decreased. Nematodes and compaction reduced PGC and influenced the time of maturation.
In 1991, Darwina was less tolerant to nematodes than Elles. PGC of infected Darwina plots was less than those of Elles, and infected Darwina plants died sooner than infected Elles plants. Compaction reduced PGC and this reduction seemed larger when plants were also infected with nematodes. Remarkably, compaction extended the growing season, due to regrowth after day 200. This regrowth might be an effect of rain after a dry period but it is not clear why this is restricted to the compacted plots. An explanation may be the slow initial growth, resulting in a larger availability of nutrients later in the growing season.
In 1992 the time courses of PGC differed from 1991. Differences between treatments were less than in 1991 and occurred mainly in the first part of the growing season. After about day 200 there were hardly any differences in PGC between treatments and plants of different treatments matured at the same time. The cultivars Bintje and Mentor matured earlier than Darwina and Elles, in accordance with their rating for maturity class in the Cultivar List (Table 2).
In 1992 full ground cover was reached by all cultivars, but only Elles had 100 % ground cover for more than one or two weeks. In 1991 Darwina and Elles maintained full ground cover for some weeks. This difference between 1991 and 1992 may be caused by the method of estimating PGC. With the grid used in 1991, all sections more than half filled with green leaves were counted. Even when the soil surface was visible, this method may give a PGC of 100 %. In this case reflectance measurement indicates a PGC of less than 100 %.
In 1992, the combined effect of nematodes and compaction on PGC of Darwina was opposite to that of 1991. In 1992, compaction only influenced PGC where the soil was fumigated. With nematodes, there were no differences in PGC of different compaction levels. In 1991, however, differences in PGC between compaction levels were large with nematodes and smaller when fumigated. Extension of the growing season by compaction was less obvious in 1992 than in 1991.

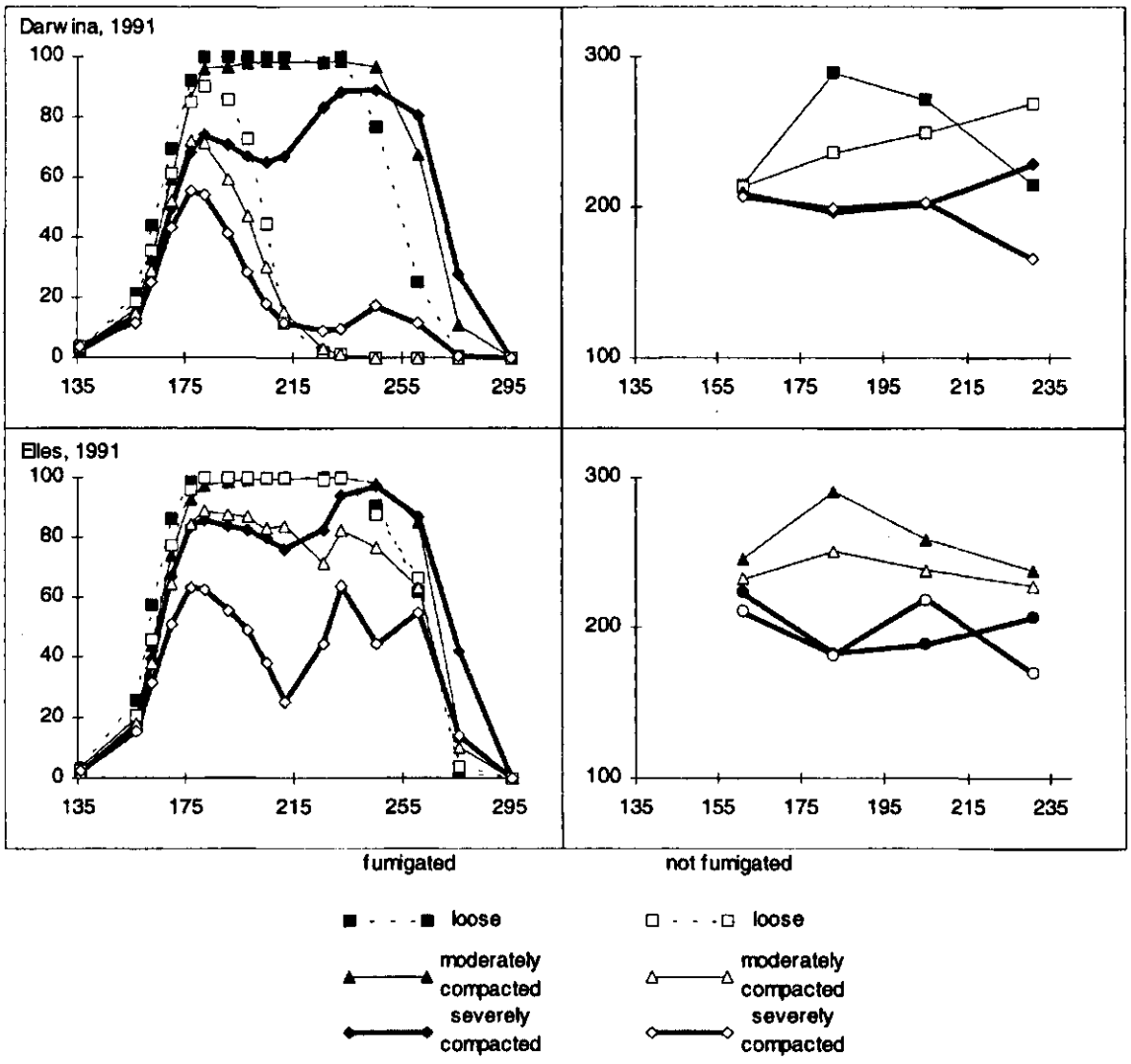

Figure 4A Ground cover (%) and specific leaf area (cm^2/g) vs. Julian day number for respectively six and four combinations of soil compaction and potato cyst nematode infestation level, 1991.

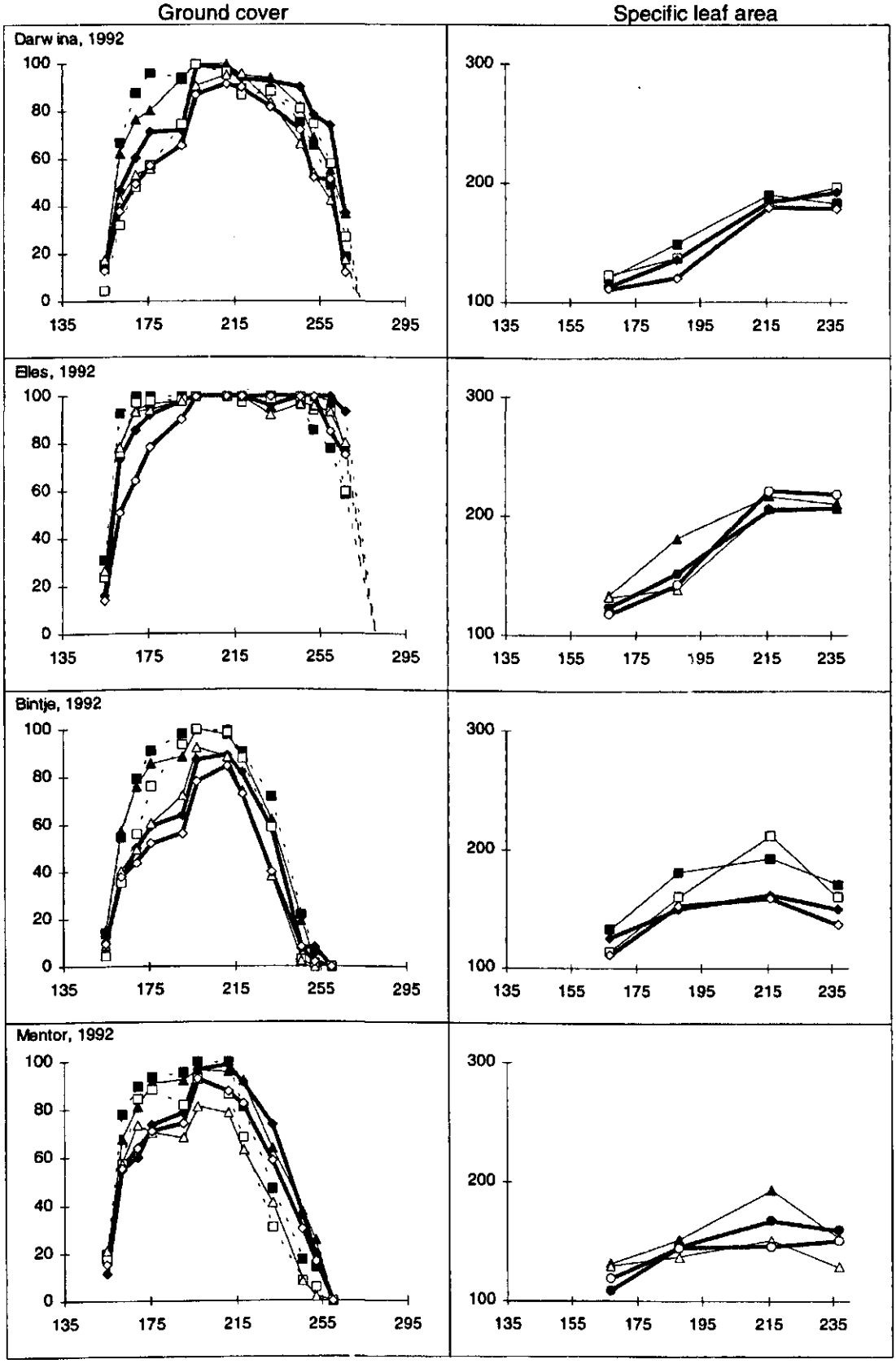

Figure 4B Ground cover (%) and specific leaf area (cm^2/g) vs. Julian day number for respectively six and four combinations of soil compaction and potato cyst nematode infestation level, 1992.

3.2 Growth of leaves, stems and tubers

Results of periodic harvests are listed in Appendix 4 and shown in Fig. 5. For each year and cultivar, effects of nematodes and compaction on time courses of leaf, stem and tuber weight are given. Because PGC mainly depends on leaves, effects on PGC are reflected in the time course of leaf weight, but differences in leaf weight between treatments can also be found when both treatments fully cover the ground.
Nematodes reduced leaf mass by reducing leaf growth rather than increasing leaf senescence. Soon after planting nematodes reduced leaf weight while leaf senescence was not increased (see chapter 3.5). In 1991, Darwina was very intolerant of nematodes and leaf growth of infected Darwina plants stopped early. Leaf growth of cultivar Elles was also reduced by nematodes but less than for cultivar Darwina. The longer growing season of plants on compacted soil is most pronounced for cultivar Darwina, where renewed leaf growth occurred between day 205 and 230.
As with PGC, differences in leaf weight between treatments were less in 1992 than in 1991. Leaf growth in infected and compacted plots was slower only at the beginning of the 1992 season. Differences remained the same later in the season .

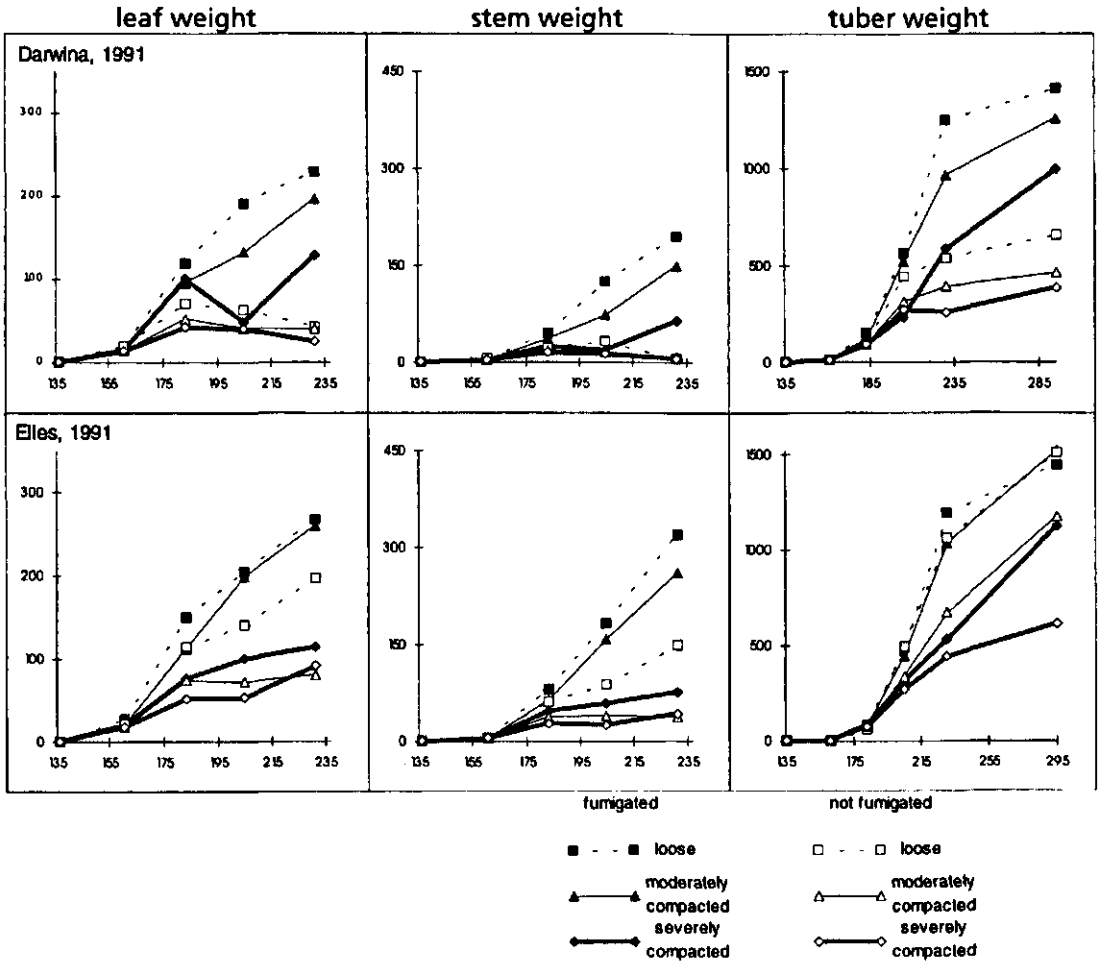

Figure 5A Weight of leaves, stems and tubers (g/m^2) vs. Julian day number for six combinations of soil compaction and potato cyst nematode infestation level, 1991.

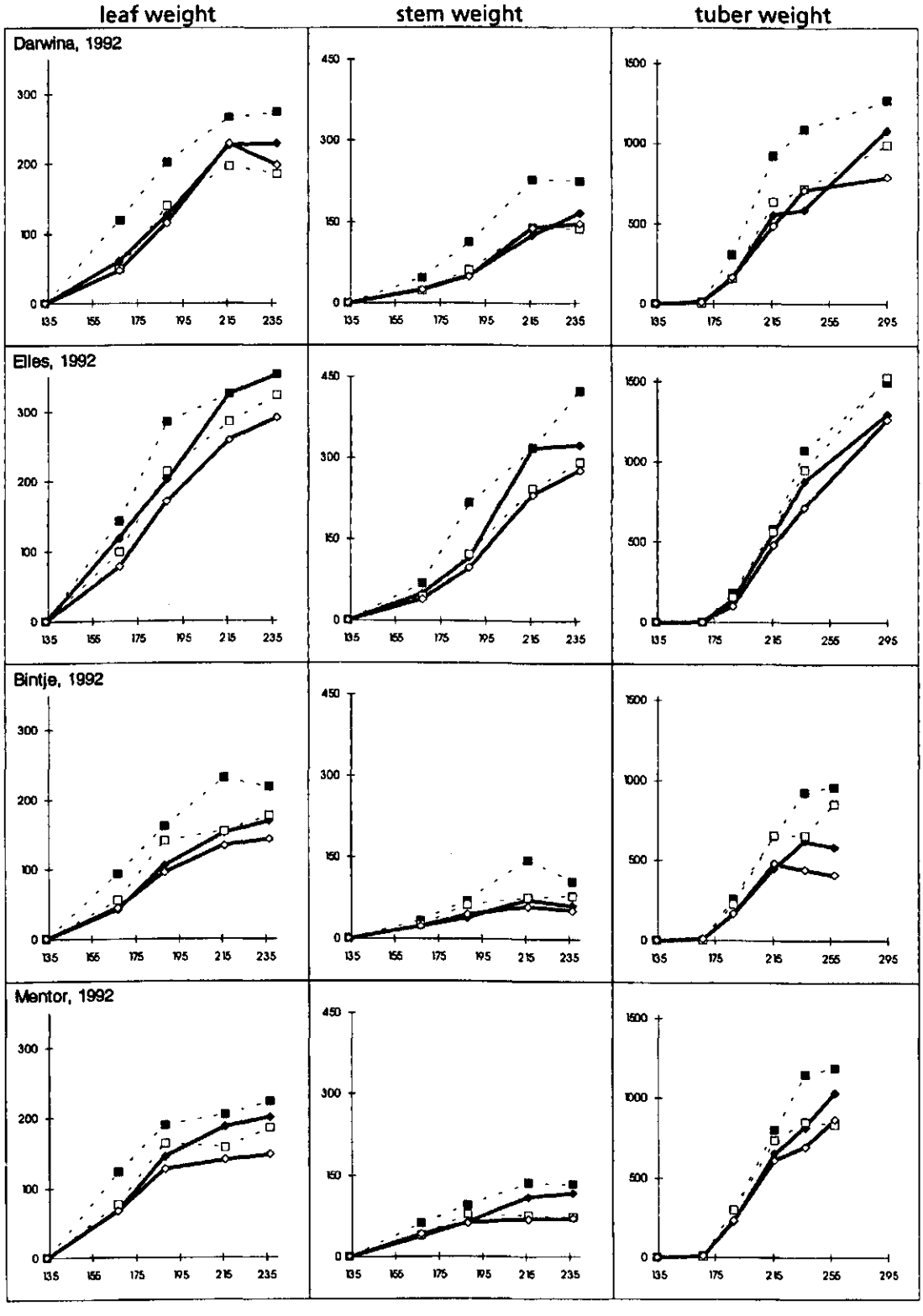

Figure 5B Weight of leaves, stems and tubers (g/m^2) vs. Julian day number for four combinations of soil compaction and potato cyst nematode infestation level, 1992.

Leaf weight was highest of cultivar Elles and lowest of the cultivars Bintje and Mentor. Cultivars differed even more in stem weight, but ranking order was the same as with leaf weight.
Specific leaf area (SLA) is shown in Fig. 4A en B. Average SLA was about 225 cm^2/g in 1991 and 175 cm^2/g in 1992. In 1991, SLA was constant between day 160 and 230 whereas in 1992 SLA increased during this period. Compaction reduced SLA more than nematodes did.
In both years in the beginning of the season tuber yield was reduced more by compaction than by nematodes (Fig. 5). Because plants on compacted soil grew longer the final tuber yield was higher in the severely compacted treatments than in the nematode treatments, with Darwina in 1991 and 1992 and with Mentor in 1992. Compaction reduced final tuber yield of the cultivars Elles and Bintje more than nematodes did.

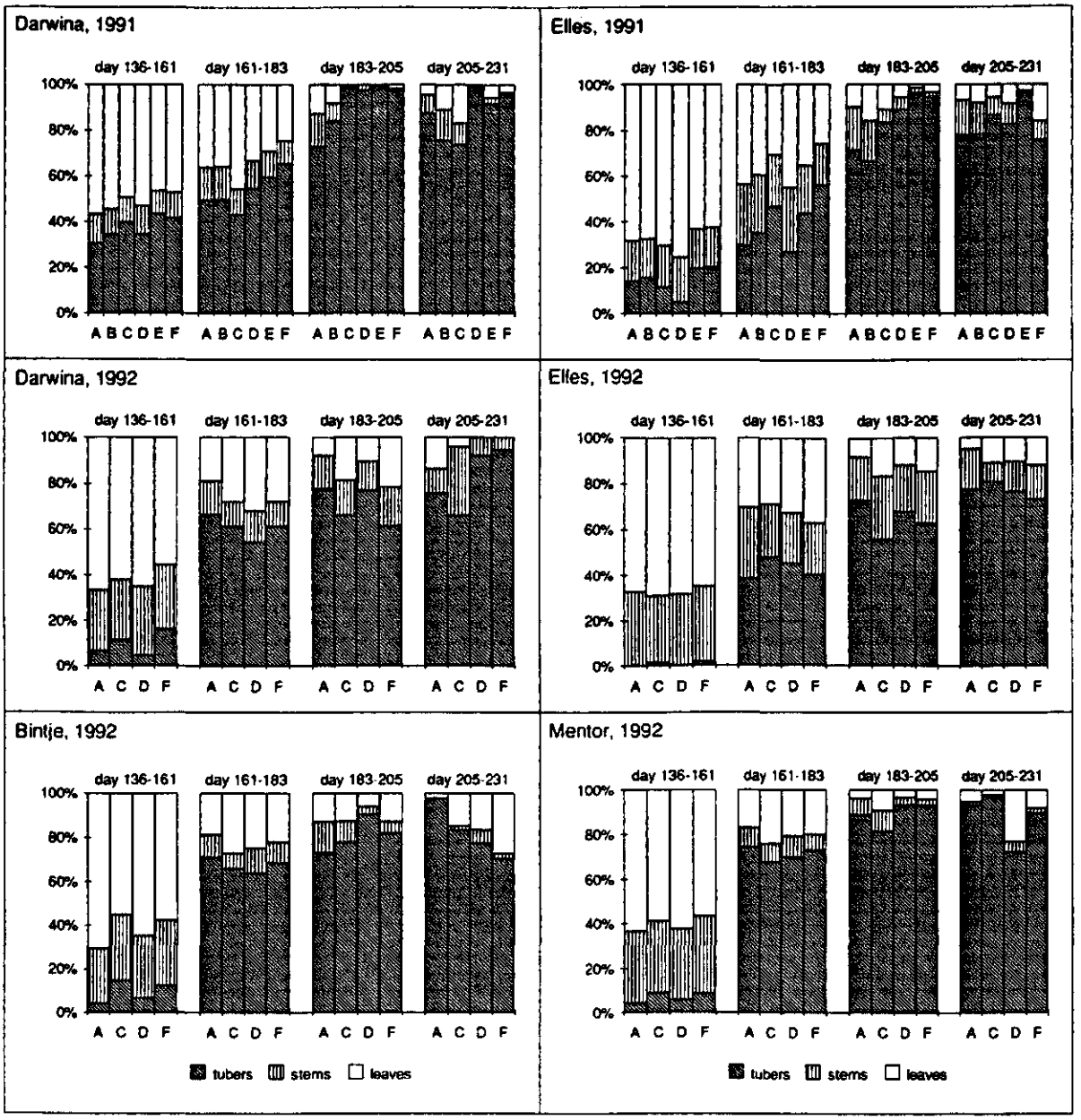

Figure 6 Partitioning of carbohydrates between leaves, stems and tubers for six combinations of soil compaction and potato cyst nematode infestation level. Fumigated: A, B, C; not fumigated: D, E, F; loose: A, D; moderately compacted: B, E; severely compacted: C, F

3.3 Partitioning

Partitioning of assimilates between growing organs was derived from differences in organ biomass increase between consecutive harvests (Fig. 6). Between two harvests the difference in weight of leaves, stems and tubers was calculated. Apparent reductions in weight were assumed to indicate zero growth. The differences in weight between two harvests were averaged and with these averages partitioning was calculated for each period.
During the season the fraction assimilates allocated to the tubers increased gradually. Regrowth in the compacted plots at the end of the season can be seen again in the increased fraction of the assimilates going to the leaves.
In 1991, compaction reduced leaf and stem growth more than tuber growth, so a larger fraction of the assimilates was allocated to the tubers. The same was found for nematodes: infected plants allocated relatively more assimilates to the tubers. This was not found in 1992, when nematodes and compaction seemed to reduce the fraction of the assimilates allocated to the tubers. In both years Elles allocated more assimilates to leaves and stems than Darwina.

3.4 Light interception, light use efficiency and photosynthesis

Light use efficiencies (LUE) were calculated for total and tuber dry matter production (Table 3). Light interception was calculated by multiplying PGC with daily global radiation (KNMI, 1991, 1992). Regression of total dry matter production on cumulative intercepted photosynthetically active radiation (PAR; PAR=0.5 x global radiation) was carried out with data of the first four harvests and forced through the origin. When yield between two harvests decreased, the dry matter production in the intermediate period was assumed to be zero.
Regression of tuber dry matter production on cumulative PAR was carried out with data from harvest 2 to 5.

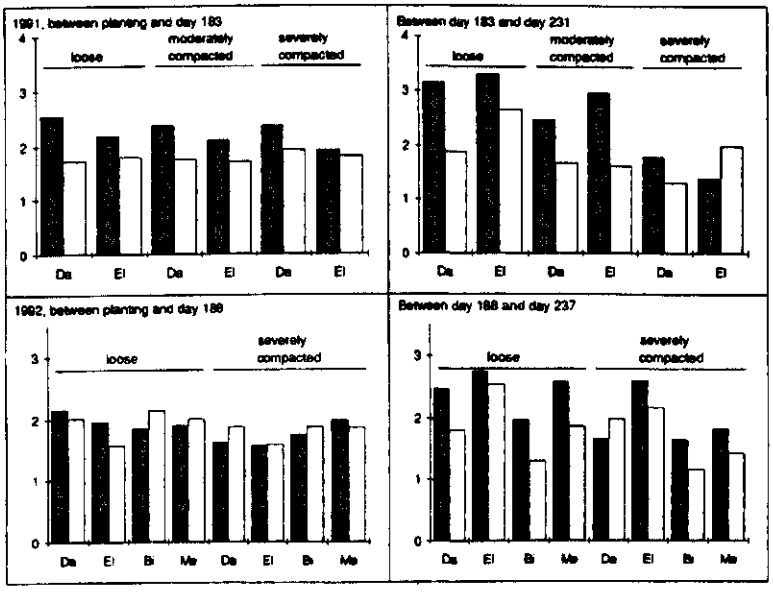

Figure 7 Light use efficiencies (g/MJ PAR) calculated for the periods between day 136-183 and 183-231 (1991) or between day 134-188 and 188-237 (1992) for four combinations of soil compaction and potato cyst nematode infestation level. Black bars: fumigated, white bars: not fumigated.

Table 3. Light use efficiencies (LUE) as calculated from regressions of total dry matter and tuber dry matter production on cumulative light interception and the apparent onset of tuber bulking. Coefficients of determination (r^2) for the regressions averaged 0.96 and 0.93 in 1991, and 0.93 and 0.81 in 1992 for total dry matter and tuber dry matter production, respectively. LSD values (0.05) for comparison of LUE values for total dry matter production and tuber dry matter production and for the apparent onset of tuber bulking are respectively 0.52, 0.58 and 56 for 1991 and 0.53, 0.63 and 136 for 1992.

Year	cultivar	loose		moderately compacted		severely compacted	
		fumigated	not fumigated	fumigated	not fumigated	fumigated	not fumigated
1991	*LUE for total dry matter production (g/MJ PAR)*						
	Darwina	2.79	1.84	2.40	1.73	1.73	1.71
	Elles	2.81	2.34	2.63	1.60	1.55	1.88
	LUE for tuber dry matter production (g/MJ PAR)						
	Darwina	2.18	2.22	1.77	1.96	1.73	1.86
	Elles	2.31	2.25	2.17	1.97	1.66	1.66
	Apparent onset of tuber bulking (MJ PAR)						
	Darwina	59	68	23	46	62	21
	Elles	116	111	101	102	88	31
1992	*LUE for total dry matter production (g/MJ PAR)*						
	Darwina	2.40	2.11			1.74	2.02
	Elles	2.21	1.97			2.11	1.93
	Bintje	1.93	1.76			1.70	1.62
	Mentor	2.13	1.94			1.92	1.70
	LUE for tuber dry matter production (g/MJ PAR)						
	Darwina	1.93	1.60	1.79	1.45	1.60	1.42
	Elles	2.29	2.28	1.98	1.89	1.89	1.88
	Bintje	1.74	1.41	1.46	1.37	1.30	0.86
	Mentor	2.34	1.73	1.91	1.37	1.87	1.55
	Apparent onset of tuber bulking (MJ PAR)						
	Darwina	111	49	153	56	125	64
	Elles	302	286	276	264	238	212
	Bintje	126	28	124	66	48	-73
	Mentor	186	90	131	30	110	75

Nematodes reduced LUE for total dry matter production, but only in 1991 this reduction was statistically significant. Nematodes did not significantly reduce LUE for tuber dry matter production. Cultivars had different LUE's, but few of the differences were statistically significant.

The intercept of the regression for LUE for tuber dry matter production, indicating the onset of tuber bulking, was mostly lower with nematodes. This may indicate earlier formation of tubers. The apparent onset of tuber bulking corresponded well with reported ratings for cultivar lateness (Table 2). Haverkort and Harris (1986) found that the LUE for tuber dry matter was higher when the quantity of intercepted radiation at the onset of tuber bulking was higher.

Cultivar lateness and LUE were not correlated in the experiments in Witten.
Besides calculating LUE for the entire growing season, LUE can also be calculated between two harvests. To investigate if LUE changed during growth, LUE was calculated from planting till harvest two and between harvest two and four. Fig. 7 shows that early in the season nematodes reduced LUE whereas compaction did not. Later in the growing season also LUE of the compacted treatments was reduced. During the season LUE of the control increased.
Fig. 8 shows crop photosynthesis of cultivar Darwina. Daily fluctuations in crop photosynthesis were very clear: a high level at noon till respiration at night. Measured crop photosynthesis is a combination of light interception and light use efficiency. Differences between treatments in Fig. 8 were mainly caused by differences in ground cover (Fig. 4). When data are corrected for proportion ground cover, LUE's can be calculated (Table 4). The results are in agreement with the LUE's calculated from periodic harvests and cumulative intercepted light but the calculated values are higher. This is the result of calculating the LUE for only low light intensities, when light is used most efficiently.

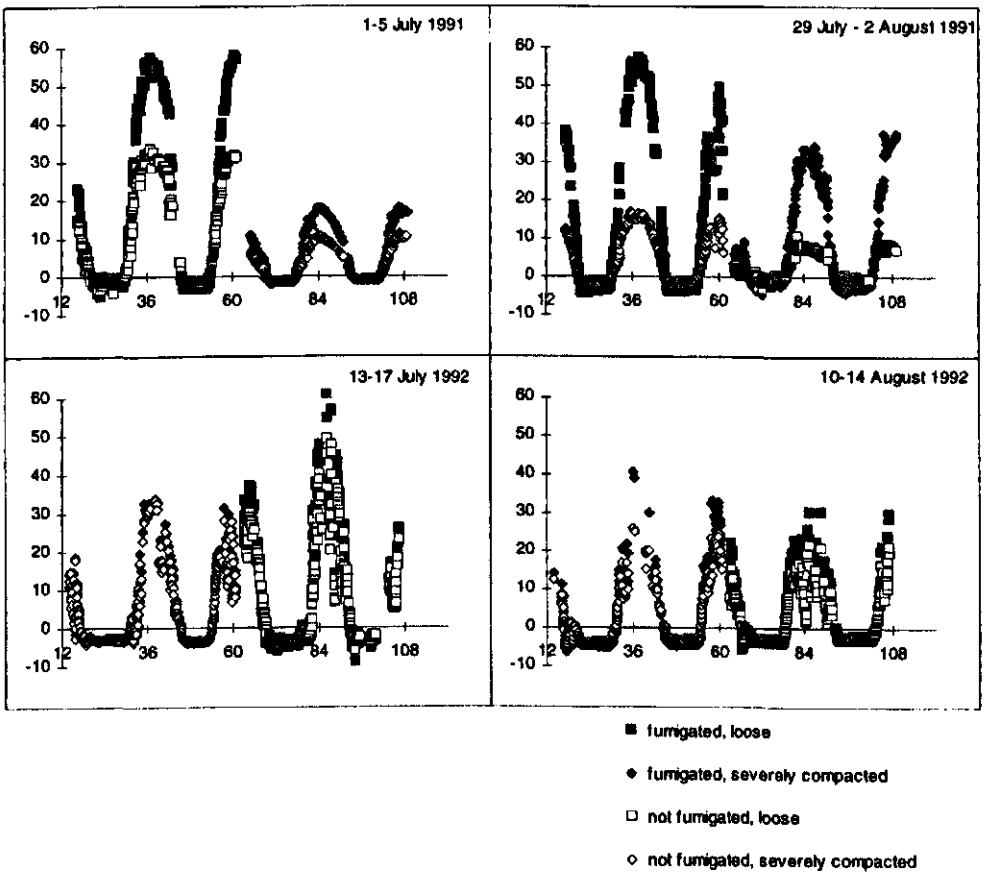

Figure 8 Crop photosynthesis (kg CO_2/(ha·h) of cultivar Darwina for four combinations of soil compaction and potato cyst nematode infestation level.

Table 4. Light use efficiencies (g/MJ PAR) for Darwina as calculated from regressions of crop photosynthesis on intercepted radiation for low light intensities. Coefficients of determination (r^2) for the regressions were always higher than 0.84, the number of observations was always higher than 272.

Year	Date	loose		severely compacted	
		fumigated	not fumigated	fumigated	not fumigated
1991	July 1-5	10.4	9.9	10.2	9.1
	July 29 - Aug. 2	12.3	7.8	8.7	6.9
1993	July 13-17	9.4	9.6	7.4	7.4
	August 10-14	7.5	6.3	7.3	6.1

3.5 Leaf senescence

Leaf death was calculated for the periods between harvest three and four of 1991 and between harvests two, three and four of 1992. At each harvest all green, yellow and dead leaves were removed, but between harvests some dead leaves may have disappeared. To check this, leaf death was calculated with different assumptions:

1 all yellow and dead leaves disappear before the next harvest time;
2 all yellow and dead leaves are still present at the next harvest time;
3 dead leaves disappear, yellow leaves are still present at the next harvest time.

Leaf death between two harvests was calculated as the increase in yellow and dead leaves, relative to the green leaf weight of the first harvest. According to the different hypotheses this formula was adapted.

When leaf death was calculated according to Assumption 1, relative death was often greater than 1. This means that not all yellow and dead leaves had disappeared between two harvests. The second assumption also appeared to be incorrect because in some cases total leaf weight decreased between two harvests, which means that some leaves must have disappeared. Therefore Assumption 3 was adopted, stating that dead leaves disappear between two harvests, but yellow leaves remain present on the plants, being either still yellow or dead. As a lower boundary of leaf death the occasionally observed decreases in green leaf area were taken. So relative leaf death between two harvests is calculated as:

$$\mathrm{MAX}[\ (\mathrm{yellow}_2+\mathrm{dead}_2-\mathrm{yellow}_1)/\mathrm{green}_1\ ,\ (\mathrm{green}_1-\mathrm{green}_2)/\mathrm{green}_1\ ]$$

The results are presented in Fig. 9. The values larger than one for Bintje and Mentor indicate that Assumption 3 is not completely valid and that part of the dead leaves remain present between two harvests. Because no information is available about the fraction of dead leaves that remains present between two harvests, Assumption 3 will be used without further modification.

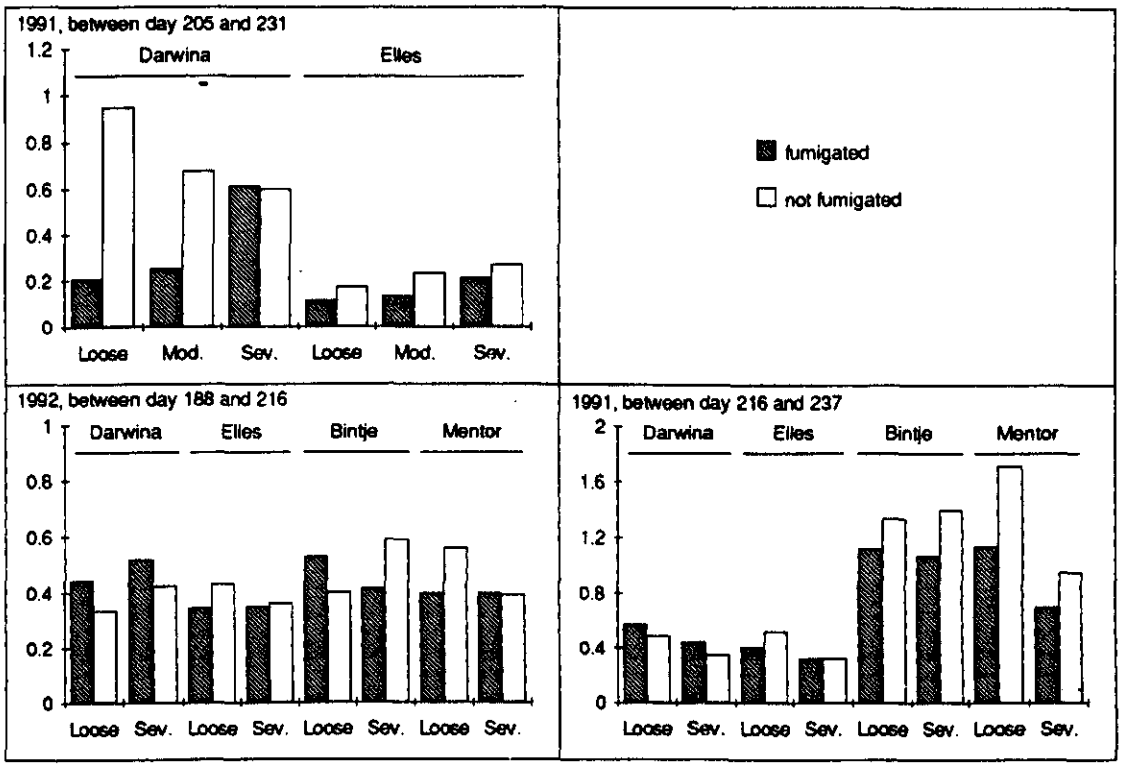

Figure 9 Relative leaf death for six combinations of soil compaction and potato cyst nematode infestation level.

Differences in earliness of cultivars show in their leaf senescence patterns. In 1992 the early cultivars Bintje and Mentor had a high relative leaf death between the third and fourth harvest. In 1991 early senescence of infected Darwina is seen in increased relative leaf death. Nematodes did not influence relative leaf death in 1992 of Darwina and Elles and, between harvest 2 and 3, of Bintje and Mentor. Between harvest 3 and 4 nematodes increased relative leaf death of Bintje and Mentor. In 1991, nematodes hardly influenced relative leaf death of Elles but increased leaf death of Darwina. Increases between harvest 3 and 4 may be due to the lower leaf mass at harvest 3 and expressing leaf death relative to the leaf mass at harvest 3.

In 1991 prolongation of the growing season in the compacted plots was not caused by lower rates of leaf death, since compaction slightly increased leaf death. Relative leaf death for 1991 is calculated between day 205 and 231. Regrowth in the compacted plots started after day 205 and is therefore not included in these calculations. It is plausible that halfway the growing season relative leaf death was somewhat greater in the compacted plots and that this was compensated by extra leaf growth later in the growing season. This effect is seen in 1992, where compaction slightly increased leaf death between harvest two and three and reduced leaf death between harvest three and four.

3.6 Root measurements

3.6.1 Minirhizotrons

Root were counted at every 2 cm increment along the minirhizotrons. Total root number was calculated as the average of summed countings for four minirhizotrons. Time courses of total root number are shown in Fig. 10. Total root number increased from planting till about day 225 and then remained constant. Differences in root number between treatments developed soon after planting and did not change much.
In 1991, compaction and nematodes reduced total root number of Darwina. Both treatments also reduced root number of Elles but only in the first ten weeks of the season. Elles had more roots than Darwina, especially in the first half of the season.

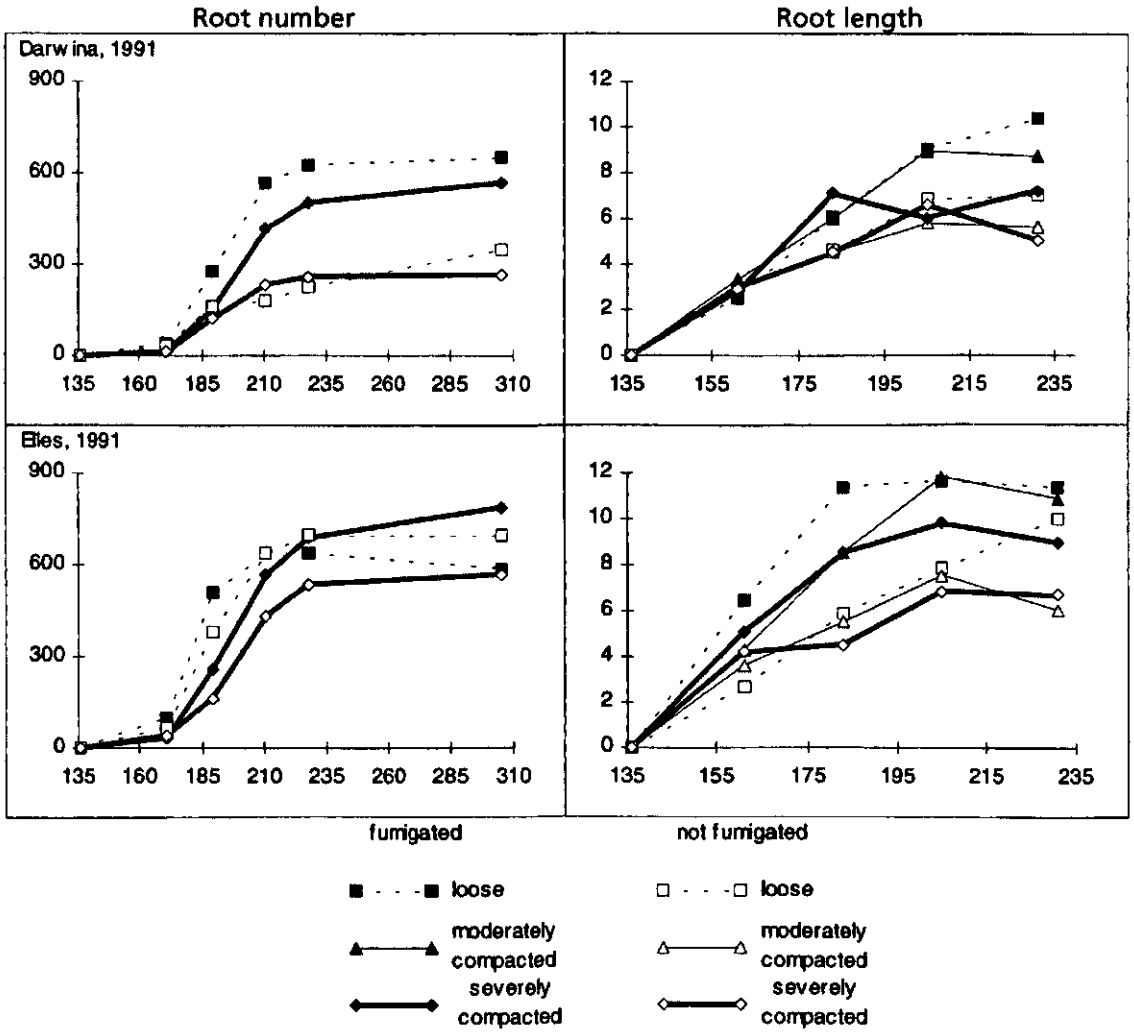

Figure 10A Total root number per minirhizotron and total root length (km/m^2) vs. Julian day number for respectivily four and six combinations of soil compaction and potato cyst nematode infestation level, 1991.

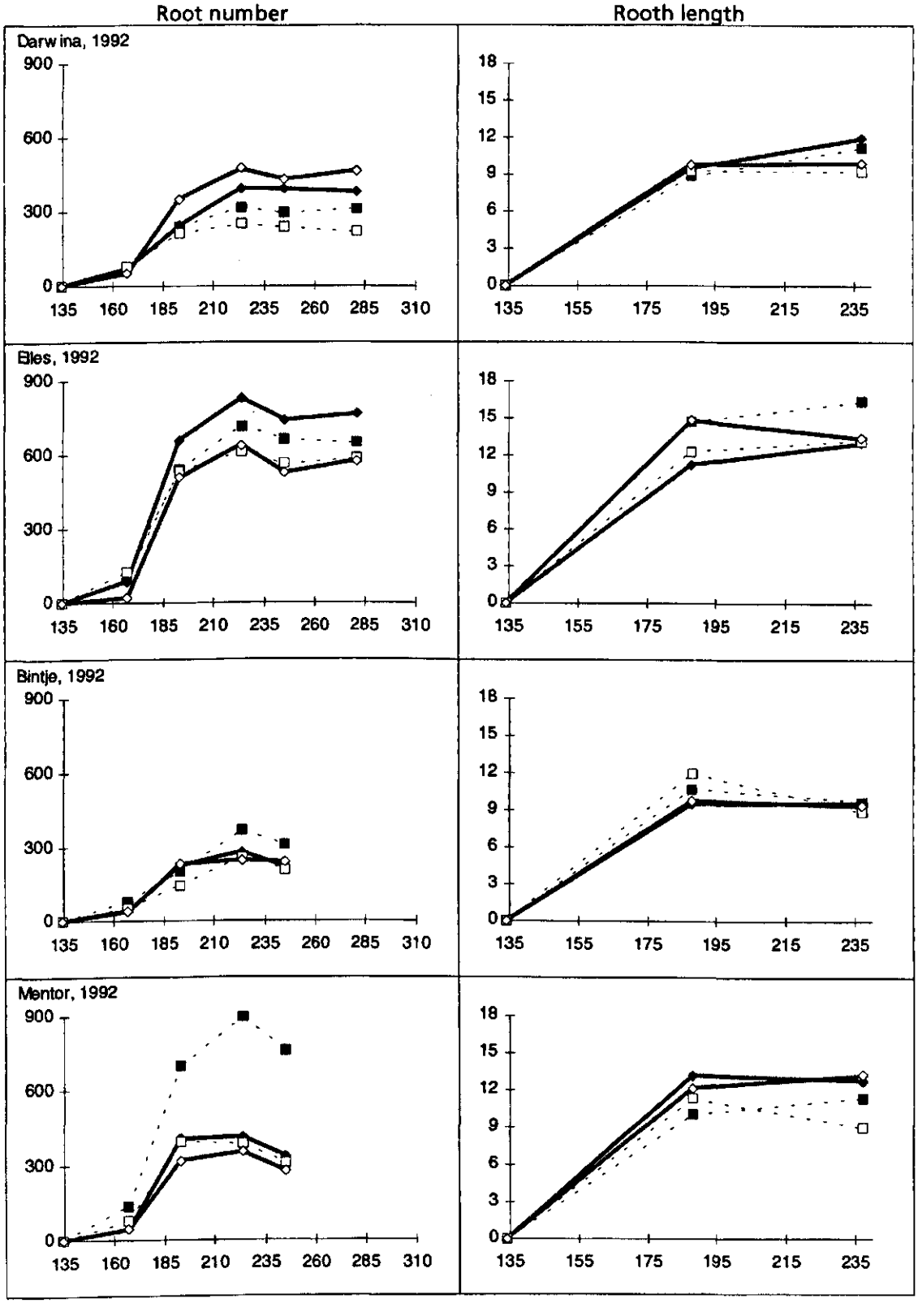

Figure 10B Total root number per minirhizotron and total root length (km/m^2) vs. Julian day number for four combinations of soil compaction and potato cyst nematode infestation level, 1992.

In 1992, effects of nematodes and compaction on root number differed from 1991. In 1992, total root number of Darwina and Elles was increased by compaction. Nematodes had inconsistent effects on root number of Darwina and slightly reduced total root number of Elles. In 1991 nematodes affected total root number of Elles only in the first half of the season, in 1992 this was only in the second half of the season. Total root number of Bintje was hardly influenced by compaction and nematodes, whereas root number of Mentor was strongly reduced by nematodes and compaction.
In Fig. 11 patterns of root number with depth are shown for each cultivar and treatment at three observation dates. Between observations both rooting depth and root density increased. In 1992, the highest root densities were found in compacted soil, which, as described before, also had the highest total root number (Fig. 10). In 1991, the highest root densities were found just below soil level and with increasing depth root densities decreased. In 1992 root density increased with increasing depth, until an maximum was reached at a depth of about 50 cm. Rooting depth of Darwina was reduced by nematodes in 1991 but in 1992 differences in rooting depth were small. In 1992 a large amount of roots grew lower than 40 cm. In 1991 only the control had a substantial number of roots lower than 40 cm, in 1992 this was found with all treatments. The average direction of root growth can be derived from the difference between root numbers counted vertically and horizontally. When, for example, more roots are counted crossing the vertical lines than for the horizontal lines, root growth has some preference for horizontal growth.

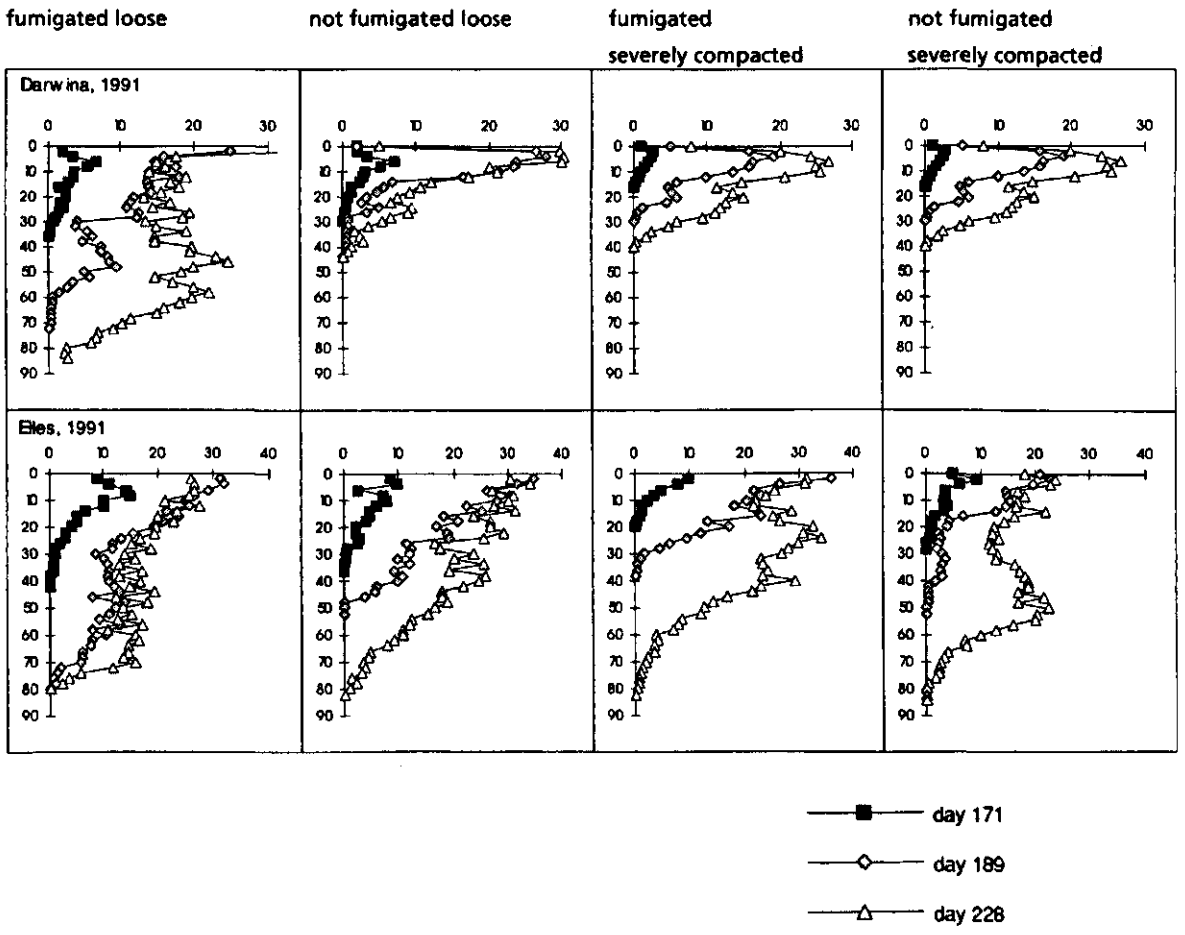

Figure 11A Rooting profiles against minirhizotrons for four combinations of soil compaction and potato cyst nematode infestation level at three observation dates, 1991.

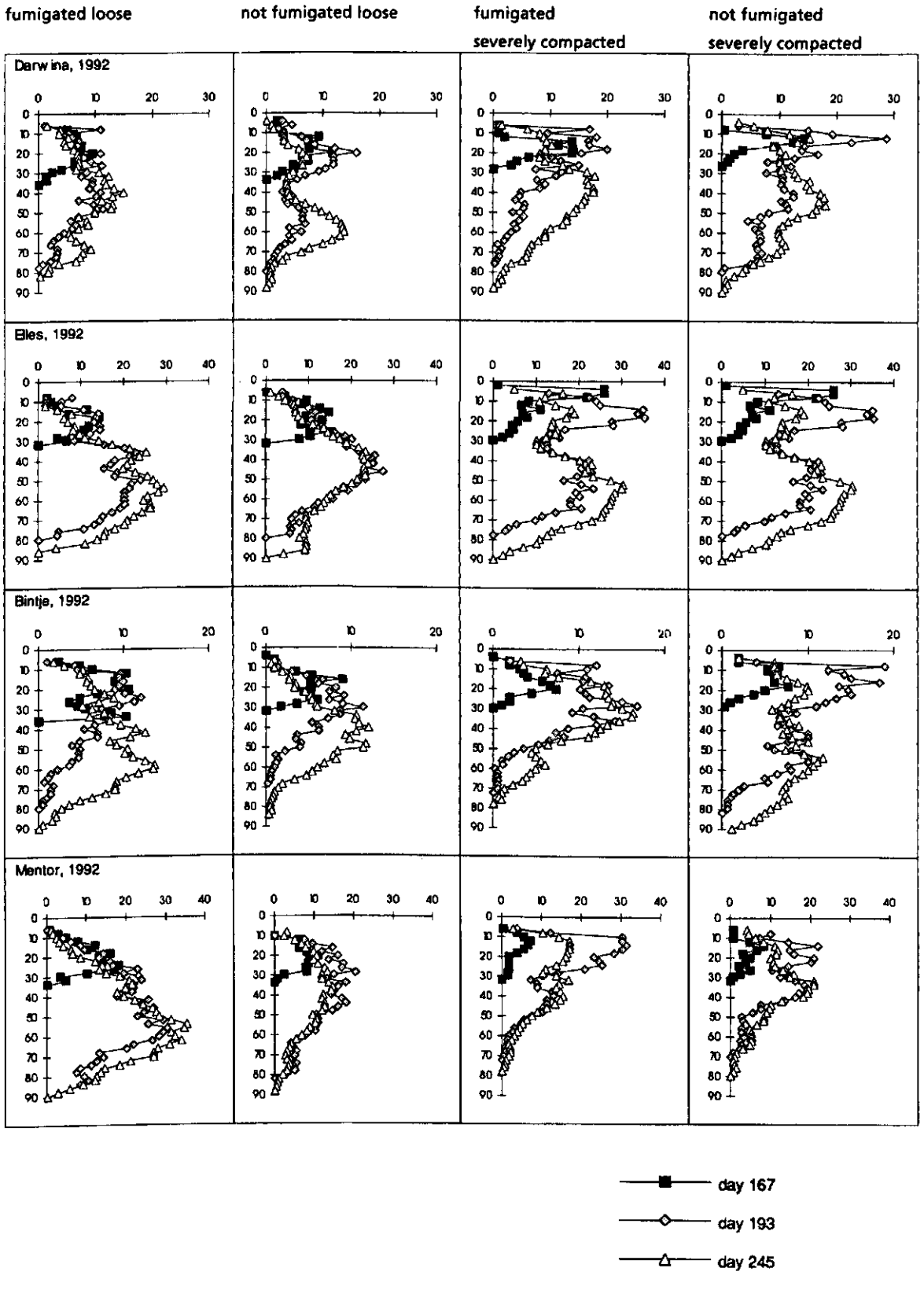

Figure 11B Rooting profiles against minirhizotrons for four combinations of soil compaction and potato cyst nematode infestation level at three observation dates, 1992.

Vertically counting of root numbers was done in two layers, 0-30 cm and >30 cm and these two layers were analyzed separately. There were no significant differences between varieties. Root growth in the layer >30 cm was more vertical than root growth in the upper layer (Table 5). This may be a result of the branching pattern. The lower layer contains more new roots which grow downwards. When the roots get older branches are formed, perpendicular to the main root. This can be seen in the shift of the average root growth direction during the growing season from relatively more vertically to relatively more horizontally or random.

Table 5. Average growth direction of roots (angle to the vertical) for two compaction levels at two depths in 1992. LSD-value (0.05) for comparison of rooting angles between levels of fumigation, harvest and layer or between levels of compaction, harvest and layer is 5.5; LSD-value (0.05) for comparisons within one level of fumigation or compaction is 4.6.

	harvest 2		harvest 3		harvest 4	
	0-30 cm	>30 cm	0-30 cm	>30 cm	0-30 cm	>30 cm
fumigated	44.3	41.0	47.0	43.8	49.3	47.9
not fumigated	44.4	50.7	45.6	42.4	48.5	45.2
loose	47.2	44.5	47.1	44.7	48.7	47.7
severely compacted	41.4	47.2	45.5	41.4	49.1	45.4

3.6.2 Root death

Counted numbers of living and dead roots were analyzed according to a binomial distribution. Fractions of roots that died between both observation dates are shown in Table 6. In 1992 only the main effect of compaction was statistically significant, compaction decreasing the fraction dead roots. In 1991 there was interaction between compaction, nematodes and cultivars.

Table 6. Fractions of roots that died between day 197 and 211 (1991) and day 193 and 224(1992). For 1991 different letters mean statistically significant differences (α=0.05).

Year	Cultivar	loose		severely compacted	
		fumigated	not fumigated	fumigated	not fumigated
1991	Darwina	0.085a	0.434b	0.567b	0.426b
	Elles	0.106a	0.161a	0.074a	0.452b
1992	Darwina	0.229	0.413	0.211	0.267
	Elles	0.269	0.303	0.153	0.219
	Bintje	0.270	0.170	0.271	0.129
	Mentor	0.293	0.401	0.234	0.444

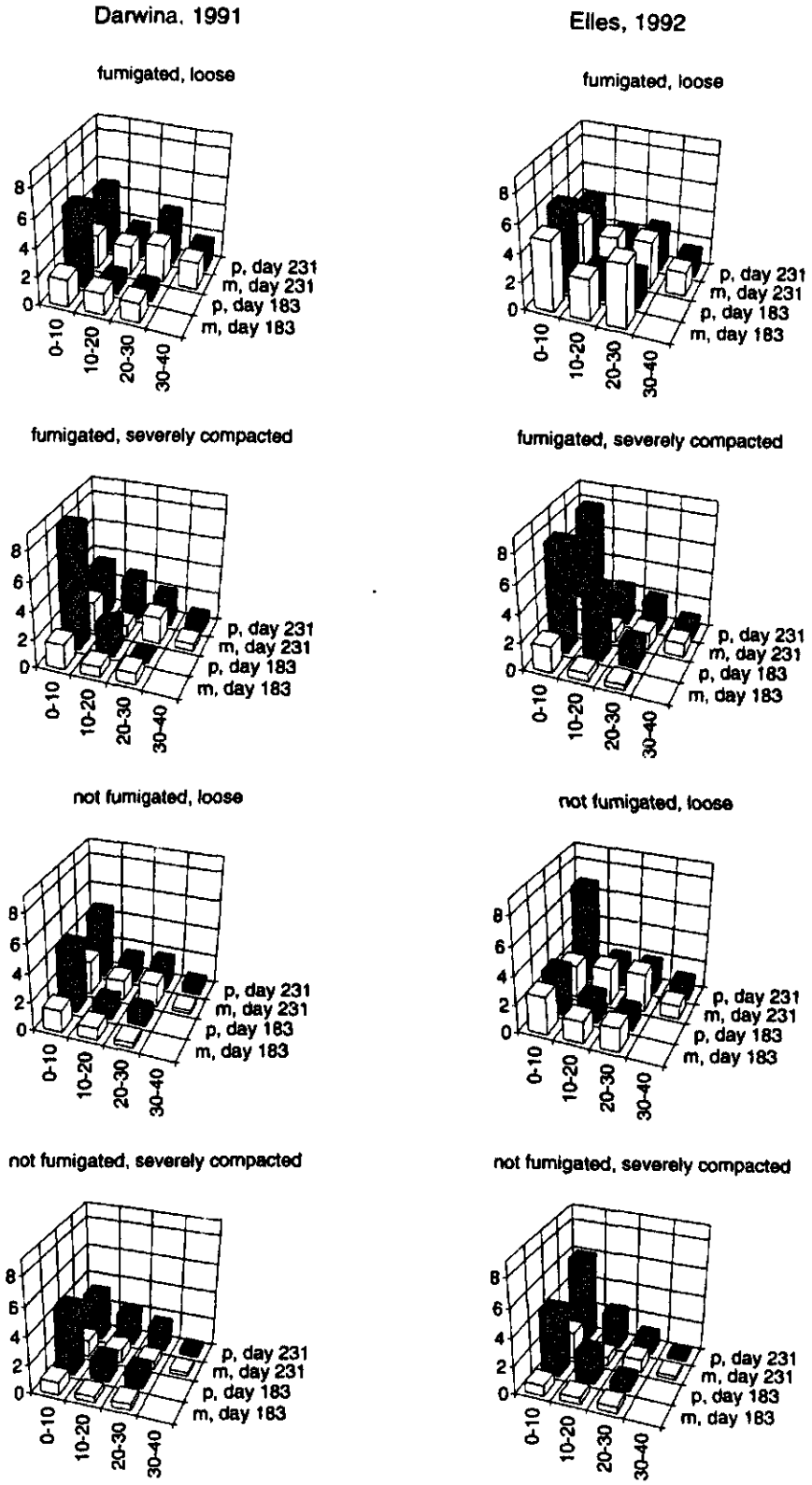

Figure 12 Spatial distribution of roots in the soil in the 1991 experiment. Root length density (cm/cm^3) at two positions, beneath plants (P) and between plants (M), four depths and two observations dates (a:day 183, b:day 231) for four combinations of soil compaction and potato cyst nematode infestation level.

3.6.3 Core samples

Beside root countings with minirhizotrons, root length was determined by taking core samples and estimating length by the line intersect method of Tennant (1975). Data of each plot are given in Appendix 5. Time courses of total root length are shown in Fig. 10. At the first sampling date only root length of Elles was reduced by compaction and nematodes. Differences in root length between treatments appeared in cultivar Darwina at the second harvest. Elles had more roots than Darwina and early reduction of root length due to nematodes and compaction resulted in equal root lengths compared to Darwina. In 1992 Bintje and Mentor also showed differences in root length at the first sampling date, also resulting in a similar root length as for cultivar Darwina. On average nematodes reduced root length more than compaction, especially in 1991.
Spatial distribution of roots in the soil is shown in Fig. 12. For 1991 root density (cm/cm^3) at the P and M position and four depths is plotted for day 183 and day 231. In the top ten centimetres, root length density beneath the plant was much higher than between plants. With increasing depth this difference in root length density between the P and M position decreased. Compaction influenced root distribution, resulting in clear differences in root length density between the P and M positions. Nematodes did not influence root distribution but reduced root length density at all depths and positions.

3.6.4 Comparison of core samples and minirhizotron results

Root growth was observed with two different methods and these should give comparable results. For a good comparison of minirhizotron and core sampling it is important which sampling positions and depths are used. The minirhizotrons were installed between four plants, which corresponds with the M position of the core sampling. Because root length density was not homogeneous, total root number measured with the minirhizotrons was compared with the results of core sampling at the M position only. Observations of both methods were first averaged before they were plotted because of the high variation.
In Fig. 13 root number of Darwina is plotted against root length density per layer of 10 cm (1991) or 20 cm (1992). In 1991 no effects of depth on the relation between observations using

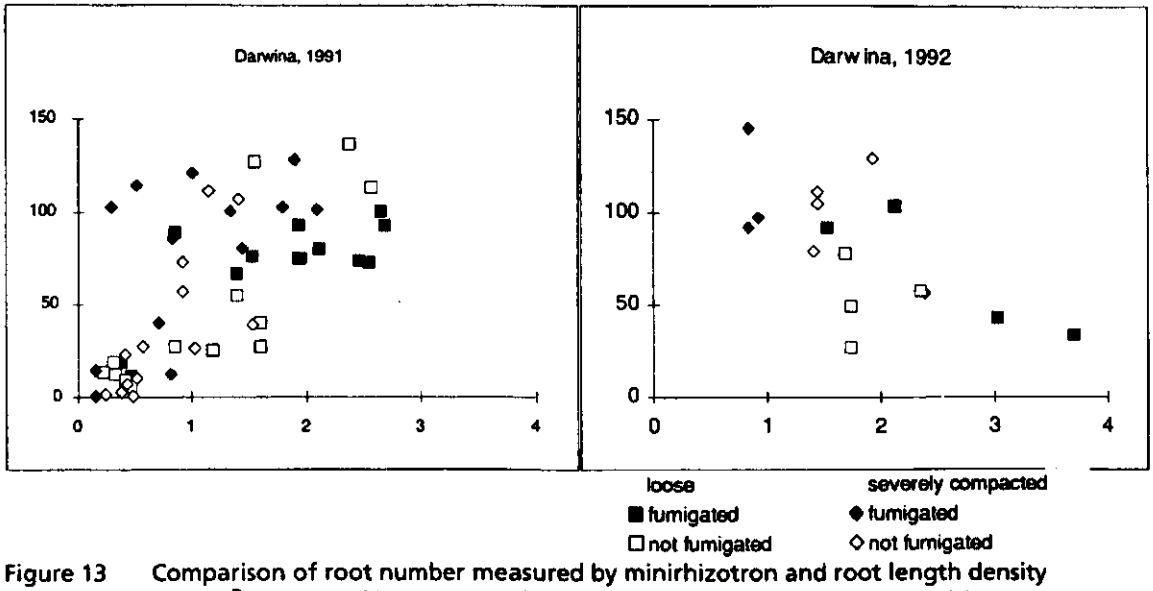

Figure 13 Comparison of root number measured by minirhizotron and root length density (cm/cm^3) measured by core sampling for 4 (1991) or 2 (1992) depths, cultivar Darwina.

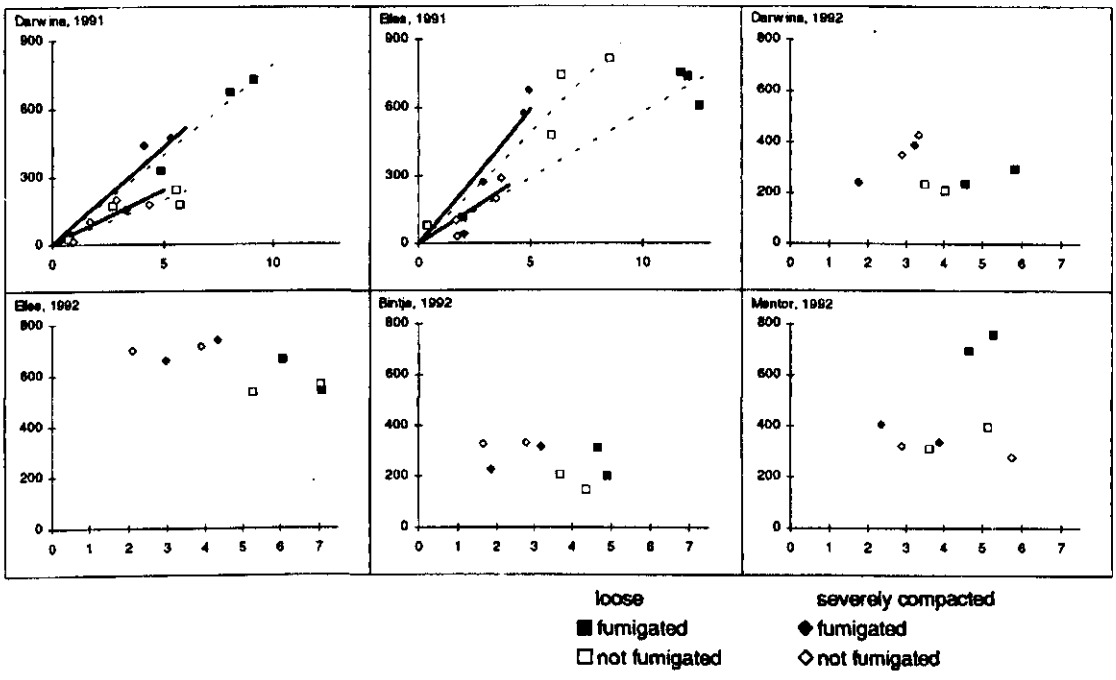

Figure 14 Comparison of total root number counted per minirhizotron and total root length (km/m^2) measured by core sampling at the M position.

minirhizotrons and core sampling were found. In 1992 sampling depth influenced the relationship. With core sampling high root length densities in the top 20 cm were found while low numbers of roots were counted against the minirhizotrons. In the layer 20-40 cm low root length densities were measured by core sampling and high root numbers by minirhizotron. Because this interaction between depth and method, observations of roots at all depths were cumulated. Thus root length at the M position over depths 0-40 cm and root number in minirhizotrons over depths 0-80 cm were compared. Results are shown in Fig. 14.
Regression through the origin for different treatments was carried out for the results of 1991 only, because this seemed not applicable to the results of 1992. In 1991 the relation between minirhizotron observations and core sampling was influenced by the different treatments but effects were not consistent. For cultivar Darwina nematodes reduced the number of roots counted along the minirhizotron more than roots taken from core samples. For cultivar Elles nematodes and compaction increased the relative root counts along the minirhizotron. In 1992 differences in root number against the minirhizotrons were small whereas core sampling resulted in differences in root length density. Compaction reduced root length density at the M position, nematodes had less effect.

3.6.5 Evaluation of methods of root measurement

The two ways of studying root growth did not give equal results of root growth for the different treatments. The advantage of minirhizotrons above core sampling is that less time is needed for observations. The question is: Do minirhizotrons give correct quantitative information about root growth and can they be used for measuring effects of soil compaction and nematodes on root growth? One limitation of vertically placed minirhizotrons is the neglect of spatial variability around a plant. This is taken into account in our evaluation of minirhizotrons and core sampling by considering samples at the M position only. Using minirhizotrons for

assessing the vertical rooting profile yields unrealistic data (Fig. 13). A reduced root growth against minirhizotrons in the upper soil layers is found by many authors and often only a good relation between minirhizotrons and core sampling is found after ignoring the top 20 or 30 cm of the soil (Bragg et al., 1983; Upchurch and Ritchie, 1983; Vos and Groenwold, 1987; Parker et al., 1991) and this is just the layer with the main amount of roots. Because roots grow deeper along a minirhizotron than in bulk soil, total root numbers or root lengths of all soil layers are compared. This comparison shows a lot of variation and no clear relation can be described. In 1992 compaction has little effect on root number and a large effect on root length. There is no clear relation between root growth measured using minirhizotrons and root growth measured by core sampling, partly because treatments seem to affect the relationship. Because root growth along minirhizotrons is likely to be unrealistic, only the results of the core sampling will be discussed further.

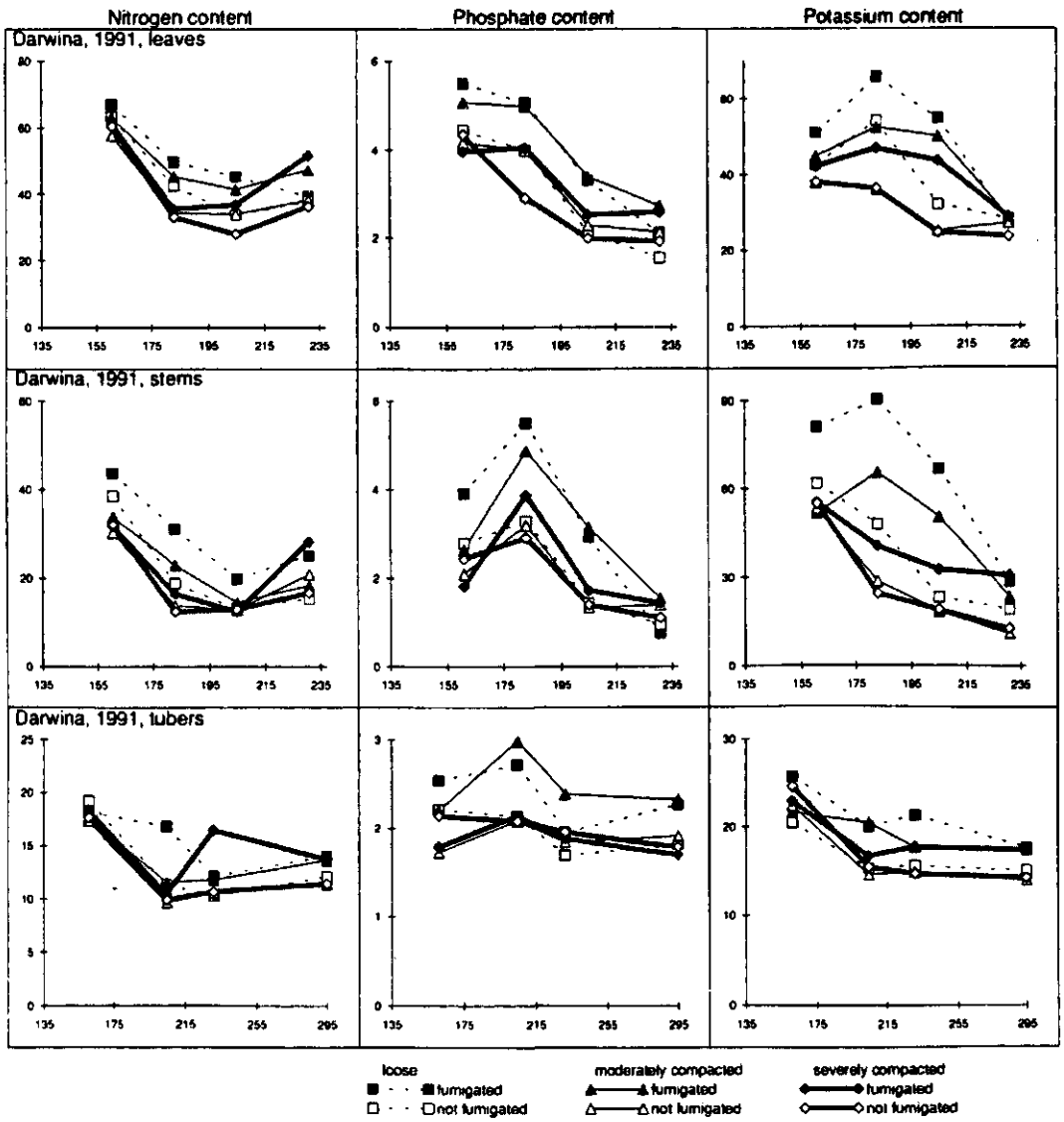

Figure 15A Concentrations of N, P and K in leaves, stems and tubers (g/kg) of cv Darwina for six combinations of soil compaction and potato cyst nematode infestation level in the 1991 experiment.

3.7 Nutrients

At each harvest concentrations of total N, P and K in stems, leaves and tubers and, in 1991, also the leaf nitrate contents were measured (Appendix 6). Fig. 15 shows concentrations of N, P and K in leaves, stems and tubers of the 1991 experiment only. Differences between treatments were very small in 1992 but effects of compaction and nematodes were equal to 1991. Nutrient concentrations in stems and leaves were highest at the first harvest and decreased during growth. Nutrient concentrations of the tubers remained fairly constant. Both compaction and nematodes reduced concentrations of N, P and K in stems, leaves and tubers. In 1991, concentrations of nitrogen in stems and leaves of the compacted treatments increased between day 205 and 230, indicating that the slow initial growth on compacted soil 'saved' nitrogen. Differences between treatments were largest on day 183 and were small on day 231.

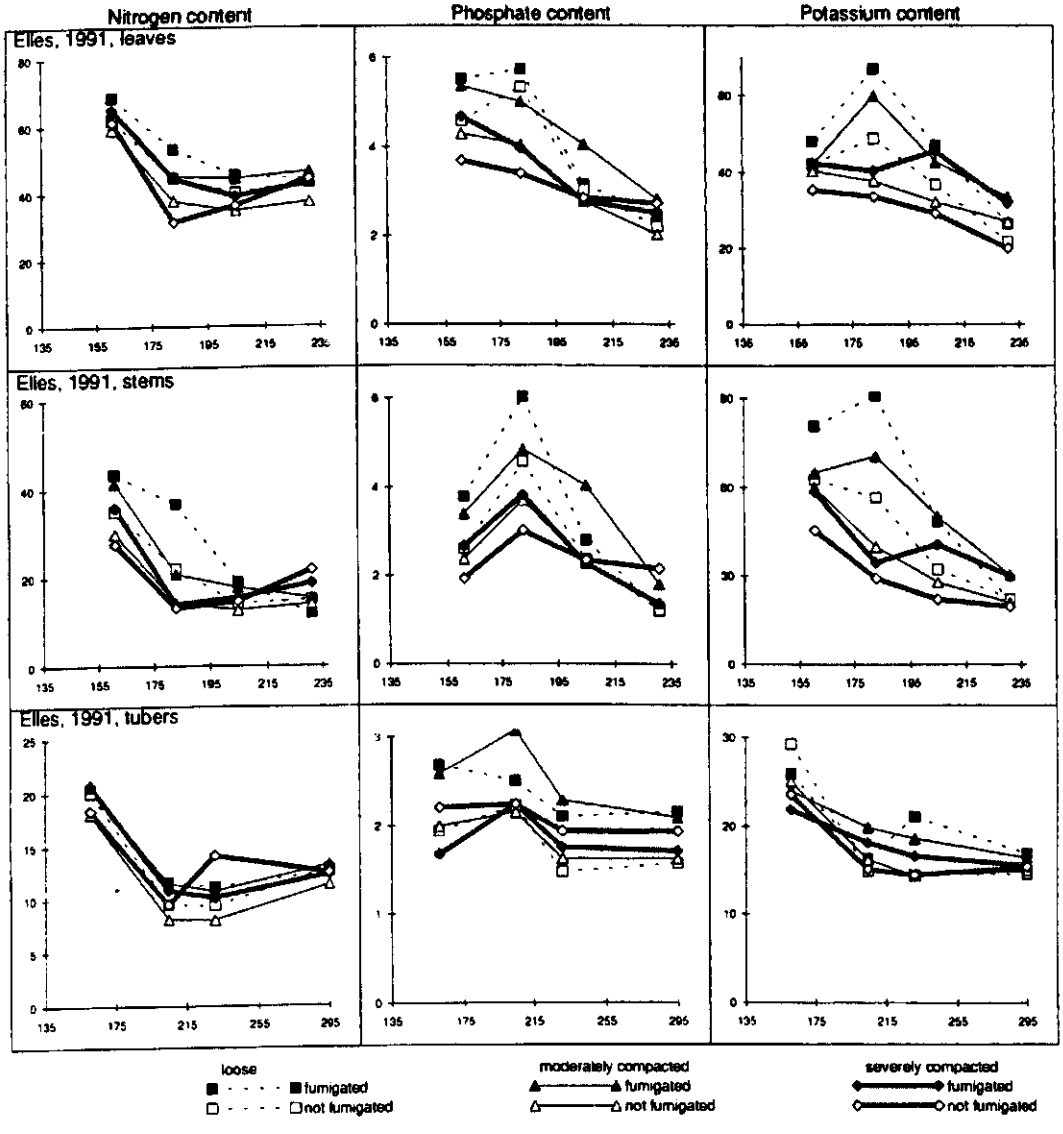

Figure 15B Concentrations of N, P and K in leaves, stems and tubers (g/kg) of cv Elles for six combinations of soil compaction and potato cyst nematode infestation level in the 1991 experiment.

From dry matter yield and nutrient concentrations, nutrient uptake per m^2 was calculated (Fig. 16). For yellow and dead leaves the nutrient concentrations of green leaves were used and it was assumed that no leaves disappeared. During the first hundred days after planting there was a steady increase in the amount of absorbed nutrients. In 1991 uptake of N, P and K was more reduced by compaction than by nematodes, but with Darwina initial differences between both treatments decreased.

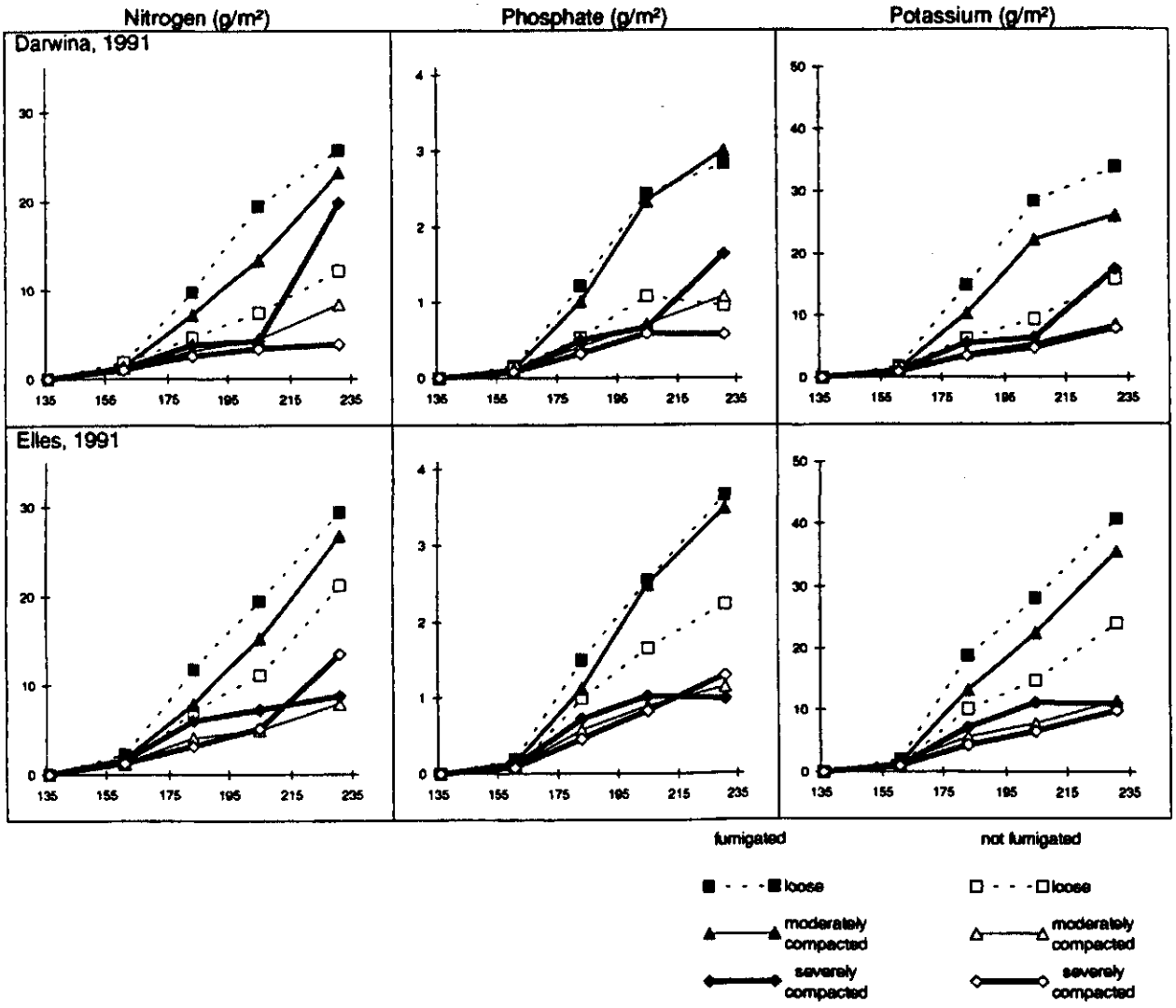

Figure 16A Total uptake of N, P and K (g/m^2) vs. Julian day number for six combinations of soil compaction and potato cyst nematode infestation level, 1991.

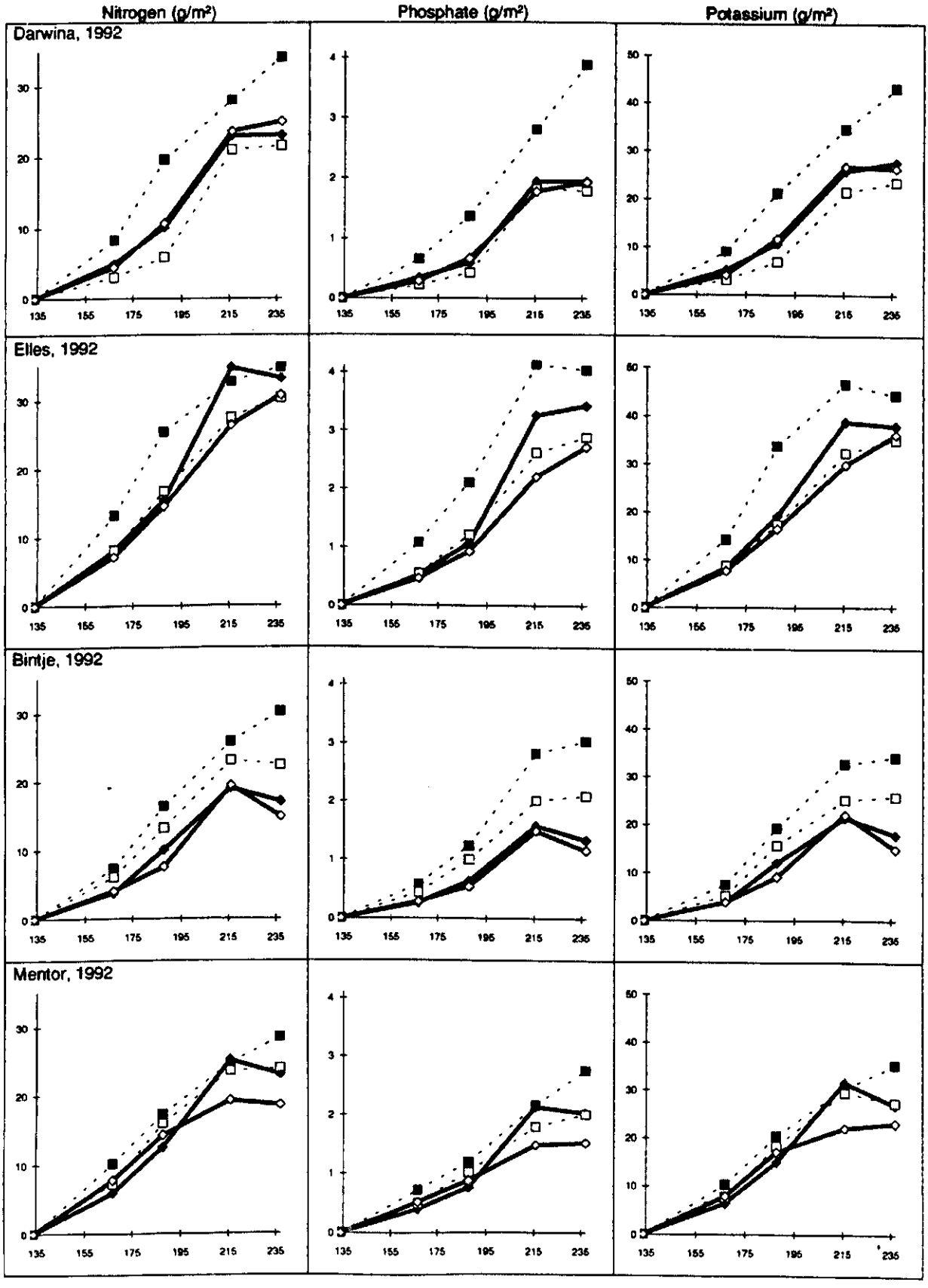

Figure 16B Total uptake of N, P and K (g/m^2) vs. Julian day number for four combinations of soil compaction and potato cyst nematode infestation level, 1992.

3.8 Nutrient uptake rates

From total root length and total absorbed nutrients the specific nutrient uptake rate of the roots was calculated. In Fig. 17 specific nitrogen uptake rate of the first 50 days after planting is plotted against the root length at 50 days after planting. Effects of nematodes and compaction on the relation between specific uptake rates and root length differed among cultivars. Specific nitrogen uptake rate of Elles was hardly influenced by nematodes or compaction whereas root length was strongly reduced. The opposite was found for cultivar Darwina, where root length was hardly affected but specific nitrogen uptake rate was reduced by nematodes and compaction. For Bintje there was no clear relation between specific nutrient uptake rate and root length. Mentor showed an inverse relationship between specific nitrogen uptake rate and root length, the control had the lowest root length but highest specific nitrogen uptake rate and compaction increased root length but reduced specific uptake rate. Specific uptake rates of P and K are not shown but patterns were similar to those of N.

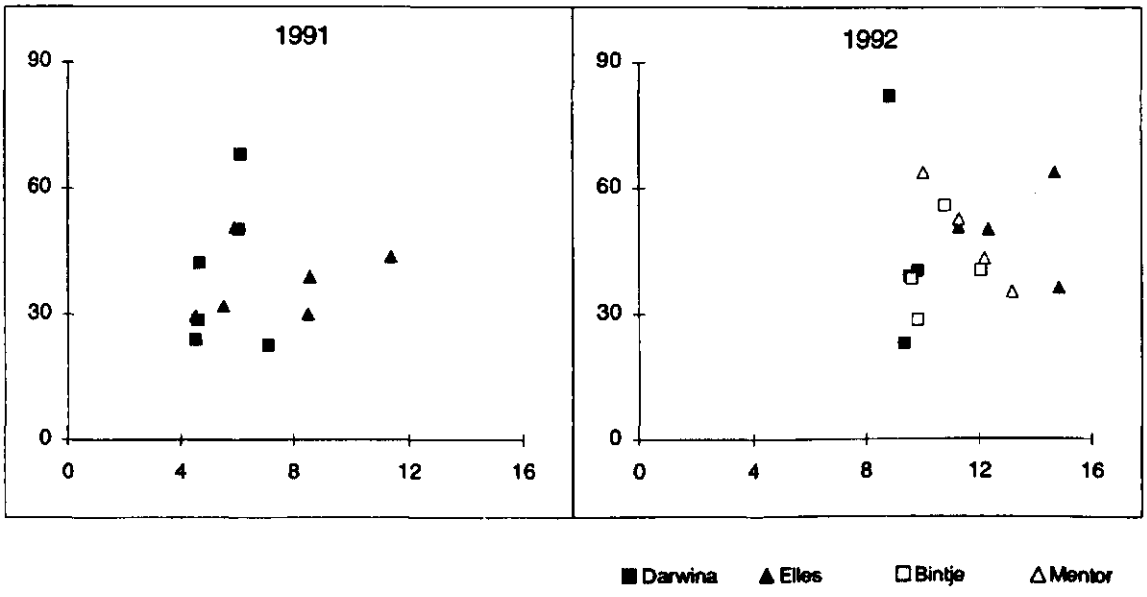

Figure 17 Specific nitrogen uptake (mg/km·day) between day 136 and 183 (1991) or day 134 and 188 (1992) vs. total root length (km/m^2) at day 183 or day 188.

3.9 Relative root length, leaf nitrogen content, tuber weight and percentage ground cover

To compare effects of compaction and nematodes, the time courses of root length, leaf nitrogen content, tuber weight and percentage ground cover were plotted relatively to the control (Fig. 18).
In the first month after planting the nitrogen content of the leaves was not reduced by nematodes nor compaction. Except for Elles, root length was neither reduced by nematodes nor compaction. On average, tuber yield was stimulated or unaffected by compaction and not or slightly reduced by nematodes. Between both years however the effects on tuber yield of Darwina and Elles were not consistent. Percentage ground cover seemed affected most by nematodes and compaction. In all cases percentage ground cover was reduced by nematodes and compaction.

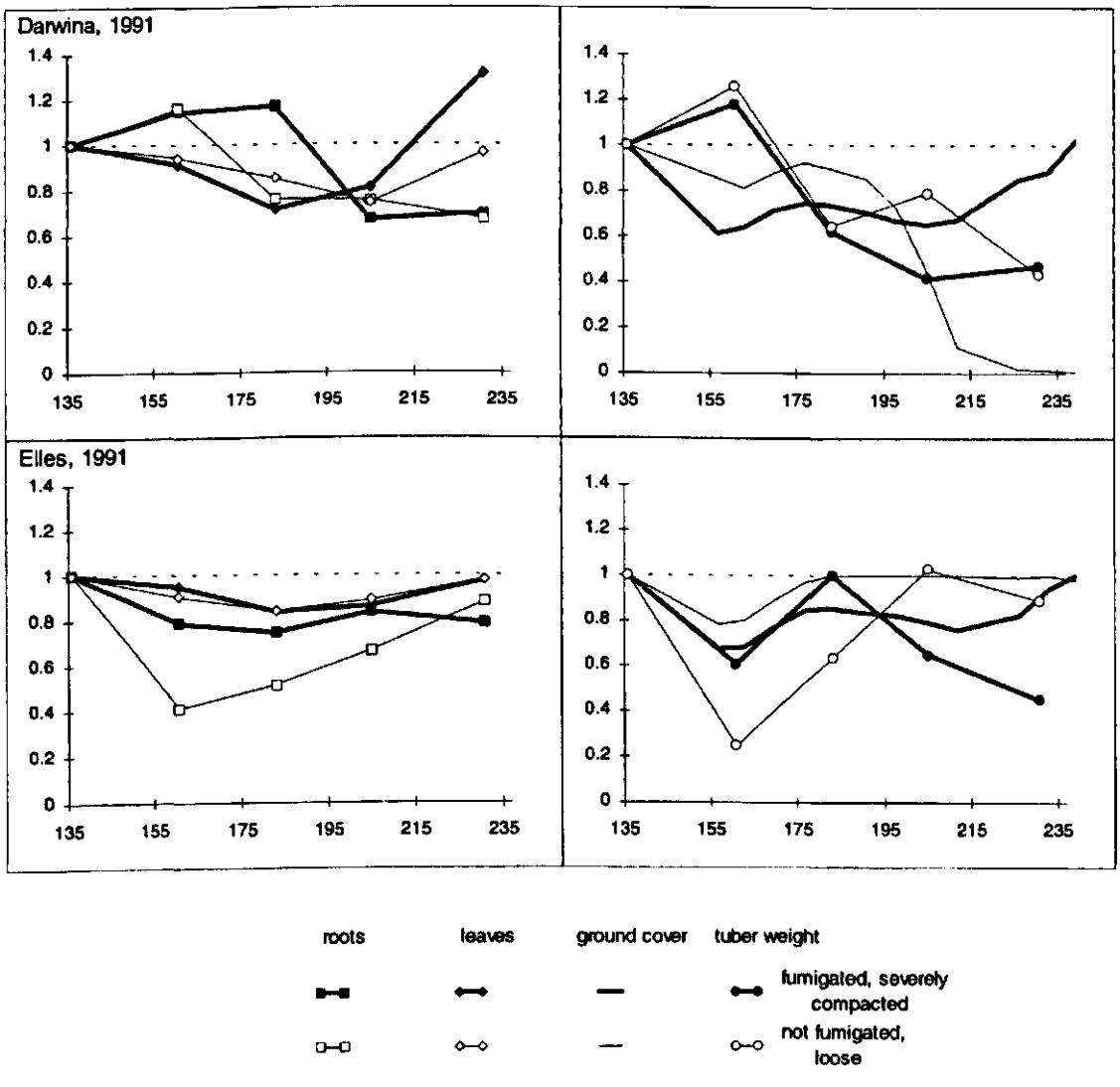

Figure 18A Relative root length, leaf nitrogen content (left), tuber weight and percentage ground cover (right) vs. Julian day number for four combinations of soil compaction and potato cyst nematode infested soil and compacted soil, 1991.

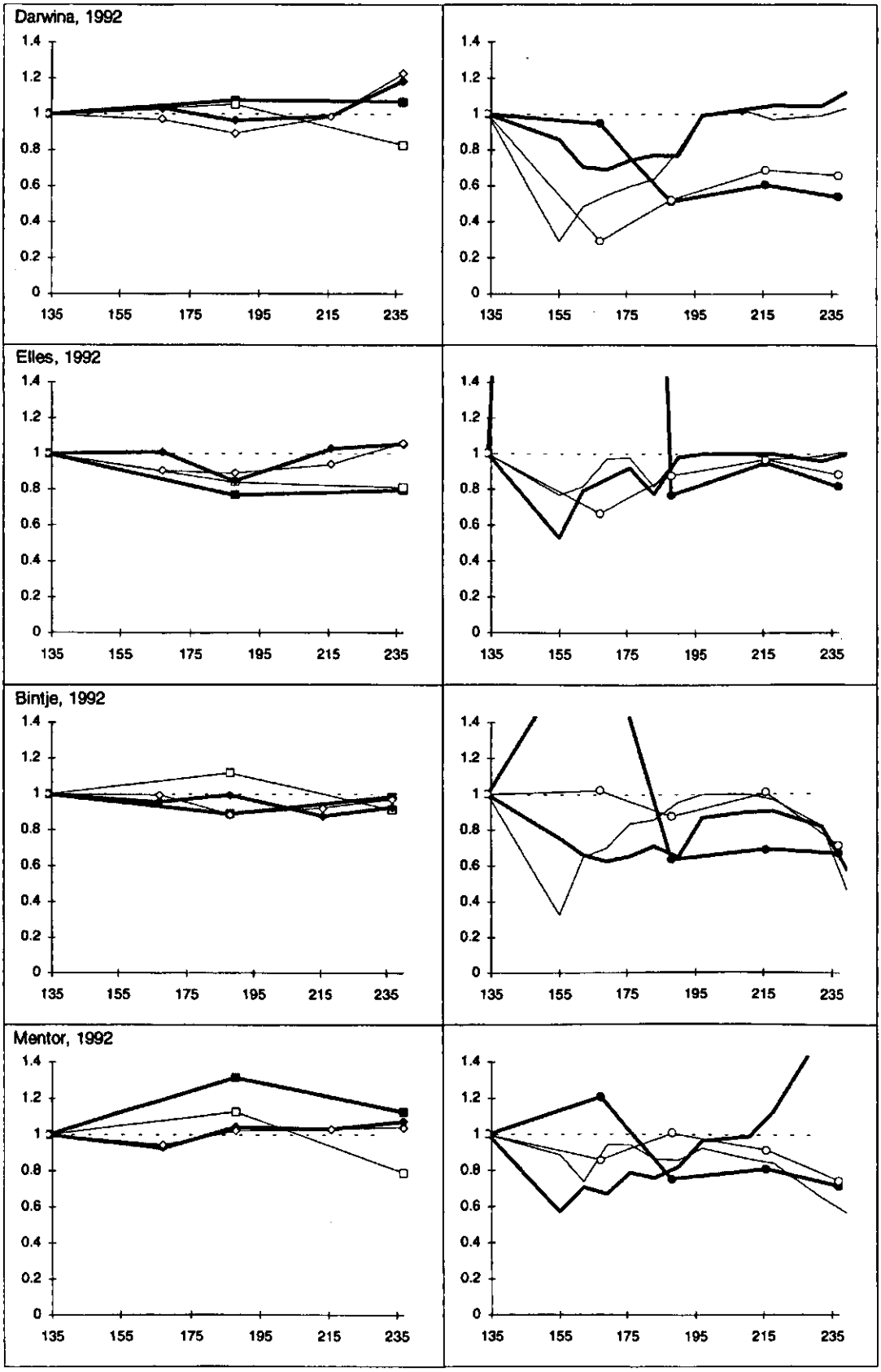

Figure 18B Relative root length, leaf nitrogen content (left), tuber weight and percentage ground cover (right) vs. Julian day number for potato cyst nematode infested soil and compacted soil, 1992.

4 Conclusions on damage mechanisms

To be able to understand the mechanism by which potato cyst nematodes reduce potato yield, effects of nematodes on individual aspects of potato growth have to be studied. Yield was reduced in 1992 but root growth was not reduced. From this we conclude that yield losses in 1992 were not caused by nutrient deficiency due to insufficient rooting. This is confirmed by the absence of treatment effects on plant nutrient contents. The nematode damage mechanism proposed by Trudgill and Cotes (1983) and Evans et al. (1977), that nematodes reduce growth and efficiency of the root system, thus affecting nutrient uptake and decreasing top growth, did therefore not account for the yield losses observed in 1992. Therefore we accept the damage mechanism proposed by Schans (1991). He stated that penetration of the roots and initiation of syncytia by *G. pallida* triggers the transport of photosynthesis-reducing messengers from root to shoot. The messenger involved may be the pathogenesis related proteins observed in potato leaves within six hours after root penetration by cyst nematodes (Bowles et al., 1991). Hormonal effects may also have caused the yield loss in 1992 due to soil compaction. As with nematodes yield was reduced by compaction but nutrient concentrations were not. The mechanism involved with compaction differs from that with nematodes because effects of both treatments on cultivar Elles were different. The hormonal mechanism may also explain the observed reductions of photosynthesis and light use efficiency without effects on leaf nitrogen contents.

Damage was more severe in 1991, possibly because of a higher soil nematode population density. In 1991, as opposed to 1992, root length reduction and decreases in nutrient contents did occur. These effects may have caused the higher yield losses. This idea is confirmed by the observation that yield of cultivar Elles, which is generally tolerant of nematodes, was reduced by nematodes only on the severely compacted soil, where root length had already been reduced because of the compaction. Hormonal effects also may have accounted for part of the yield loss in 1991, since ground cover was already severely reduced in this year before root length density and nutrient contents became significantly affected.

We conclude that yield losses caused by nematodes may always be partly due to hormonal effects, but may sometimes be aggravated by nutrient deficiency because of reduced root length.

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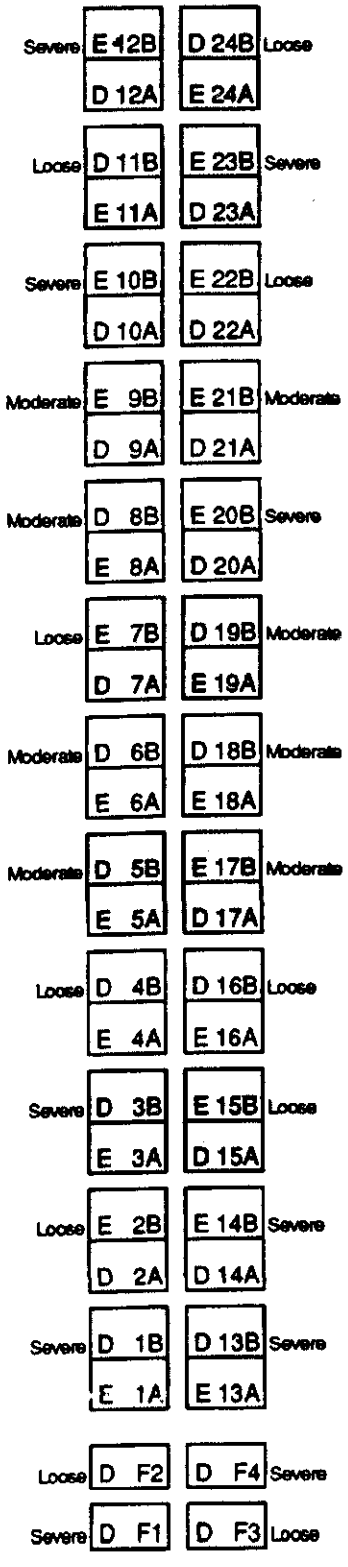
Appendix I:

Layout of the experiments

1991



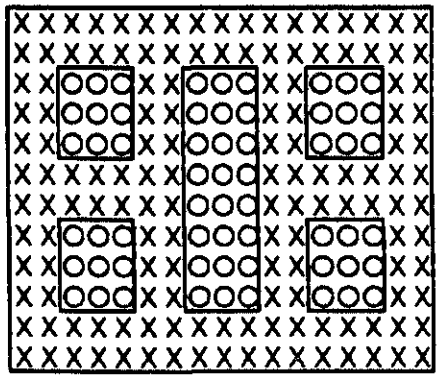
2 cultivars:
D=Darwina
E=Elles

2 nematode levels:
grey=fumigated soil
white=not fumigated soil

3 soil compaction levels:
loose
moderately compacted
severely compacted

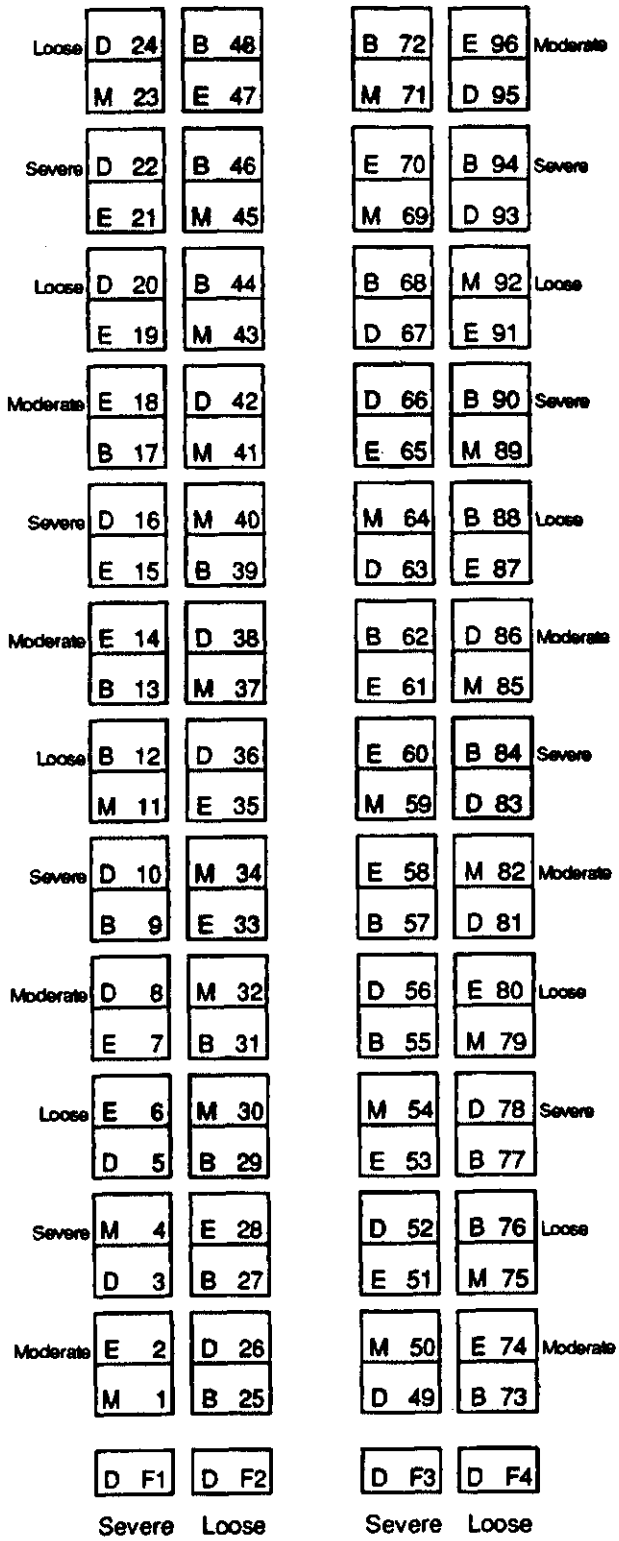
4 replicates:
I: plot 1A-6B
II: plot 7A-12B
III: plot 13A-17B
IV: plot 18A-24B

One individual plot:



O = harvest plant
X = border plant
Plant spacing: 25 x 25 cm

1992



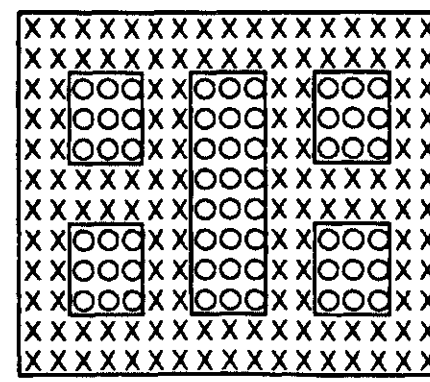
4 cultivars:
- D=Darwina
- E=Elles
- B=Bintje
- M=Mentor

2 nematode levels:
- grey=fumigated soil
- white=not fumigated soil

3 soil compaction levels:
- loose
- moderately compacted
- severely compacted

4 replicates:
- I: plot 1-12; 25-36
- II: plot 13-24; 37-48
- III: plot 49-60; 73-84
- IV: plot 61-72; 85-96

One individual plot:



O = harvest plant
X = border plant
Plant spacing: 25 x 25 cm

Appendix II:

Dates of cultural practices

	1991	day	1992	day
fumigation	04-04	94	10-04	101
planting tubers in the greenhouse	22-04	112	27-04	118
soil sampling for nematodes	06-05	126	22-04	113
soil sampling for nutrients	10-06	161	22-04	113
compaction	13-05	133	28-04	119
fertilization	13-05	133		
removing plants from tubers	15-05	135	12-05	133
planting	16-05	136	13,14-05	134,135
harvests	10-06	161	15-06	167
	02-07	183	06-07	188
	24-07	205	03-08	216
	19-08	231	24-08	237
	3,22-10	295	14-09	258
penetrometer	13-05	133	07-07	189
	27-06	178	11-08	224
	03-10	276	03-10	277
pF curve	04-09	247		
Bulk density	27-06	178	11-08	224
	04-09	247		
Endoscope	20-06	171	15-06	167
	5,10-07	189	11-07	193
	16-07	197	11-08	224
	30-07,02-08	212	01-09	245
	15,16-08	228	07-10	281
	25-10,05-11	305		
Video endoscope	16-07	197	14-07	196
	30-07	211	12-08	225
Photosynthesis	1-5/07	182-186	13-17/07	195-199
	29/7-2/8	210-214	10-14/08	223-227

Spraying against Phytophthora regularly, about once every week.
In 1991 twice sprayed with Decis against stem borer.
In 1992 the field was irrigated five times from 1 July onward, about 30 mm water per time.

Appendix III:

Percentage ground cover

1991, measured with a grid.

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:
1=Darwina
2=Elles

Nematodes:
1=fumigated
2=not fumigated

Compaction:
1=loose
2=moderately compacted
3=severely compacted

code					Day number														
					137	158	164	171	178	183	192	199	206	213	226	233	246	261	277	297
1	1	1	1	4B	1	19	38	63	88	100	100	100	100	100	98	100	95	40	1	0
1	1	1	2	11B	4	26	50	75	93	100	100	100	100	99	95	100	76	0	2	0
1	1	1	3	16B	2	19	43	73	94	100	100	100	100	100	98	100	40	45	0	0
1	1	1	4	24B	1	22	43	69	92	100	100	100	100	100	100	100	95	15	0	0
1	1	2	1	6B	1	19	37	61	87	99	99	99	99	100	99	98	95	80	10	0
1	1	2	2	9A	2	16	40	72	92	95	94	97	98	97	98	100	95	55	10	0
1	1	2	3	18B	5	15	27	53	83	96	98	99	98	97	98	95	98	45	8	0
1	1	2	4	21A	3	15	28	52	83	95	95	97	99	98	98	100	98	90	15	0
1	1	3	1	1B	1	9	24	49	66	70	67	64	60	57	60	93	90	85	65	0
1	1	3	2	12A	2	17	33	57	82	89	88	91	92	92	96	96	98	80	20	0
1	1	3	3	13B	2	11	24	41	54	59	51	37	30	29	80	70	70	70	5	0
1	1	3	4	23A	4	15	30	52	73	79	76	76	79	91	96	95	98	87	20	0
1	2	1	1	2A	3	16	31	53	79	90	88	71	38	6	0	0	0	0	0	0
1	2	1	2	7A	7	20	38	66	88	93	89	80	57	20	4	1	0	0	0	0
1	2	1	3	15A	1	15	30	56	81	86	83	69	38	5	1	1	0	0	0	0
1	2	1	4	22A	3	21	43	70	91	92	82	69	46	15	2	3	0	0	0	0
1	2	2	1	5B	4	12	25	48	69	70	63	51	34	38	5	3	0	0	0	0
1	2	2	2	8B	5	16	31	52	79	85	73	57	30	3	0	0	0	0	0	0
1	2	2	3	17A	3	17	33	58	74	66	52	42	29	12	6	1	0	0	0	0
1	2	2	4	19B	2	14	28	49	67	64	50	39	28	8	2	0	0	0	0	0
1	2	3	1	3B	2	12	26	46	57	51	47	44	30	28	5	2	0	0	0	0
1	2	3	2	10A	1	12	31	53	66	69	51	32	24	12	32	36	68	45	2	0
1	2	3	3	14A	4	10	17	26	35	40	30	15	6	2	0	0	0	0	0	0
1	2	3	4	20A	8	13	26	48	63	57	39	24	14	4	0	0	0	0	0	0
2	1	1	1	4A	5	25	56	86	99	100	100	100	100	100	100	100	95	25	0	0
2	1	1	2	11A	4	27	58	87	99	100	100	100	100	100	100	100	95	85	2	0
2	1	1	3	16A	4	24	55	86	99	100	100	100	100	100	100	100	98	93	5	0
2	1	1	4	24A	1	28	59	87	99	100	100	100	100	100	100	98	75	45	0	0
2	1	2	1	6A	3	23	54	86	99	100	100	100	100	100	100	100	98	80	8	0
2	1	2	2	9B	4	14	37	71	93	98	97	98	99	99	100	100	98	95	35	0
2	1	2	3	18A	4	24	49	78	95	100	100	100	100	100	100	100	98	80	8	0
2	1	2	4	21B	3	17	35	62	84	92	97	100	100	99	100	100	98	85	6	0
2	1	3	1	1A	1	13	38	68	82	84	78	69	63	66	53	95	95	80	18	0
2	1	3	2	12B	1	20	47	79	96	98	96	98	100	99	100	100	100	90	60	0
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2	1	3	4	23B	1	21	40	63	79	80	81	85	86	91	100	96	98	98	50	0
2	2	1	1	2B	1	18	43	73	94	100	100	100	100	100	98	100	90	80	1	0
2	2	1	2	7B	1	19	42	72	94	100	100	100	100	100	100	100	98	75	2	0
2	2	1	3	15B	4	19	44	79	98	100	100	100	100	100	99	99	67	35	5	0
2	2	1	4	22B	5	26	55	86	99	100	100	100	100	100	100	99	95	75	8	0
2	2	2	1	5A	1	15	31	54	75	80	81	85	83	88	98	99	63	25	5	0
2	2	2	2	8A	1	19	43	74	95	100	100	97	92	84	84	50	91	70	1	0
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2	2	2	4	19A	4	21	44	69	85	88	85	84	83	86	24	85	82	77	30	0
2	2	3	1	3A	1	13	27	48	65	67	65	65	57	49	90	98	70	70	14	0
2	2	3	2	10B	2	16	37	60	73	75	64	51	43	28	40	70	86	80	25	0
2	2	3	3	14B	2	15	27	38	47	47	40	32	18	6	24	56	5	30	3	0
2	2	3	4	20B	4	18	36	57	69	62	54	49	33	18	24	30	16	40	14	0

1992, *measured by cropscan.*

Code: Variety, Nematodes, Compaction, block number, plot number

Va riety:		Nematodes:	Compaction:
1=Darwina	3=Bintje	1=fumigated	1=loose
2=Elles	4=Mentor	2=not fumigated	2=moderately compacted
			3=severely compacted

code					Day number													
					155	162	169	176	183	190	197	211	218	232	246	252	260	267
1	1	1	1	5	22	66	88	92	62	89	100	91	82	93	94	84	70	43
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1	1	1	3	52	15	74	95	100	70	100	100	100	100	91	73	67	66	16
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1	1	2	3	49	18	66	84	89	68	96	100	100	100	100	94	60	67	15
1	1	2	4	95	11	53	82	81	75	100	100	100	98	100	80	64	48	44
1	1	3	1	10	13	31	47	45	33	51	97	100	93	85	100	92	91	69
1	1	3	2	22	19	55	68	83	52	73	100	95	82	94	94	73	62	24
1	1	3	4	66	9	59	61	81	65	86	100	100	100	92	75	60	57	21
1	1	3	3	83	12	44	66	77	61	77	100	100	100	100	92	88	86	36
1	2	1	2	20	0	19	34	50	34	71	100	95	80	67	64	74	56	26
1	2	1	1	36	18	52	68	70	51	80	100	100	84	88	97	68	61	28
1	2	1	3	56	0	23	40	44	39	63	100	92	83	98	89	82	62	22
1	2	1	4	67	0	35	51	64	50	85	100	100	100	99	73	76	52	32
1	2	2	1	8	22	51	65	66	53	54	80	81	86	74	85	75	63	39
1	2	2	2	42	17	49	62	61	51	89	100	100	97	98	91	57	38	24
1	2	2	3	81	9	15	21	18	24	46	83	100	100	87	53	61	54	7
1	2	2	4	86	21	56	65	79	66	79	100	100	100	75	35	22	15	0
1	2	3	1	3	18	43	54	56	43	55	74	74	69	90	100	80	87	38
1	2	3	2	16	14	43	58	67	56	77	98	98	91	65	59	53	32	0
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2	1	3	4	65	16	87	96	100	83	100	100	100	100	100	100	100	100	100
2	2	1	2	19	24	72	100	100	72	100	100	100	96	100	100	100	100	44
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2	2	2	4	61	24	84	97	99	90	100	100	100	100	98	100	90	94	83
2	2	3	2	15	21	63	79	90	65	100	100	100	100	100	100	100	100	100
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2	2	3	3	53	10	50	48	58	44	81	100	100	100	100	100	100	76	84
2	2	3	4	70	8	50	72	104	79	100	100	100	100	100	100	100	79	66

1992, measured by cropscan.

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:		Nematodes:	Compaction:
1=Darwina	3=Bintje	1=fumigated	1=loose
2=Elles	4=Mentor	2=not fumigated	2=moderately compacted
			3=severely compacted

code					Day number											
					155	162	169	176	183	190	197	211	218	232	246	252
3	1	1	1	29	8	57	72	77	58	97	100	100	81	62	15	0
3	1	1	2	48	18	61	99	94	56	100	100	98	87	61	19	4
3	1	1	3	76	15	45	69	91	55	100	100	100	100	93	39	22
3	1	1	4	88	15	54	78	100	78	95	100	98	93	69	13	0
3	1	2	2	13	11	38	59	75	51	85	100	100	93	70	56	10
3	1	2	1	25	14	58	87	88	63	88	100	100	89	47	0	0
3	1	2	4	72	13	65	79	91	69	100	100	90	90	59	8	0
3	1	2	3	73	24	69	79	88	66	80	100	100	84	72	13	0
3	1	3	1	9	16	45	63	69	47	72	86	85	83	57	5	6
3	1	3	2	46	9	30	50	58	33	60	81	81	63	48	16	22
3	1	3	3	84	9	34	45	58	43	62	87	96	85	72	0	6
3	1	3	4	90	7	35	41	53	53	61	94	95	95	56	10	0
3	2	1	1	12	9	29	50	72	45	90	100	95	90	47	1	0
3	2	1	2	44	8	28	49	68	41	86	100	100	77	67	0	5
3	2	1	3	55	0	40	57	79	59	100	100	100	100	82	11	0
3	2	1	4	68	1	45	67	84	68	98	100	100	82	38	0	0
3	2	2	2	17	21	36	44	54	44	65	90	82	64	32	0	0
3	2	2	1	31	13	43	48	64	48	60	83	76	56	19	0	0
3	2	2	3	57	0	38	60	61	38	80	95	100	95	61	10	0
3	2	2	4	62	2	44	47	63	55	83	100	95	81	40	0	0
3	2	3	1	27	8	52	44	50	35	50	77	81	46	36	12	0
3	2	3	2	39	11	35	44	48	42	63	73	77	86	40	11	1
3	2	3	3	77	14	30	37	47	46	53	74	92	73	50	9	7
3	2	3	4	94	5	34	51	63	52	59	88	88	87	35	0	0
4	1	1	2	23	8	51	84	100	71	100	100	100	89	54	10	12
4	1	1	1	30	23	93	79	82	68	99	100	98	74	35	31	13
4	1	1	4	64	14	81	95	100	88	100	100	100	88	43	3	0
4	1	1	3	75	35	87	100	91	83	82	100	100	73	57	25	32
4	1	2	1	1	18	54	71	78	60	76	86	83	79	65	50	36
4	1	2	2	37	25	70	71	86	56	93	100	100	96	61	45	32
4	1	2	3	50	21	86	93	100	86	100	100	100	96	77	48	25
4	1	2	4	71	8	61	90	100	89	100	100	100	98	51	11	9
4	1	3	1	34	20	69	66	83	54	67	98	100	88	65	30	24
4	1	3	2	45	11	43	59	65	48	83	96	100	98	77	41	30
4	1	3	3	59	5	59	70	88	72	95	100	95	87	81	24	5
4	1	3	4	89	10	49	45	58	61	68	92	100	94	72	49	20
4	2	1	1	11	22	53	83	86	62	72	89	80	68	25	6	1
4	2	1	2	43	12	55	91	88	54	85	100	100	100	77	28	20
4	2	1	3	79	25	65	86	85	73	78	81	83	45	12	0	0
4	2	1	4	92	13	56	77	93	78	92	100	82	62	9	0	0
4	2	2	1	32	19	54	64	60	45	62	71	63	64	33	4	0
4	2	2	2	41	23	58	78	75	56	74	95	96	68	55	18	7
4	2	2	3	82	21	60	78	66	59	63	78	82	61	39	12	0
4	2	2	4	85	20	58	74	80	69	73	81	72	60	37	0	0
4	2	3	1	4	18	54	57	67	54	57	71	66	61	48	22	13
4	2	3	2	40	20	58	80	68	58	72	100	92	87	53	23	15
4	2	3	3	54	9	50	52	67	54	77	100	93	86	77	42	26
4	2	3	4	69	15	59	67	83	59	90	100	100	94	56	34	13

Appendix IV:

Results of periodic harvests

Harvest 1: 10-06-1991

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
		3=severely compacted

Dry weights (g/m^2)

Code					total weight	leaf weight green	leaf weight yellow	leaf weight dead	leaf weight total	stem weight	tuber weight	tuber % dry	tuber no	SLA (cm^2/g)	LAI (m^2/m^2)
1	1	1	1	4B	35.55	19.00	0	0	19.00	4.19	12.35	15.3	9	214	0.41
1	1	1	2	11B	32.94	20.42	0	0	20.42	4.10	8.41	14.7	11	198	0.40
1	1	1	3	16B	25.66	14.04	0	0	14.04	3.11	8.51	14.0	12	229	0.32
1	1	1	4	24B	39.61	22.70	0	0	22.70	5.32	11.60	14.5	16	218	0.50
1	1	2	1	6B	34.58	19.61	0	0	19.61	3.71	11.26	14.8	12	210	0.41
1	1	2	2	9A	29.45	18.20	0	0	18.20	3.10	8.15	16.2	8	226	0.41
1	1	2	3	18B	25.47	12.57	0	0	12.57	2.78	10.13	15.7	11	227	0.29
1	1	2	4	21A	30.11	15.13	0	0	15.13	3.25	11.73	15.9	13	229	0.35
1	1	3	1	1B	27.66	12.53	0	0	12.53	3.23	11.89	15.0	19	222	0.28
1	1	3	2	12A	24.77	15.98	0	0	15.98	3.34	5.46	14.9	10	214	0.34
1	1	3	3	13B	35.96	15.13	0	0	15.13	2.89	17.95	16.0	16	197	0.30
1	1	3	4	23A	32.95	16.40	0	0	16.40	3.63	12.92	15.9	17	203	0.33
1	2	1	1	2A	44.09	21.78	0	0	21.78	5.13	17.17	16.8	17	214	0.47
1	2	1	2	7A	34.47	19.04	0	0	19.04	4.33	11.09	16.0	12	220	0.42
1	2	1	3	15A	33.05	15.96	0	0	15.96	3.44	13.65	15.3	9	214	0.34
1	2	1	4	22A	37.45	22.58	0	0	22.58	5.36	9.51	15.2	12	205	0.46
1	2	2	1	5B	33.41	14.59	0	0	14.59	3.44	15.38	16.9	13	217	0.32
1	2	2	2	8B	24.38	13.26	0	0	13.26	2.61	8.51	16.4	15	211	0.28
1	2	2	3	17A	28.10	11.69	0	0	11.69	2.55	13.86	17.1	9	243	0.28
1	2	2	4	19B	31.84	15.27	0	0	15.27	3.35	13.22	17.3	11	218	0.33
1	2	3	1	3B	25.08	12.55	0	0	12.55	2.60	9.92	15.5	9	222	0.28
1	2	3	2	10A	29.13	12.98	0	0	12.98	3.02	13.13	17.8	13	205	0.27
1	2	3	3	14A	32.37	12.99	0	0	12.99	3.41	15.97	15.9	14	197	0.26
1	2	3	4	20A	24.38	14.02	0	0	14.02	3.23	7.14	17.3	8	203	0.28
2	1	1	1	4A	37.52	27.48	0	0	27.48	7.33	2.71	12.9	7	251	0.69
2	1	1	2	11A	41.56	28.88	0	0	28.88	7.19	5.49	12.5	10	238	0.69
2	1	1	3	16A	38.56	24.64	0	0	24.64	6.51	7.40	12.5	9	267	0.66
2	1	1	4	24A	40.04	26.79	0	0	26.79	6.74	6.51	12.8	7	225	0.60
2	1	2	1	6A	28.55	21.15	0	0	21.15	5.48	1.93	12.2	5	260	0.55
2	1	2	2	9B	22.33	14.18	0	0	14.18	3.73	4.43	13.4	3	234	0.33
2	1	2	3	18A	35.92	23.79	0	0	23.79	6.10	6.03	12.2	7	249	0.59
2	1	2	4	21B	36.46	24.20	0	0	24.20	5.30	6.96	13.0	10	234	0.57
2	1	3	1	1A	26.95	17.51	0	0	17.51	4.49	4.95	12.6	8	228	0.40
2	1	3	2	12B	35.36	24.95	0	0	24.95	6.40	4.01	12.6	5	244	0.61
2	1	3	3	13A	23.66	16.43	0	0	16.43	4.13	3.10	13.1	5	210	0.34
2	1	3	4	23B	30.65	23.40	0	0	23.40	5.85	1.41	12.8	5	210	0.49
2	2	1	1	2B	22.74	15.72	0	0	15.72	3.81	3.21	13.1	4	236	0.37
2	2	1	2	7B	28.57	22.79	0	0	22.79	5.42	0.36	13.4	4	222	0.50
2	2	1	3	15B	27.71	20.24	0	0	20.24	5.60	1.88	13.2	3	248	0.50
2	2	1	4	22B	31.66	24.92	0	0	24.92	6.74	0.00	*	0	222	0.55
2	2	2	1	5A	33.05	18.62	0	0	18.62	4.89	9.54	13.8	13	250	0.47
2	2	2	2	8A	27.19	19.37	0	0	19.37	5.33	2.50	13.0	4	246	0.48
2	2	2	3	17B	26.04	14.04	0	0	14.04	3.87	8.14	13.5	11	250	0.35
2	2	2	4	19A	23.81	17.70	0	0	17.70	4.55	1.55	14.1	1	225	0.40
2	2	3	1	3A	22.52	13.31	0	0	13.31	3.74	5.47	13.5	9	224	0.30
2	2	3	2	10B	31.17	20.10	0	0	20.10	5.62	5.45	13.1	14	230	0.46
2	2	3	3	14B	30.86	16.75	0	0	16.75	4.83	9.28	14.5	11	182	0.30
2	2	3	4	20B	28.76	20.88	0	0	20.88	5.09	2.78	13.5	2	205	0.43

Harvest 2: 02-07-1991

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
		3=severely compacted

Dry weights (g/m²)

Code					total	leaf weight				stem	tuber			SLA	LAI
					weight	green	yellow	dead	total	weight	weight	% dry	no	(cm²/g)	(m²/m²)
1	1	1	4	B	276.2	100.1	1.96	0	102.0	36.61	137.6	15.8	39	280	2.80
1	1	1	2	11B	324.3	118.7	3.73	0	122.5	47.90	154.0	15.1	38	299	3.55
1	1	1	3	16B	320.6	124.1	1.96	0	126.0	48.24	146.3	15.1	32	290	3.59
1	1	1	4	24B	335.5	127.8	3.20	0	131.0	47.40	157.1	15.8	33	287	3.67
1	1	2	1	6B	283.0	115.7	0.00	0	115.7	47.73	119.5	15.8	40	228	2.64
1	1	2	2	9A	246.4	87.2	0.00	0	87.2	32.94	126.2	15.1	28	238	2.08
1	1	2	3	18B	244.4	99.1	0.00	0	99.1	33.45	111.8	15.1	35	267	2.64
1	1	2	4	21A	236.2	82.2	0.00	0	82.2	30.69	123.3	15.8	34	258	2.12
1	1	3	1	1B	120.9	40.5	0.00	0	40.5	16.62	63.8	15.8	18	181	0.73
1	1	3	2	12A	410.1	250.9	0.00	0	250.9	40.27	118.9	15.1	32	185	4.64
1	1	3	3	13B	114.3	40.7	0.00	0	40.7	13.79	59.8	15.1	16	212	0.86
1	1	3	4	23A	223.7	69.1	0.00	0	69.1	26.39	128.1	15.8	37	207	1.43
1	2	1	1	2A	168.3	66.0	0.00	0	66.0	19.62	82.7	15.8	19	227	1.50
1	2	1	2	7A	218.4	84.3	0.00	0	84.3	27.25	106.9	15.1	23	236	1.99
1	2	1	3	15A	191.6	60.6	0.00	0	60.6	21.01	110.0	15.1	19	232	1.41
1	2	1	4	22A	181.0	69.0	1.24	0	70.2	25.95	84.9	15.8	20	248	1.71
1	2	2	1	5B	143.8	46.1	0.00	0	46.1	16.31	81.3	15.8	19	198	0.91
1	2	2	2	8B	189.7	64.1	0.00	0	64.1	23.86	101.7	15.1	18	212	1.36
1	2	2	3	17A	151.7	50.2	0.00	0	50.2	14.78	86.7	15.1	19	198	0.99
1	2	2	4	19B	166.2	49.7	0.00	0	49.7	17.01	99.5	15.8	19	206	1.02
1	2	3	1	3B	147.4	43.4	0.00	0	43.4	14.77	89.3	15.8	17	210	0.91
1	2	3	2	10A	210.3	68.9	0.00	0	68.9	26.68	114.8	15.1	35	181	1.25
1	2	3	3	14A	97.0	24.8	0.00	0	24.8	7.02	65.2	15.1	17	191	0.47
1	2	3	4	20A	124.8	30.2	0.00	0	30.2	10.57	84.0	15.8	44	213	0.64
2	1	1	1	4A	266.0	145.0	8.36	0	153.3	85.29	27.4	15.8	30	271	3.93
2	1	1	2	11A	355.1	142.9	5.69	0	148.6	73.23	133.2	15.1	27	266	3.80
2	1	1	3	16A	350.0	152.3	4.09	0	156.4	85.43	108.1	15.1	24	296	4.50
2	1	1	4	24A	307.2	138.8	2.49	0	141.3	80.57	85.3	15.8	29	330	4.57
2	1	2	1	6A	285.6	116.0	1.07	0	117.1	65.10	103.5	15.8	35	267	3.10
2	1	2	2	9B	264.0	112.6	0.00	0	112.6	69.97	81.4	15.1	67	213	2.40
2	1	2	3	18A	258.3	114.4	0.00	0	114.4	67.59	76.4	15.1	51	269	3.08
2	1	2	4	21B	246.5	107.1	0.71	0	107.8	54.54	84.2	15.8	35	241	2.58
2	1	3	1	1A	241.3	85.9	0.00	0	85.9	53.82	101.5	15.8	30	165	1.42
2	1	3	2	12B	214.7	78.9	0.00	0	78.9	55.24	80.6	15.1	40	213	1.68
2	1	3	3	13A	165.0	69.9	0.00	0	69.9	37.45	57.7	15.1	22	150	1.05
2	1	3	4	23B	230.9	71.7	0.00	0	71.7	44.08	115.1	15.8	34	202	1.45
2	2	1	1	2B	202.5	106.4	3.20	0	109.6	61.66	31.2	15.8	10	278	2.96
2	2	1	2	7B	237.3	108.0	0.00	0	108.0	55.33	74.0	15.1	12	248	2.67
2	2	1	3	15B	255.3	118.3	0.00	0	118.3	65.13	71.8	15.1	24	253	3.00
2	2	1	4	22B	233.5	116.9	0.00	0	116.9	68.29	48.3	15.8	40	224	2.62
2	2	2	1	5A	192.0	68.0	0.00	0	68.0	26.69	97.3	15.8	21	240	1.63
2	2	2	2	8A	187.3	89.7	1.60	0	91.3	54.56	41.5	15.1	19	236	2.12
2	2	2	3	17B	191.7	71.8	0.00	0	71.8	37.64	82.3	15.1	36	223	1.60
2	2	2	4	19A	179.6	64.4	0.00	0	64.4	35.07	80.2	15.8	24	211	1.36
2	2	3	1	3A	156.1	41.3	0.00	0	41.3	18.61	96.3	15.8	35	210	0.87
2	2	3	2	10B	187.9	72.0	0.00	0	72.0	46.07	69.8	15.1	38	162	1.16
2	2	3	3	14B	117.7	36.1	0.00	0	36.1	16.53	65.1	15.1	20	185	0.67
2	2	3	4	20B	180.6	57.7	0.00	0	57.7	33.48	89.3	15.8	19	169	0.98

Harvest 3: 24-07-1991

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
		3=severely compacted

Dry weights (g/m^2)

Code					total weight	leaf weight				stem weight	tuber weight	% dry	no	SLA (cm^2/g)	LAI (m^2/m^2)
						green	yellow	dead	total						
1	1	1	1	4B	910.9	162.9	7.47	0	170.4	116.0	624.4	22.0	34	259	4.22
1	1	1	2	11B	843.4	191.0	21.16	0	212.2	147.9	483.3	21.1	30	253	4.84
1	1	1	3	16B	953.8	191.4	7.11	0	198.5	132.9	622.5	21.8	30	303	5.81
1	1	1	4	24B	797.3	164.0	22.58	0	186.6	103.0	507.7	21.1	30	268	4.39
1	1	2	1	6B	682.3	114.6	3.20	0	117.8	64.6	499.8	22.8	34	205	2.35
1	1	2	2	9A	811.0	145.8	11.20	0	157.0	92.0	562.0	21.4	49	331	4.82
1	1	2	3	18B	589.4	87.2	1.96	0	89.2	38.5	461.8	23.5	37	270	2.35
1	1	2	4	21A	832.5	154.8	9.42	0	164.2	95.9	572.4	20.7	41	254	3.92
1	1	3	1	1B	194.2	16.0	6.04	0	22.1	7.9	164.3	23.6	16	173	0.28
1	1	3	2	12A	504.7	81.4	2.49	0	83.9	38.3	382.6	22.6	41	209	1.70
1	1	3	3	13B	122.4	20.0	0.00	0	20.0	6.1	96.3	22.1	19	197	0.39
1	1	3	4	23A	375.4	65.4	1.24	0	66.6	23.4	285.4	23.1	30	227	1.49
1	2	1	1	2A	549.9	59.3	3.56	0	62.8	33.2	453.9	25.3	23	268	1.59
1	2	1	2	7A	671.0	61.6	11.20	0	72.8	39.8	558.5	26.0	26	262	1.62
1	2	1	3	15A	432.0	36.1	18.31	0	54.4	17.2	360.3	24.4	26	234	0.85
1	2	1	4	22A	499.0	45.9	16.53	0	62.4	35.1	401.4	25.7	18	233	1.07
1	2	2	1	5B	387.4	40.6	6.93	0	47.6	14.5	325.3	26.3	25	177	0.72
1	2	2	2	8B	467.9	37.1	8.53	0	45.6	23.2	399.1	24.7	38	205	0.76
1	2	2	3	17A	315.6	21.1	12.27	0	33.4	8.6	273.7	27.7	20	187	0.39
1	2	2	4	19B	301.3	23.7	13.87	0	37.6	16.0	247.8	26.4	26	175	0.42
1	2	3	1	3B	322.4	14.5	19.91	0	34.4	12.5	275.5	25.7	28	172	0.25
1	2	3	2	10A	486.6	77.0	4.27	0	81.3	26.6	378.7	23.7	33	174	1.34
1	2	3	3	14A	212.8	6.5	15.82	0	22.3	3.9	186.6	26.4	22	248	0.16
1	2	3	4	20A	256.6	12.1	8.71	0	20.8	8.3	227.4	26.8	17	217	0.26
2	1	1	1	4A	921.6	184.7	18.49	0	203.2	175.7	542.7	19.7	45	232	4.29
2	1	1	2	11A	890.6	179.6	25.24	0	204.8	228.5	457.2	19.5	45	247	4.43
2	1	1	3	16A	730.7	167.9	19.38	0	187.3	141.5	401.9	18.9	39	357	6.00
2	1	1	4	24A	954.3	209.7	16.36	0	226.1	190.3	537.9	19.5	36	199	4.17
2	1	2	1	6A	794.8	193.7	27.02	0	220.8	204.6	369.4	17.4	64	229	4.44
2	1	2	2	9B	809.8	191.4	19.02	0	210.4	171.8	427.6	19.4	59	215	4.12
2	1	2	3	18A	985.4	213.8	12.44	0	226.2	175.7	583.5	18.4	90	342	7.31
2	1	2	4	21B	627.3	131.4	7.64	0	139.0	81.6	406.7	18.5	43	203	2.67
2	1	3	1	1A	417.4	58.4	2.84	0	61.3	39.6	316.6	21.9	50	194	1.13
2	1	3	2	12B	640.6	171.3	6.40	0	177.7	109.3	353.6	18.0	54	197	3.38
2	1	3	3	13A	401.9	67.8	0.00	0	67.8	42.8	291.3	19.0	51	179	1.21
2	1	3	4	23B	446.9	92.6	0.71	0	93.3	45.6	307.9	20.4	26	183	1.70
2	2	1	1	2B	741.9	136.1	4.09	0	140.2	79.4	522.3	21.2	34	209	2.84
2	2	1	2	7B	868.2	176.4	6.76	0	183.1	140.6	544.4	20.3	41	201	3.55
2	2	1	3	15B	645.9	109.7	4.27	0	113.9	58.1	473.9	22.0	28	340	3.72
2	2	1	4	22B	650.7	119.8	4.62	0	124.4	71.5	454.7	21.7	34	203	2.43
2	2	2	1	5A	432.0	60.9	4.44	0	65.4	27.6	339.0	23.0	34	178	1.08
2	2	2	2	8A	604.1	103.2	4.62	0	107.8	77.2	419.0	22.0	42	304	3.14
2	2	2	3	17B	423.9	59.5	0.00	0	59.5	28.9	335.5	23.3	45	240	1.43
2	2	2	4	19A	358.7	53.5	0.00	0	53.5	25.6	279.6	22.5	39	197	1.05
2	2	3	1	3A	347.2	67.6	2.49	0	70.0	34.4	242.8	21.5	47	177	1.19
2	2	3	2	10B	370.6	57.9	1.24	0	59.2	33.6	277.8	22.8	52	245	1.42
2	2	3	3	14B	320.9	29.3	5.87	0	35.1	12.1	273.6	24.7	29	235	0.69
2	2	3	4	20B	358.8	38.2	8.71	0	46.9	23.4	288.5	25.0	48	219	0.84

Harvest 4: 19-08-1991

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
		3=severely compacted

Dry weights (g/m^2)

Code					total weight	leaf weight				stem weight	tuber weight	% dry	no	SLA (cm^2/g)	LAI (m^2/m^2)
						green	yellow	dead	total						
1	1	1	1	4B	*	*	*	*	*	*	*	*	*	*	*
1	1	1	2	11B	1559.2	151.6	7.47	62.22	221.3	195.5	1142.3	26.7	38	224	3.39
1	1	1	3	16B	1947.4	235.0	6.93	28.09	270.0	273.6	1403.8	25.0	51	207	4.87
1	1	1	4	24B	1530.5	149.4	8.00	40.53	197.9	118.1	1214.5	29.1	45	214	3.20
1	1	2	1	6B	1268.4	123.5	9.78	38.58	171.8	143.8	952.7	26.5	40	272	3.36
1	1	2	2	9A	1476.7	184.5	3.56	20.09	208.2	162.4	1106.1	26.9	42	210	3.88
1	1	2	3	18B	1205.9	145.2	6.22	28.44	179.8	114.6	911.4	25.9	40	256	3.72
1	1	2	4	21A	1316.1	182.9	1.60	43.73	228.2	179.4	908.5	26.1	44	217	3.96
1	1	3	1	1B	795.9	132.1	4.09	31.11	167.3	98.7	529.9	26.7	28	236	3.12
1	1	3	2	12A	1041.5	99.5	7.29	40.71	147.5	76.6	817.4	25.0	42	253	2.51
1	1	3	3	13B	435.6	48.7	0.00	6.93	55.6	18.5	361.4	25.5	21	*	*
1	1	3	4	23A	852.4	112.9	3.38	28.27	144.6	62.2	645.7	27.4	39	196	2.22
1	2	1	1	2A	455.1	0.0	0.00	40.71	40.7	0.0	414.4	28.8	19	*	0.00
1	2	1	2	7A	732.0	7.5	0.00	36.09	43.6	12.9	675.5	31.1	27	194	0.15
1	2	1	3	15A	460.2	0.6	0.00	27.56	28.2	1.2	430.9	27.5	26	251	0.02
1	2	1	4	22A	697.2	2.7	0.89	55.29	58.9	6.7	631.6	28.9	36	362	0.10
1	2	2	1	5B	681.9	37.4	3.20	27.56	68.1	23.9	589.9	30.9	23	158	0.59
1	2	2	2	8B	431.3	0.0	0.00	36.44	36.4	0.0	394.8	29.4	37	*	0.00
1	2	2	3	17A	345.8	1.8	0.00	23.47	25.3	6.7	313.8	28.7	19	130	0.02
1	2	2	4	19B	295.3	0.0	0.00	28.44	28.4	0.0	266.9	29.6	18	*	0.00
1	2	3	1	3B	279.4	3.1	1.60	23.64	28.3	4.8	246.3	28.8	21	201	0.06
1	2	3	2	10A	384.8	32.8	0.00	8.89	41.7	13.0	330.2	29.0	24	151	0.50
1	2	3	3	14A	171.3	0.0	0.00	8.00	8.0	0.0	163.3	26.0	16	*	0.00
1	2	3	4	20A	317.4	8.2	1.96	12.98	23.1	4.8	289.4	29.2	21	144	0.12
2	1	1	1	4A	1817.8	218.9	10.13	36.27	265.3	298.9	1253.7	26.1	38	254	5.55
2	1	1	2	11A	1656.6	243.6	10.49	22.58	276.7	303.6	1076.3	27.0	47	220	5.35
2	1	1	3	16A	1802.5	209.7	21.16	29.16	260.0	311.8	1230.6	24.0	50	231	4.84
2	1	1	4	24A	1844.1	231.5	8.00	27.20	266.7	366.5	1210.9	25.2	66	247	5.71
2	1	2	1	6A	1730.8	228.9	6.22	24.71	259.8	283.6	1187.4	25.1	53	237	5.43
2	1	2	2	9B	1613.7	204.4	10.84	32.89	248.1	253.8	1111.8	24.2	81	258	5.28
2	1	2	3	18A	1534.8	241.5	8.53	31.47	281.5	263.9	989.4	24.1	49	232	5.60
2	1	2	4	21B	1363.0	202.5	12.09	35.38	249.9	241.7	871.4	23.7	46	270	5.46
2	1	3	1	1A	512.8	37.5	2.49	22.40	62.4	33.2	417.2	25.1	35	152	0.57
2	1	3	2	12B	1131.2	147.4	3.56	32.89	183.9	178.4	768.9	22.8	49	282	4.15
2	1	3	3	13A	714.1	88.0	0.00	10.13	98.1	39.1	576.9	23.7	39	173	1.53
2	1	3	4	23B	559.0	91.4	4.27	17.60	113.3	55.7	390.0	25.7	37	219	2.00
2	2	1	1	2B	1814.0	172.6	15.64	15.29	203.5	172.5	1438.0	30.6	41	231	3.99
2	2	1	2	7B	1723.8	257.4	3.38	30.58	291.3	251.1	1181.4	26.2	35	217	5.58
2	2	1	3	15B	927.4	99.9	3.38	6.58	109.8	55.4	762.1	27.5	24	245	2.45
2	2	1	4	22B	1158.9	142.1	9.42	29.33	180.9	112.3	865.8	27.3	43	217	3.08
2	2	2	1	5A	806.8	73.4	2.13	7.29	82.8	38.2	685.8	28.3	26	181	1.33
2	2	2	2	8A	1000.5	86.2	0.00	21.51	107.7	58.6	834.3	28.9	58	180	1.55
2	2	2	3	17B	763.1	68.1	4.62	9.42	82.1	32.6	648.4	29.1	38	165	1.13
2	2	2	4	19A	602.7	22.3	3.91	24.89	51.1	22.7	528.9	31.2	40	166	0.37
2	2	3	1	3A	809.1	127.4	2.49	10.84	140.7	72.2	596.2	26.6	33	179	2.28
2	2	3	2	10B	745.5	115.3	0.00	11.91	127.2	72.8	545.4	26.1	25	192	2.21
2	2	3	3	14B	308.8	29.2	0.00	9.42	38.6	11.1	259.1	26.9	18	170	0.50
2	2	3	4	20B	453.5	20.1	3.20	32.36	55.6	16.4	381.5	28.7	42	134	0.27

Final harvest: 03-10-'91 (2A;3B;5B;7A;8B;14A;15A;17A;19B;20A;22A), 22-10-'91 (other plots)
Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
		3=severely compacted

Dry weights (g/m^2)

Code					total weight	leaf weight				stem weight	tuber weight			SLA	LAI
						green	yellow	dead	total			% dry	no	(cm^2/g)	(m^2/m^2)
1	1	1	1	4B	1373.2	0.0	0	0	0.0	0.0	1373.2	26.1	95	0	0
1	1	1	2	11B	1497.2	0.0	0	0	0.0	0.0	1497.2	28.1	108	0	0
1	1	1	3	16B	1339.0	0.0	0	0	0.0	0.0	1339.0	25.9	119	0	0
1	1	1	4	24B	1434.2	0.0	0	0	0.0	0.0	1434.2	26.4	130	0	0
1	1	2	1	6B	1365.5	0.0	0	0	0.0	0.0	1365.5	26.5	120	0	0
1	1	2	2	9A	1391.0	0.0	0	0	0.0	0.0	1391.0	27.4	124	0	0
1	1	2	3	18B	1170.3	0.0	0	0	0.0	0.0	1170.3	25.9	131	0	0
1	1	2	4	21A	1116.7	0.0	0	0	0.0	0.0	1116.7	25.2	125	0	0
1	1	3	1	1B	819.8	0.0	0	0	0.0	0.0	819.8	26.6	92	0	0
1	1	3	2	12A	1273.3	0.0	0	0	0.0	0.0	1273.3	26.6	134	0	0
1	1	3	3	13B	776.8	0.0	0	0	0.0	0.0	776.8	25.2	94	0	0
1	1	3	4	23A	1117.6	0.0	0	0	0.0	0.0	1117.6	26.8	117	0	0
1	2	1	1	2A	*	0.0	0	0	0.0	0.0	*	27.8	*	0	0
1	2	1	2	7A	801.8	0.0	0	0	0.0	0.0	801.8	29.3	93	0	0
1	2	1	3	15A	532.8	0.0	0	0	0.0	0.0	532.8	27.7	60	0	0
1	2	1	4	22A	644.1	0.0	0	0	0.0	0.0	644.1	27.7	105	0	0
1	2	2	1	5B	563.4	0.0	0	0	0.0	0.0	563.4	28.9	81	0	0
1	2	2	2	8B	464.0	0.0	0	0	0.0	0.0	464.0	29.0	91	0	0
1	2	2	3	17A	*	0.0	0	0	0.0	0.0	*	27.8	*	0	0
1	2	2	4	19B	362.1	0.0	0	0	0.0	0.0	362.1	27.9	88	0	0
1	2	3	1	3B	498.6	0.0	0	0	0.0	0.0	498.6	28.0	68	0	0
1	2	3	2	10A	552.4	0.0	0	0	0.0	0.0	552.4	29.0	71	0	0
1	2	3	3	14A	195.8	0.0	0	0	0.0	0.0	195.8	27.2	46	0	0
1	2	3	4	20A	299.0	0.0	0	0	0.0	0.0	299.0	28.3	63	0	0
2	1	1	1	4A	*	0.0	0	0	0.0	0.0	*	*	*	0	0
2	1	1	2	11A	1591.0	0.0	0	0	0.0	0.0	1591.0	28.2	124	0	0
2	1	1	3	16A	1323.7	0.0	0	0	0.0	0.0	1323.7	24.8	116	0	0
2	1	1	4	24A	1438.3	0.0	0	0	0.0	0.0	1438.3	27.4	154	0	0
2	1	2	1	6A	1563.3	0.0	0	0	0.0	0.0	1563.3	26.0	201	0	0
2	1	2	2	9B	1592.2	0.0	0	0	0.0	0.0	1592.2	28.2	133	0	0
2	1	2	3	18A	1315.2	0.0	0	0	0.0	0.0	1315.2	24.2	194	0	0
2	1	2	4	21B	1617.0	0.0	0	0	0.0	0.0	1617.0	25.9	174	0	0
2	1	3	1	1A	758.4	0.0	0	0	0.0	0.0	758.4	25.4	132	0	0
2	1	3	2	12B	1430.4	0.0	0	0	0.0	0.0	1430.4	23.8	177	0	0
2	1	3	3	13A	1059.1	0.0	0	0	0.0	0.0	1059.1	25.2	114	0	0
2	1	3	4	23B	1270.8	0.0	0	0	0.0	0.0	1270.8	25.0	156	0	0
2	2	1	1	2B	1379.0	0.0	0	0	0.0	0.0	1379.0	32.1	95	0	0
2	2	1	2	7B	1581.9	0.0	0	0	0.0	0.0	1581.9	29.0	84	0	0
2	2	1	3	15B	1584.2	0.0	0	0	0.0	0.0	1584.2	29.0	90	0	0
2	2	1	4	22B	1501.1	0.0	0	0	0.0	0.0	1501.1	28.9	125	0	0
2	2	2	1	5A	1128.4	0.0	0	0	0.0	0.0	1128.4	28.5	107	0	0
2	2	2	2	8A	1267.7	0.0	0	0	0.0	0.0	1267.7	28.9	192	0	0
2	2	2	3	17B	1182.9	0.0	0	0	0.0	0.0	1182.9	28.6	135	0	0
2	2	2	4	19A	1127.9	0.0	0	0	0.0	0.0	1127.9	27.5	169	0	0
2	2	3	1	3A	841.7	0.0	0	0	0.0	0.0	841.7	27.2	125	0	0
2	2	3	2	10B	649.9	0.0	0	0	0.0	0.0	649.9	26.6	89	0	0
2	2	3	3	14B	466.9	0.0	0	0	0.0	0.0	466.9	25.6	74	0	0
2	2	3	4	20B	523.0	0.0	0	0	0.0	0.0	523.0	26.6	101	0	0

Harvest 1: 15-06-1992

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m^2)

Code					total weight	leaf weight				stem weight	tuber weight	% dry	no	SLA (cm^2/g)	LAI (m^2/m^2)
						green	yellow	dead	total						
1	1	1	1	5	188.5	123.6	0.71	0	124.3	54.2	10.0		57	131	1.61
1	1	1	2	24	124.1	84.1	0.00	0	84.1	34.8	5.2		44	123	1.03
1	1	1	3	52	180.4	110.7	0.00	0	110.7	49.1	20.6		68	114	1.26
1	1	1	4	63	224.5	159.4	0.89	0	160.3	52.4	11.7		41	114	1.81
1	1	2	1	26	180.0	111.0	0.00	0	111.0	45.2	23.8		62	120	1.34
1	1	2	2	38	41.2	26.8	0.00	0	26.8	12.6	1.8		121	101	0.27
1	1	2	3	49	143.1	89.2	0.00	0	89.2	36.6	17.2		62	131	1.17
1	1	2	4	95	147.2	91.0	0.00	0	91.0	40.4	15.8		57	119	1.08
1	1	3	1	10	94.2	60.6	0.00	0	60.6	22.2	11.4		50	114	0.69
1	1	3	2	22	59.4	38.6	0.18	0	38.8	17.6	3.0		36	111	0.43
1	1	3	4	66	119.8	70.8	1.42	0	72.2	32.4	15.3		50	113	0.80
1	1	3	3	83	117.7	71.6	0.00	0	71.6	30.8	15.3		37	116	0.83
1	2	1	2	20	39.6	26.3	0.00	0	26.3	12.6	0.7		14	114	0.30
1	2	1	1	36	89.6	54.4	0.00	0	54.4	27.7	7.5		37	128	0.70
1	2	1	3	56	71.5	48.6	0.00	0	48.6	21.9	1.1		12	126	0.61
1	2	1	4	67	103.6	69.3	0.00	0	69.3	29.7	4.6		36	123	0.85
1	2	2	1	8	89.9	56.1	0.00	0	56.1	26.1	7.6		46	104	0.58
1	2	2	2	42	118.6	71.0	0.00	0	71.0	35.7	11.9		66	104	0.74
1	2	2	3	81	28.1	16.2	0.00	0	16.2	9.8	2.1		9	104	0.17
1	2	2	4	86	128.9	77.0	0.00	0	77.0	33.8	18.1		75	127	0.98
1	2	3	1	3	102.6	55.5	0.00	0	55.5	25.6	21.5		11	119	0.66
1	2	3	2	16	104.2	59.0	0.00	0	59.0	29.2	16.0		62	113	0.67
1	2	3	3	78	77.3	38.6	1.96	0	40.5	23.3	13.5		57	102	0.39
1	2	3	4	93	56.9	34.3	0.00	0	34.3	18.5	4.1		25	109	0.37
2	1	1	1	6	198.9	134.0	2.31	0	136.3	62.4	0.2		5	117	1.57
2	1	1	2	47	228.2	143.7	0.53	0	144.3	83.9	0.0		2	144	2.07
2	1	1	3	51	190.2	135.1	0.00	0	135.1	55.1	0.0		0	136	1.84
2	1	1	4	87	227.9	153.1	0.00	0	153.1	74.5	0.4		9	138	2.11
2	1	2	1	2	163.4	107.6	0.36	0	108.0	48.2	7.3		23	126	1.36
2	1	2	2	14	161.5	106.7	0.00	0	106.7	54.4	0.4		5	121	1.29
2	1	2	3	74	179.6	120.0	0.00	0	120.0	57.6	2.0		16	131	1.58
2	1	2	4	96	124.6	81.4	0.00	0	81.4	43.2	0.0		4	129	1.05
2	1	3	2	21	92.6	62.7	0.00	0	62.7	29.5	0.4		9	114	0.71
2	1	3	1	33	163.7	105.3	0.00	0	105.3	54.2	4.3		57	128	1.35
2	1	3	3	60	170.9	110.1	0.00	0	110.1	59.2	1.6		32	125	1.38
2	1	3	4	65	257.8	197.0	0.00	0	197.0	57.6	3.2		41	127	2.49
2	2	1	2	19	140.3	95.3	0.00	0	95.3	45.0	0.0		0	145	1.38
2	2	1	1	35	133.6	98.9	0.00	0	98.9	34.7	0.0		4	125	1.24
2	2	1	3	80	148.4	97.4	0.00	0	97.4	50.7	0.4		2	111	1.08
2	2	1	4	91	149.8	101.6	0.00	0	101.6	48.2	0.0		0	146	1.48
2	2	2	1	7	128.8	83.5	0.00	0	83.5	44.4	0.9		30	122	1.02
2	2	2	2	18	130.8	83.7	0.00	0	83.7	46.9	0.2		4	128	1.07
2	2	2	3	58	178.6	115.7	0.00	0	115.7	62.0	0.9		11	126	1.46
2	2	2	4	61	161.5	102.6	0.00	0	102.6	56.4	2.5		32	134	1.37
2	2	3	2	15	143.4	89.7	0.00	0	89.7	52.1	1.6		0	126	1.13
2	2	3	1	28	110.0	73.7	0.00	0	73.7	34.0	2.3		14	111	0.82
2	2	3	3	53	121.5	74.8	2.31	0	77.1	40.5	3.9		32	110	0.82
2	2	3	4	70	103.7	70.1	0.00	0	70.1	32.9	0.7		14	123	0.86

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m^2)

Code					total	leaf weight				stem	tuber			SLA	LAI
					weight	green	yellow	dead	total	weight	weight	% dry	no	(cm^2/g)	(m^2/m^2)
3	1	1	1	29	82.1	53.9	0.00	0	53.9	23.3	5.0		28	139	0.75
3	1	1	2	48	118.3	74.0	0.00	0	74.0	37.5	6.8		73	137	1.01
3	1	1	3	76	121.4	82.5	0.00	0	82.5	31.5	7.5		46	131	1.08
3	1	1	4	88	210.5	165.5	0.00	0	165.5	42.0	3.0		41	124	2.05
3	1	2	2	13	94.3	57.5	0.00	0	57.5	26.3	10.5		25	133	0.77
3	1	2	1	25	129.6	74.0	1.07	0	75.1	36.4	18.1		103	137	1.01
3	1	2	4	72	116.1	69.2	0.00	0	69.2	41.4	5.5		32	129	0.90
3	1	2	3	73	123.3	70.4	0.00	0	70.4	33.2	19.7		80	132	0.93
3	1	3	1	9	90.1	54.8	1.07	0	55.8	24.9	9.4		73	122	0.67
3	1	3	2	46	76.8	43.0	0.00	0	43.0	27.4	6.4		48	132	0.57
3	1	3	3	84	70.9	36.6	0.00	0	36.6	18.3	16.0		60	127	0.46
3	1	3	4	90	65.9	31.9	0.53	0	32.5	20.4	13.0		39	122	0.39
3	2	1	1	12	69.5	39.6	0.00	0	39.6	18.0	11.9		68	135	0.53
3	2	1	2	44	77.5	44.6	0.00	0	44.6	29.0	3.9		37	128	0.57
3	2	1	3	55	117.4	91.1	0.00	0	91.1	20.8	5.5		36	75	0.68
3	2	1	4	68	75.4	45.2	0.00	0	45.2	28.8	1.4		12	119	0.54
3	2	2	2	17	64.4	33.4	0.00	0	33.4	23.8	7.1		48	130	0.43
3	2	2	1	31	72.9	39.8	0.00	0	39.8	21.7	11.4		39	118	0.47
3	2	2	3	57	69.8	39.6	0.00	0	39.6	18.8	11.4		41	137	0.54
3	2	2	4	62	126.7	69.6	0.00	0	69.6	47.3	9.8		94	125	0.87
3	2	3	1	27	62.9	34.7	0.00	0	34.7	17.4	10.8		50	129	0.45
3	2	3	2	39	90.7	48.3	0.00	0	48.3	30.4	12.1		64	120	0.58
3	2	3	3	77	71.3	47.6	0.00	0	47.6	13.7	10.0		52	71	0.34
3	2	3	4	94	82.5	47.3	0.00	0	47.3	30.0	5.2		41	124	0.59
4	1	1	2	23	92.4	65.2	0.00	0	65.2	26.3	0.9		7	138	0.90
4	1	1	1	30	204.6	127.8	0.00	0	127.8	74.3	2.5		46	121	1.54
4	1	1	4	64	228.1	139.7	0.00	0	139.7	67.7	20.6		78	130	1.82
4	1	1	3	75	246.5	158.1	0.00	0	158.1	78.6	9.8		82	137	2.17
4	1	2	1	1	128.3	80.0	0.00	0	80.0	41.2	7.1		69	96	0.76
4	1	2	2	37	133.4	57.9	0.00	0	57.9	54.6	21.0		46	110	0.64
4	1	2	3	50	199.8	113.2	0.00	0	113.2	68.6	18.0		133	135	1.53
4	1	2	4	71	131.6	84.0	0.00	0	84.0	39.5	8.2		52	134	1.12
4	1	3	1	34	129.6	78.5	0.00	0	78.5	40.0	11.0		64	124	0.97
4	1	3	2	45	107.3	67.3	0.36	0	67.7	32.9	6.8		80	100	0.68
4	1	3	3	59	118.3	66.6	0.00	0	66.6	41.1	10.7		151	107	0.71
4	1	3	4	89	108.1	60.1	0.00	0	60.1	35.7	12.3		71	104	0.63
4	2	1	1	11	117.9	70.4	0.00	0	70.4	38.6	8.9		60	126	0.89
4	2	1	2	43	97.7	64.7	0.00	0	64.7	31.3	1.8		44	136	0.88
4	2	1	3	79	164.3	101.0	0.00	0	101.0	51.9	11.4		44	118	1.20
4	2	1	4	92	115.3	71.9	0.36	0	72.2	36.1	6.9		68	139	1.00
4	2	2	1	32	123.8	71.5	0.53	0	72.0	40.9	10.8		73	114	0.82
4	2	2	2	41	98.9	61.6	0.00	0	61.6	29.2	8.2		57	125	0.77
4	2	2	3	82	111.9	64.8	0.00	0	64.8	37.0	10.1		73	119	0.77
4	2	2	4	85	153.4	89.0	0.00	0	89.0	51.4	13.0		84	125	1.12
4	2	3	1	4	71.6	39.8	0.00	0	39.8	23.1	8.7		68	111	0.44
4	2	3	2	40	132.2	82.6	0.18	0	82.7	44.3	5.2		48	114	0.94
4	2	3	3	54	179.5	96.0	0.71	0	96.7	65.2	17.6		124	115	1.10
4	2	3	4	69	90.5	48.0	0.00	0	48.0	33.2	9.2		71	135	0.65

Harvest 2: 06-07-1992

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m^2)

Code					total weight	leaf weight				stem weight	tuber weight	% dry	no	SLA (cm^2/g)	LAI (m^2/m^2)
						green	yellow	dead	total						
1	1	1	1	5	587.2	148.3	7.61	28.37	184.3	101.5	301.3	22.4	69	117	1.74
1	1	1	2	24	525.6	135.4	4.09	47.56	187.1	80.2	258.3	22.3	53	115	1.55
1	1	1	3	52	637.8	171.3	11.20	23.82	206.3	126.3	305.2	20.8	55	162	2.77
1	1	1	4	63	741.7	188.9	10.67	37.33	236.9	140.9	364.0	21.2	57	203	3.83
1	1	2	1	26							198.4	22.7	43		
1	1	2	2	38							245.2	21.7	50		
1	1	2	3	49							261.5	19.7	59		
1	1	2	4	95							288.9	23.1	52		
1	1	3	1	10	318.9	113.3	1.96	7.20	122.4	53.2	143.3	20.9	53	158	1.79
1	1	3	2	22	320.1	112.8	0.00	15.11	127.9	47.8	144.4	22.1	48	115	1.30
1	1	3	4	66	412.9	119.9	5.51	10.04	135.5	68.3	209.1	20.5	43	134	1.61
1	1	3	3	83	291.8	121.3	0.00	2.12	123.4	36.1	132.3	19.9	50	136	1.65
1	2	1	2	20	117.1	63.5	2.67	0.00	66.2	25.6	25.4	16.4	30	128	0.81
1	2	1	1	36	658.8	175.1	13.24	28.80	217.2	106.9	334.7	20.6	43	148	2.60
1	2	1	3	56	198.7	84.2	5.28	1.07	90.5	39.7	68.4	17.9	23	139	1.17
1	2	1	4	67	480.4	168.1	7.29	16.18	191.6	76.4	212.4	18.9	36	133	2.24
1	2	2	1	8							234.0	23.7	43		
1	2	2	2	42							253.6	20.7	50		
1	2	2	3	81							84.4	20.0	39		
1	2	2	4	86							246.4	21.2	44		
1	2	3	1	3	343.2	103.2	0.00	3.20	106.4	54.7	182.0	21.6	50	121	1.25
1	2	3	2	16	363.6	120.5	1.60	7.82	130.0	51.8	181.9	21.6	46	121	1.46
1	2	3	3	78	334.0	116.1	0.00	7.47	123.5	50.6	159.8	20.5	37	109	1.27
1	2	3	4	93	292.4	104.3	1.97	1.55	107.8	44.9	139.7	19.4	28	132	1.38
2	1	1	1	6	594.2	216.3	14.93	25.60	256.9	174.4	162.9	16.6	128	198	4.28
2	1	1	2	47	682.7	238.6	23.29	25.01	286.9	218.5	177.3	16.2	103	159	3.79
2	1	1	3	51	554.0	214.8	19.16	4.14	238.1	193.9	122.0	15.2	64	183	3.93
2	1	1	4	87	910.8	328.0	13.87	19.91	361.8	277.6	271.4	17.1	101	185	6.07
2	1	2	1	2							206.9	19.6	60		
2	1	2	2	14							145.5	17.9	84		
2	1	2	3	74							259.8	17.9	124		
2	1	2	4	96							86.6	19.4	78		
2	1	3	2	21	385.6	181.1	4.44	0.00	185.5	89.5	110.6	16.7	75	157	2.84
2	1	3	1	33	381.9	162.2	8.20	3.20	173.6	90.5	117.7	16.8	92	148	2.40
2	1	3	3	60	458.6	191.3	12.50	9.96	213.8	129.6	115.3	16.2	76	138	2.65
2	1	3	4	65	613.7	202.3	27.20	7.20	236.7	156.4	220.5	16.4	139	163	3.29
2	2	1	2	19	551.5	202.3	4.98	15.63	223.0	107.8	220.8	18.1	130	127	2.56
2	2	1	1	35	486.0	187.4	20.98	11.89	220.3	131.2	134.5	15.9	78	159	2.98
2	2	1	3	80	434.8	160.9	5.87	19.20	186.0	99.5	149.3	17.6	85	138	2.21
2	2	1	4	91	522.2	205.7	14.67	9.67	230.0	152.0	140.1	17.0	94	129	2.65
2	2	2	1	7							155.8	18.2	82		
2	2	2	2	18							209.7	18.3	82		
2	2	2	3	58							213.6	18.8	100		
2	2	2	4	61							189.6	17.7	96		
2	2	3	2	15	483.7	200.7	4.09	4.09	208.8	128.2	146.6	16.7	78	117	2.34
2	2	3	1	28	332.1	155.6	5.28	4.27	165.1	76.9	90.1	16.9	53	169	2.63
2	2	3	3	53	287.7	129.1	4.62	3.73	137.5	69.1	81.1	16.5	48	127	1.64
2	2	3	4	70	394.0	161.7	6.76	6.76	175.2	115.9	102.8	14.7	98	155	2.50

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m^2)

Code					total	leaf weight				stem	tuber			SLA	LAI
					weight	green	yellow	dead	total	weight	weight	% dry	no	(cm^2/g)	(m^2/m^2)
3	1	1	1	29	405.2	124.8	10.79	7.11	142.7	61.0	201.5	17.1	59	215	2.68
3	1	1	2	48	442.6	126.2	6.40	11.18	143.8	61.6	237.3	19.1	71	154	1.94
3	1	1	3	76	556.9	176.0	9.74	3.73	189.5	80.8	286.6	18.6	78	165	2.90
3	1	1	4	88	554.3	160.7	3.72	2.13	166.6	77.2	310.5	19.0	59	190	3.06
3	1	2	2	13							215.2	19.4	57		
3	1	2	1	25							137.3	18.1	59		
3	1	2	4	72							238.3	19.9	60		
3	1	2	3	73							252.0	20.0	53		
3	1	3	1	9	361.9	127.2	0.00	0.71	128.0	22.8	211.2	18.4	96	162	2.06
3	1	3	2	46	245.7	74.7	0.00	4.82	79.5	29.8	136.4	17.9	59	168	1.26
3	1	3	3	84	380.1	115.7	0.00	0.00	115.7	57.7	206.6	18.7	46	131	1.52
3	1	3	4	90	241.2	94.1	1.16	0.00	95.3	41.5	104.4	17.2	48	138	1.30
3	2	1	1	12	442.5	145.5	1.96	0.00	147.5	53.4	241.6	18.6	62	157	2.28
3	2	1	2	44	464.5	146.0	21.85	3.91	171.7	79.7	213.1	17.6	89	203	2.97
3	2	1	3	55	378.7	114.3	3.91	1.96	120.1	52.5	206.0	18.6	52	154	1.76
3	2	1	4	68	435.2	117.6	3.48	1.60	122.7	64.1	248.4	18.1	62	125	1.47
3	2	2	2	17							115.5	18.3	48		
3	2	2	1	31							148.5	17.7	43		
3	2	2	3	57							193.8	19.8	44		
3	2	2	4	62							152.3	17.4	53		
3	2	3	1	27	304.3	102.9	1.42	0.73	105.1	47.3	151.9	18.1	53	181	1.86
3	2	3	2	39	275.7	81.8	4.98	0.00	86.7	42.5	146.4	17.1	68	174	1.42
3	2	3	3	77	237.9	66.2	0.00	0.00	66.2	30.5	141.2	18.2	59	133	0.88
3	2	3	4	94	396.6	112.6	6.40	1.65	120.6	54.8	221.2	18.4	52	122	1.38
4	1	1	2	23	374.1	143.9	4.44	7.80	156.2	65.2	152.7	19.3	76	194	2.79
4	1	1	1	30	582.2	190.3	8.92	12.21	211.4	107.9	262.9	20.2	128	143	2.72
4	1	1	4	64	612.5	160.5	0.00	0.00	160.5	91.4	360.6	19.9	69	136	2.18
4	1	1	3	75	761.3	189.5	8.75	31.82	230.1	115.0	416.2	21.3	91	135	2.56
4	1	2	1	1							287.6	21.8	78		
4	1	2	2	37							275.2	20.5	64		
4	1	2	3	50							450.7	19.7	117		
4	1	2	4	71							303.2	20.6	64		
4	1	3	1	34	456.0	133.7	7.11	8.62	149.5	63.0	243.5	19.3	100	120	1.60
4	1	3	2	45	325.2	104.7	3.84	0.00	108.6	51.8	164.8	18.5	68	120	1.25
4	1	3	3	59	467.5	146.1	6.95	2.90	155.9	64.6	246.9	19.6	69	219	3.19
4	1	3	4	89	482.9	155.4	1.88	7.29	164.5	72.2	246.2	18.8	84	124	1.93
4	2	1	1	11	509.2	140.3	3.36	23.11	166.8	76.9	265.5	19.7	62	131	1.84
4	2	1	2	43	458.7	133.3	7.47	22.40	163.2	72.7	222.8	19.9	78	122	1.63
4	2	1	3	79	639.9	140.4	6.88	19.02	166.3	77.9	395.6	22.9	71	130	1.82
4	2	1	4	92	558.7	135.0	8.18	16.62	159.8	83.9	315.0	21.7	71	167	2.26
4	2	2	1	32							248.7	22.0	128		
4	2	2	2	41							260.5	20.8	57		
4	2	2	3	82							287.9	21.7	60		
4	2	2	4	85							336.0	22.1	71		
4	2	3	1	4	329.3	83.9	2.13	1.97	88.0	43.1	198.2	21.4	82	121	1.02
4	2	3	2	40	451.3	129.0	8.62	11.63	149.2	68.7	233.3	19.1	71	139	1.79
4	2	3	3	54	441.9	124.5	4.80	9.78	139.1	65.9	237.0	19.9	34	145	1.80
4	2	3	4	69	466.4	119.9	5.35	7.66	133.0	73.1	260.3	19.7	78	176	2.11

Harvest 3: 03-08-1992

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m^2)

Code					total weight	leaf weight				stem weight	tuber weight	% dry	no	SLA (cm^2/g)	LAI (m^2/m^2)
						green	yellow	dead	total						
1	1	1	1	5	1337.7	188.9	16.34	53.24	258.5	201.2	878.0	26.3	73	201	3.81
1	1	1	2	24	969.0	127.0	11.45	54.44	192.9	110.1	665.9	25.8	69	149	1.89
1	1	1	3	52	1465.5	184.0	24.02	58.52	266.5	263.2	935.8	25.6	68	215	3.96
1	1	1	4	63	1893.1	247.9	28.68	72.28	348.9	336.2	1208.0	25.4	98	196	4.86
1	1	2	1	26							382.1	24.2	27		
1	1	2	2	38							276.4	23.2	55		
1	1	2	3	49							726.1	24.5	66		
1	1	2	4	95							767.3	24.7	89		
1	1	3	1	10	901.7	159.9	13.62	52.82	226.3	123.6	551.7	24.7	80	182	2.91
1	1	3	2	22	914.7	164.6	15.73	55.47	235.8	121.0	557.9	25.7	60	192	3.17
1	1	3	4	66	*	*	*	*	*	*	628.4	25.4	48	*	*
1	1	3	3	83	913.5	176.7	10.45	32.62	219.8	130.6	563.1	23.7	76	153	2.70
1	2	1	2	20	875.1	135.9	21.53	28.41	185.8	117.9	571.3	26.4	34	173	2.35
1	2	1	1	36	892.2	121.9	13.42	48.02	183.4	128.0	580.8	24.9	46	209	2.55
1	2	1	3	56	1029.8	173.0	10.13	32.28	215.4	157.6	656.8	24.6	57	175	3.03
1	2	1	4	67	1092.1	168.2	12.43	26.22	206.9	155.7	729.5	25.4	55	177	2.98
1	2	2	1	8							569.9	25.3	48		
1	2	2	2	42							320.3	24.6	34		
1	2	2	3	81							234.2	23.5	30		
1	2	2	4	86							1003.2	24.4	78		
1	2	3	1	3	716.2	160.2	5.83	34.84	200.9	131.4	383.9	23.4	66	207	3.32
1	2	3	2	16	939.1	178.4	8.34	42.77	229.5	165.3	544.3	24.9	57	184	3.27
1	2	3	3	78	826.0	174.5	6.58	36.16	217.3	159.8	449.0	22.5	48	169	2.95
1	2	3	4	93	948.7	214.2	17.74	39.22	271.2	101.3	576.2	24.8	66	160	3.42
2	1	1	1	6	1039.8	210.4	37.69	70.47	318.5	284.5	436.8	22.2	119	213	4.48
2	1	1	2	47	1313.4	217.6	27.09	85.72	330.5	343.7	639.3	23.5	101	220	4.79
2	1	1	3	51	1048.9	207.2	39.13	69.83	316.2	343.4	389.3	21.0	89	231	4.78
2	1	1	4	87	1494.8	251.2	42.24	43.24	336.6	302.5	855.7	25.3	133	202	5.08
2	1	2	1	2							485.9	24.2	107		
2	1	2	2	14							460.3	24.1	73		
2	1	2	3	74							473.7	23.7	43		
2	1	2	4	96							435.4	23.1	73		
2	1	3	2	21	1232.1	270.1	24.11	60.07	354.3	311.5	566.3	23.1	94	192	5.18
2	1	3	1	33	1017.0	228.9	24.02	44.94	297.9	293.9	425.2	23.4	48	217	4.96
2	1	3	3	60	1289.7	233.3	45.05	22.47	300.9	314.0	674.8	24.1	91	208	4.84
2	1	3	4	65	1248.0	262.6	27.77	60.05	350.4	357.0	540.5	23.2	89	203	5.34
2	2	1	2	19	1351.1	238.1	40.46	72.80	351.3	302.6	697.2	24.8	107	203	4.84
2	2	1	1	35	1076.8	189.7	28.71	79.22	297.6	296.4	482.8	23.2	53	221	4.19
2	2	1	3	80	928.3	177.3	11.00	34.92	223.2	140.2	564.9	24.7	50	170	3.01
2	2	1	4	91	1006.9	164.0	47.25	58.72	270.0	234.0	502.9	23.5	114	234	3.83
2	2	2	1	7							525.3	22.9	80		
2	2	2	2	18							427.1	23.4	66		
2	2	2	3	58							632.4	25.1	84		
2	2	2	4	61							576.9	23.3	100		
2	2	3	2	15	997.5	185.0	35.88	49.37	270.2	240.7	486.5	23.4	71	218	4.04
2	2	3	1	28	813.2	174.5	16.36	44.43	235.3	202.1	375.9	22.6	52	273	4.77
2	2	3	3	53	995.8	193.8	23.80	25.74	243.4	202.5	549.9	23.7	48	196	3.80
2	2	3	4	70	1085.5	232.1	20.53	39.04	291.7	284.3	509.6	23.5	80	199	4.62

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m^2)

Code	total weight	leaf weight green	leaf weight yellow	leaf weight dead	leaf weight total	stem weight	tuber weight	tuber % dry	tuber no	SLA (cm^2/g)	LAI (m^2/m^2)
3 1 1 1 29	1131.5	117.9	11.20	44.55	173.6	114.6	843.3	21.9	68	165	1.95
3 1 1 2 48	1154.6	106.5	22.31	101.10	229.9	113.4	811.3	21.0	82	215	2.29
3 1 1 3 76	807.2	180.1	37.99	42.29	260.4	175.6	371.2	19.8	46	227	4.09
3 1 1 4 88	1016.4	176.3	32.34	49.62	258.2	173.8	584.4	21.3	84	164	2.89
3 1 2 2 13							374.8	20.5	57		
3 1 2 1 25							421.0	19.3	76		
3 1 2 4 72							696.1	21.8	84		
3 1 2 3 73							552.8	22.2	44		
3 1 3 1 9	651.5	103.5	9.51	40.66	153.7	53.8	444.1	20.8	57	173	1.79
3 1 3 2 46	449.3	60.9	20.34	19.27	100.5	50.5	298.3	20.9	50	129	0.78
3 1 3 3 84	1108.5	165.5	20.64	16.85	203.0	98.6	806.9	21.4	89	186	3.08
3 1 3 4 90	487.8	104.3	16.11	28.76	149.2	85.0	253.6	19.5	75	160	1.67
3 2 1 1 12	548.0	50.8	26.10	21.46	98.3	42.9	406.8	22.3	39	199	1.01
3 2 1 2 44	860.1	107.5	22.79	31.06	161.4	77.5	621.3	21.6	52	190	2.05
3 2 1 3 55	1198.3	124.2	33.64	39.08	197.0	96.4	904.9	23.1	55	211	2.63
3 2 1 4 68	942.1	95.8	18.68	47.41	161.9	86.9	693.2	21.8	50	248	2.37
3 2 2 2 17							502.1	21.1	92		
3 2 2 1 31							501.8	21.7	53		
3 2 2 3 57							469.2	22.5	55		
3 2 2 4 62							476.8	19.1	92		
3 2 3 1 27	558.5	53.8	8.80	69.87	132.4	48.6	377.5	20.1	59	168	0.90
3 2 3 2 39	808.9	117.1	18.10	36.25	171.4	82.7	554.8	19.5	121	161	1.88
3 2 3 3 77	775.6	100.2	22.15	30.35	152.7	66.2	556.8	21.1	66	157	1.58
3 2 3 4 94	538.2	36.6	13.53	28.09	78.2	42.1	417.9	21.1	59	150	0.55
4 1 1 2 23	906.7	97.2	24.87	41.48	163.5	81.6	661.6	25.6	68	185	1.80
4 1 1 1 30	1135.5	136.0	18.24	30.90	185.2	135.0	815.3	24.8	117	229	3.12
4 1 1 4 64	1259.3	94.1	19.06	73.60	186.8	133.4	939.2	24.6	75	197	1.86
4 1 1 3 75	1273.3	198.3	27.24	59.40	284.9	195.4	793.0	23.8	71	163	3.23
4 1 2 1 1							544.0	23.7	73		
4 1 2 2 37							504.7	23.6	43		
4 1 2 3 50							845.4	24.0	89		
4 1 2 4 71							898.3	24.5	114		
4 1 3 1 34	698.4	69.0	21.42	36.07	126.5	60.0	511.9	23.7	78	141	0.97
4 1 3 2 45	1102.4	166.2	23.54	44.09	233.8	133.7	734.9	24.2	105	167	2.77
4 1 3 3 59	1060.9	138.4	13.92	31.24	183.6	104.7	772.6	23.5	103	163	2.26
4 1 3 4 89	934.6	141.3	20.84	43.45	205.6	143.7	585.3	23.7	57	201	2.84
4 2 1 1 11	850.2	38.5	37.60	52.78	128.9	55.5	665.8	25.6	73	143	0.55
4 2 1 2 43	1164.2	131.8	43.70	53.19	228.7	132.4	803.1	24.0	66	190	2.51
4 2 1 3 79	1053.5	50.8	32.82	51.70	135.3	60.9	857.3	25.9	76	144	0.73
4 2 1 4 92	815.7	80.1	17.40	43.34	140.8	58.7	616.2	25.8	53	129	1.03
4 2 2 1 32							548.3	25.9	57		
4 2 2 2 41							604.6	23.9	76		
4 2 2 3 82							404.8	25.8	30		
4 2 2 4 85							798.2	25.1	82		
4 2 3 1 4	534.7	63.3	17.58	27.41	108.3	44.2	382.2	23.1	53	132	0.84
4 2 3 2 40	863.3	68.9	27.02	32.92	128.9	56.6	677.9	25.3	87	135	0.93
4 2 3 3 54	876.1	105.9	11.54	39.31	156.8	83.2	636.1	23.4	96	178	1.88
4 2 3 4 69	1018.4	121.8	19.98	24.28	166.1	96.2	756.1	24.1	114	140	1.71

Harvest 4: 24-08-1992

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m²)

Code					total weight	leaf weight				stem weight	tuber			SLA	LAI
						green	yellow	dead	total		weight	% dry	no	(cm²/g)	(m²/m²)
1	1	1	1	5	1175.4	114.0	12.94	82.81	209.7	187.9	777.8	24.9	71	204	2.32
1	1	1	2	24	1871.6	221.4	17.94	103.20	342.6	226.2	1302.8	24.6	68	153	3.38
1	1	1	3	52	1599.7	114.1	27.91	86.33	228.3	238.4	1133.0	25.3	69	198	2.26
1	1	1	4	63	1709.4	140.2	37.32	137.37	314.9	249.5	1145.0	25.1	57	177	2.48
1	1	2	1	26							884.3	25.8	46		
1	1	2	2	38							941.0	26.6	59		
1	1	2	3	49							1082.9	26.3	60		
1	1	2	4	95							916.4	25.8	66		
1	1	3	1	10	897.6	154.2	12.48	51.16	217.9	135.6	544.1	23.1	85	186	2.86
1	1	3	2	22	1039.8	144.5	21.16	87.75	253.4	179.0	607.4	24.3	50	194	2.80
1	1	3	4	66	1096.3	134.8	27.43	65.08	227.4	198.4	670.5	24.7	80	188	2.54
1	1	3	3	83	897.5	159.8	7.64	50.06	217.5	152.2	527.8	24.1	66	201	3.21
1	2	1	2	20	779.6	109.1	9.28	58.17	176.6	148.7	454.3	25.3	30	176	1.92
1	2	1	1	36	1022.2	77.3	22.65	81.35	181.3	124.1	716.8	26.2	34	213	1.65
1	2	1	3	56	1272.5	124.5	18.13	63.40	206.1	166.0	900.4	26.7	52	215	2.68
1	2	1	4	67	1099.5	87.3	22.26	72.30	181.8	106.9	810.8	26.5	44	182	1.59
1	2	2	1	8							798.3	24.3	82		
1	2	2	2	42							686.7	25.1	46		
1	2	2	3	81							*	25.9	*		
1	2	2	4	86							741.5	24.9	85		
1	2	3	1	3	650.5	112.8	10.97	23.32	147.1	130.4	373.0	24.4	34	172	1.93
1	2	3	2	16	1202.6	128.4	20.50	70.19	219.1	140.8	842.7	25.5	64	176	2.26
1	2	3	3	78	1112.6	131.3	27.09	56.52	214.9	161.4	736.3	25.3	57	176	2.31
1	2	3	4	93	1264.4	130.8	15.16	69.07	215.0	152.7	896.7	25.5	73	191	2.50
2	1	1	1	6	1722.6	216.5	26.60	99.31	342.4	410.6	969.6	24.6	100	226	4.89
2	1	1	2	47	1344.3	202.5	15.61	102.08	320.2	320.3	703.8	24.9	100	210	4.25
2	1	1	3	51	2102.7	271.3	46.88	48.62	366.8	477.1	1258.8	26.5	60	204	5.53
2	1	1	4	87	2226.9	224.2	76.12	89.26	389.6	486.2	1351.1	25.3	75	201	4.52
2	1	2	1	2							855.0	24.5	69		
2	1	2	2	14							801.3	26.1	53		
2	1	2	3	74							885.5	25.7	48		
2	1	2	4	96							876.0	25.4	78		
2	1	3	2	21	1358.6	217.1	15.24	52.32	284.6	209.7	864.3	25.4	76	194	4.21
2	1	3	1	33	1360.7	258.6	24.92	64.71	348.3	288.6	723.8	25.8	59	201	5.20
2	1	3	3	60	1713.1	246.7	34.13	96.05	376.9	361.9	974.4	25.6	66	197	4.87
2	1	3	4	65	1775.0	250.5	43.04	109.40	402.9	437.6	934.4	24.7	107	234	5.86
2	2	1	2	19	1428.0	169.7	29.76	87.88	287.3	238.8	901.9	26.3	85	223	3.79
2	2	1	1	35	1751.3	181.6	51.16	84.66	317.5	299.8	1134.0	26.1	82	212	3.85
2	2	1	3	80	1374.0	187.1	31.08	57.23	275.4	235.2	863.3	25.6	87	197	3.69
2	2	1	4	91	1690.1	228.1	78.40	107.00	413.5	393.1	883.5	24.1	82	195	4.45
2	2	2	1	7							606.0	25.1	53		
2	2	2	2	18							757.0	25.9	52		
2	2	2	3	58							816.4	26.7	62		
2	2	2	4	61							654.7	24.7	50		
2	2	3	2	15	1790.5	296.1	27.34	48.30	371.7	381.5	1037.3	25.0	105	201	5.94
2	2	3	1	28	950.9	155.3	22.97	28.23	206.5	214.3	530.1	25.1	52	225	3.50
2	2	3	3	53	1190.6	161.5	25.53	70.26	257.3	201.1	732.2	26.1	50	226	3.64
2	2	3	4	70	1189.1	204.4	27.64	98.76	330.8	315.7	542.5	24.2	69	222	4.54

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m^2)

Code					total weight	leaf weight green	yellow	dead	total	stem weight	tuber weight	% dry	no	SLA (cm^2/g)	LAI (m^2/m^2)
3	1	1	1	29	1282.1	4.2	15.80	182.40	202.4	76.4	1003.3	21.5	68	170	0.07
3	1	1	2	48	1224.5	29.0	39.68	115.75	184.4	92.9	947.1	21.5	62	161	0.47
3	1	1	3	76	1564.5	43.7	52.23	149.21	245.1	116.5	1202.9	21.7	75	184	0.81
3	1	1	4	88	941.2	37.2	82.10	119.06	238.3	140.6	562.2	21.0	59	170	0.63
3	1	2	2	13							967.0	21.8	66		
3	1	2	1	25							848.4	22.3	50		
3	1	2	4	72							707.4	21.2	85		
3	1	2	3	73							740.0	22.0	73		
3	1	3	1	9	812.6	19.5	46.26	114.44	180.2	52.5	579.9	21.1	60	137	0.27
3	1	3	2	46	627.6	34.3	20.64	98.06	153.0	41.0	433.7	22.4	28	112	0.38
3	1	3	3	84	968.4	26.0	28.60	90.35	144.9	49.8	773.6	22.0	57	179	0.46
3	1	3	4	90	980.8	64.2	45.16	86.42	195.8	99.8	685.2	21.4	84	172	1.10
3	2	1	1	12	963.0	6.7	13.88	151.02	171.6	45.0	746.4	22.5	46	148	0.10
3	2	1	2	44	1154.7	42.3	27.91	136.52	206.8	117.4	830.5	21.8	55	161	0.68
3	2	1	3	55	952.3	48.9	39.63	90.01	178.5	90.3	683.4	22.8	37	171	0.84
3	2	1	4	68	583.5	0.0	25.39	122.56	147.9	66.0	369.6	21.7	39	*	0.00
3	2	2	2	17							341.4	22.0	32		
3	2	2	1	31							583.0	22.6	62		
3	2	2	3	57							737.1	22.1	55		
3	2	2	4	62							638.5	20.2	78		
3	2	3	1	27	577.7	31.1	17.28	101.32	149.7	47.0	381.1	20.3	66	128	0.40
3	2	3	2	39	484.1	18.6	30.68	104.53	153.8	75.3	255.0	19.2	64	100	0.19
3	2	3	3	77	775.8	25.7	15.43	106.67	147.8	43.0	585.0	21.3	82	144	0.37
3	2	3	4	94	702.0	2.9	11.31	104.69	118.9	46.8	536.4	21.1	71	176	0.05
4	1	1	2	23	962.0	44.3	27.31	95.25	166.9	81.4	713.7	25.2	59	163	0.72
4	1	1	1	30	1774.7	51.6	48.44	160.66	260.7	137.6	1376.3	25.4	137	136	0.70
4	1	1	4	64	1247.8	16.0	39.06	133.62	188.7	151.0	908.1	24.7	62	159	0.25
4	1	1	3	75	2016.9	93.1	36.09	146.33	275.6	164.8	1576.6	25.9	89	158	1.47
4	1	2	1	1							948.6	23.1	87		
4	1	2	2	37							649.3	25.0	66		
4	1	2	3	50							1400.7	24.4	71		
4	1	2	4	71							1134.1	24.9	82		
4	1	3	1	34	*	*	*	*	*	*	*	*	*	*	*
4	1	3	2	45	1067.9	109.4	47.00	64.64	221.0	131.4	715.5	22.7	112	162	1.77
4	1	3	3	59	1027.8	73.7	16.89	77.87	168.5	89.4	769.9	23.9	57	162	1.19
4	1	3	4	89	1326.0	87.9	32.43	94.15	214.4	132.5	979.1	22.9	124	155	1.36
4	2	1	1	11	1057.6	16.0	33.23	142.81	192.0	59.2	806.3	26.4	60	108	0.17
4	2	1	2	43	1240.1	45.2	35.40	101.46	182.1	86.4	971.7	25.2	59	165	0.75
4	2	1	3	79	1256.4	8.2	7.89	172.80	188.9	74.4	993.1	26.3	73	145	0.12
4	2	1	4	92	897.1	24.6	20.14	132.84	177.6	70.9	648.6	25.3	59	97	0.24
4	2	2	1	32							559.6	25.8	53		
4	2	2	2	41							746.8	24.9	80		
4	2	2	3	82							406.9	24.8	66		
4	2	2	4	85							688.1	24.7	94		
4	2	3	1	4	603.8	34.5	10.12	84.25	128.8	37.3	437.6	23.2	48	143	0.49
4	2	3	2	40	750.5	33.8	25.39	60.80	120.0	61.9	568.5	24.1	52	130	0.44
4	2	3	3	54	1100.9	55.8	17.76	95.59	169.1	89.6	842.1	23.9	69	176	0.98
4	2	3	4	69	1204.7	49.7	26.06	97.39	173.2	92.6	938.9	23.4	112	155	0.77

Harvest 5: 14-09-1992

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m^2)

Code	tuber weight <27mm	tuber weight >27mm	tuber weight total	% dry matter	tuber number total	tuber number <27mm	tuber number >27mm
1 1 1 1 5	32	1399	1431	27.0	61	9	52
1 1 1 2 24	35	1179	1212	26.4	59	15	44
1 1 1 3 52	17	1372	1382	27.5	46	5	41
1 1 1 4 63	40	1015	1050	26.5	57	17	39
1 1 2 1 26	36	1003	1043	26.9	56	17	39
1 1 2 2 38	43	1205	1244	26.8	57	15	41
1 1 2 3 49	50	1247	1289	27.0	61	18	43
1 1 2 4 95	46	1084	1129	25.0	65	17	48
1 1 3 1 10	57	1156	1211	26.0	72	18	54
1 1 3 2 22	44	938	983	25.8	61	18	43
1 1 3 4 66	31	954	981	25.7	57	14	43
1 1 3 3 83	59	1120	1166	25.7	76	21	55
1 2 1 2 20	32	909	945	27.0	51	14	37
1 2 1 1 36	59	982	1045	25.7	72	27	45
1 2 1 3 56	21	796	815	27.3	36	7	29
1 2 1 4 67	10	1158	1164	28.1	52	3	49
1 2 2 1 8	49	877	942	26.3	60	21	39
1 2 2 2 42	32	969	993	25.5	54	13	41
1 2 2 3 81	17	716	741	27.1	39	7	32
1 2 2 4 86	29	843	877	26.6	51	12	39
1 2 3 1 3	41	645	695	25.6	59	19	39
1 2 3 2 16	49	880	928	25.2	69	24	45
1 2 3 3 78	41	407	446	25.0	41	13	27
1 2 3 4 93	73	1029	1090	25.3	77	27	50
2 1 1 1 6	25	1444	1454	26.9	63	15	47
2 1 1 2 47	26	1627	1643	26.0	63	11	51
2 1 1 3 51	28	1058	1089	26.3	53	10	43
2 1 1 4 87	17	1765	1799	26.3	59	7	52
2 1 2 1 2	35	1212	1253	26.4	69	16	53
2 1 2 2 14	27	1457	1491	25.1	73	14	59
2 1 2 3 74	30	1353	1392	25.7	67	15	51
2 1 2 4 96	53	1268	1334	25.0	89	29	59
2 1 3 2 21	27	1293	1325	26.4	73	19	54
2 1 3 1 33	50	1025	1064	24.3	71	22	49
2 1 3 3 60	32	1609	1655	25.6	64	13	51
2 1 3 4 65	30	1099	1135	25.6	65	16	49
2 2 1 2 19	80	*	1613	26.3	62	11	51
2 2 1 1 35	17	1638	1661	27.5	64	11	53
2 2 1 3 80	16	1330	1354	27.4	56	11	45
2 2 1 4 91	18	1444	1464	27.1	55	11	44
2 2 2 1 7	41	918	949	25.4	60	17	43
2 2 2 2 18	44	1390	1436	27.2	80	25	55
2 2 2 3 58	41	1534	1580	26.3	89	21	68
2 2 2 4 61	42	1506	1550	27.9	76	17	59
2 2 3 2 15	38	1341	1373	26.1	79	17	63
2 2 3 1 28	40	1272	1309	26.4	75	17	58
2 2 3 3 53	50	1168	1218	26.7	66	18	48
2 2 3 4 70	57	1109	1152	26.1	87	31	57

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

Dry weights (g/m^2)

Code					tuber weight			% dry	tuber number		
					<27mm	>27mm	total	matter	total	<27mm	>27mm
3	1	1	1	29	47	845	900	21.7	65	27	37
3	1	1	2	48	36	1080	1134	21.1	74	19	55
3	1	1	3	76	33	1029	1068	22.1	69	18	51
3	1	1	4	88	27	708	744	21.8	50	13	37
3	1	2	2	13	36	680	720	21.4	59	23	36
3	1	2	1	25	27	727	759	21.1	53	15	39
3	1	2	4	72	22	720	746	20.2	63	14	49
3	1	2	3	73	16	663	683	21 4	47	13	35
3	1	3	1	9	7	622	636	21.1	44	8	36
3	1	3	2	46	47	569	620	20.0	73	33	40
3	1	3	3	84	32	571	615	20.0	58	17	41
3	1	3	4	90	41	408	454	20.4	56	25	31
3	2	1	1	12	29	757	789	21.6	61	21	39
3	2	1	2	44	22	657	682	21.0	53	16	37
3	2	1	3	55	15	1031	1055	21.5	53	9	45
3	2	1	4	68	26	844	876	21.0	58	13	45
3	2	2	2	17	56	550	608	21.5	77	38	39
3	2	2	1	31	11	428	444	21.4	36	6	30
3	2	2	3	57	28	528	560	20.8	47	15	33
3	2	2	4	62	34	672	712	20.6	60	20	40
3	2	3	1	27	32	295	327	20.8	45	19	25
3	2	3	2	39	30	258	292	18.8	51	25	26
3	2	3	3	77	26	399	431	20.8	55	21	34
3	2	3	4	94	27	533	564	21.2	50	17	33
4	1	1	2	23	42	1011	1059	24.6	75	21	53
4	1	1	1	30	57	1229	1291	25.3	93	34	59
4	1	1	4	64	49	1067	1123	24.5	91	23	67
4	1	1	3	75	22	1258	1289	25.7	68	13	55
4	1	2	1	1	58	612	672	23.5	83	37	47
4	1	2	2	37	34	1168	1208	25.2	73	19	54
4	1	2	3	50	34	1394	1436	25.2	78	14	64
4	1	2	4	71	28	1168	1200	24.2	69	18	51
4	1	3	1	34	30	1158	1196	25.2	76	15	61
4	1	3	2	45	65	821	890	24.1	95	41	54
4	1	3	3	59	58	1073	1136	24.7	87	30	57
4	1	3	4	89	45	859	908	24.2	84	23	61
4	2	1	1	11	16	734	754	25.4	45	9	36
4	2	1	2	43	21	997	1025	24.9	62	15	47
4	2	1	3	79	79	597	677	25.3	95	50	45
4	2	1	4	92	17	845	875	25.8	59	13	47
4	2	2	1	32	43	575	625	24.1	63	22	41
4	2	2	2	41	47	743	793	23.8	73	23	50
4	2	2	3	82	36	790	838	25.4	67	17	49
4	2	2	4	85	32	687	725	24.4	57	15	41
4	2	3	1	4	54	527	586	24.1	82	31	51
4	2	3	2	40	43	791	841	24.6	73	23	49
4	2	3	3	54	54	930	997	24.1	86	30	56
4	2	3	4	69	46	979	1032	24.6	72	22	50

Appendix V:

root length (cm/cm³) as measured by core sampling

1991

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:	Position:
1=Darwina	1=fumigated	1=loose	P=below plant
2=Elles	2=not fumigated	2=moderately compacted	M=between 4 plants
		3=severely compacted	

			10-06-'91		02-07-'91			24-07-'91				19-08-'91			
code	depth:		0-10	10-20	0-10	10-20	20-30	0-10	10-20	20-30	30-40	0-10	10-20	20-30	30-40
1 1 1 1	4B	P	4.54	0.86	7.26	0.87	0.56	9.58	1.94	2.88	0.76	4.40	2.06	3.27	1.94
1 1 1 1	4B	M	0.21	0.05	2.07	2.27	1.30	1.44	2.57	2.51	0.68	2.81	2.34	3.25	1.88
1 1 1 3	16B	P	2.47	0.47	5.45	0.84	1.03	1.96	1.24	1.41	0.43	1.88	1.00	1.75	0.77
1 1 1 3	16B	M	0.23	0.33	1.38	0.95	1.34	2.18	1.41	2.11	0.48	1.14	1.21	1.40	1.36
1 1 1 4	24B	P	3.53	0.76	4.01	1.16	0.72	4.11	2.74	1.81	1.32	7.56	2.49	5.42	2.32
1 1 1 4	24B	M	0.69	1.01	2.37	1.38	1.52	4.00	1.89	3.40	1.41	3.41	2.77	3.28	2.56
1 1 2 1	6B	P	3.97	0.62	7.46	1.78	2.09	5.41	3.19	4.25	0.48	4.78	2.70	1.83	0.72
1 1 2 1	6B	M	0.12	0.05	1.86	0.95	0.67	1.57	2.01	1.13	0.26	2.52	1.32	1.84	0.74
1 1 2 3	18B	P	1.85	0.61	4.40	0.80	0.79	1.99	1.88	0.66	0.59	2.36	1.33	1.11	0.64
1 1 2 3	18B	M	0.18	0.16	0.80	0.60	0.19	0.15	0.51	0.89	0.07	0.48	0.96	0.83	0.50
1 1 2 4	21A	P	7.32	2.05	6.64	1.26	1.66	5.69	7.87	4.06	1.32	6.13	4.10	4.20	1.09
1 1 2 4	21A	M	1.15	1.87	2.85	0.99	0.45	2.67	4.47	2.61	0.12	3.22	2.55	6.13	0.41
1 1 3 1	1B	P	5.87	3.19	9.57	3.06	0.27	4.99	2.24	0.30	0.07	4.36	3.02	2.53	1.29
1 1 3 1	1B	M	0.00	0.09	1.44	0.30	0.18	1.37	0.49	0.45	0.04	2.27	0.99	2.69	0.56
1 1 3 3	13B	P	3.60	1.00	2.45	0.63	0.18	3.46	1.43	0.46	0.11	1.93	1.14	1.00	0.54
1 1 3 3	13B	M	0.15	0.14	0.69	0.48	0.17	1.02	0.45	0.56	0.06	0.79	0.45	0.72	0.05
1 1 3 4	23A	P	2.20	0.52	13.14	2.92	0.43	4.04	3.06	2.11	1.82	4.04	4.48	2.52	0.57
1 1 3 4	23A	M	0.30	0.27	3.26	1.37	2.12	1.65	3.39	2.03	0.77	3.22	1.06	2.28	0.96
1 2 1 1	2A	P	6.11	0.12	6.50	1.50	0.44	5.33	1.39	1.54	0.38	4.76	1.74	1.38	0.30
1 2 1 1	2A	M	0.04	0.00	1.64	0.67	0.15	1.66	1.74	1.41	0.39	1.58	1.85	1.16	0.29
1 2 1 3	15A	P	3.67	0.30	4.16	0.50	0.38	1.71	0.85	0.97	0.32	2.06	0.45	0.65	0.33
1 2 1 3	15A	M	0.28	0.47	0.57	0.47	0.16	1.06	0.51	0.39	0.10	1.12	0.55	0.31	0.21
1 2 1 4	22A	P	4.16	0.85	3.11	1.22	1.77	3.95	3.27	2.83	1.28	7.11	2.23	3.15	1.16
1 2 1 4	22A	M	0.60	0.95	2.42	1.42	0.68	4.94	2.56	1.75	0.74	4.39	1.80	3.32	0.18
1 2 2 1	5B	P	3.03	0.00	4.53	0.98	1.79	2.65	0.44	1.12	0.39	5.43	2.21	1.22	0.57
1 2 2 1	5B	M	0.10	0.00	0.91	0.66	0.22	0.48	0.45	0.46	0.46	1.13	0.55	0.68	0.36
1 2 2 3	17A	P	2.51	0.28	3.41	0.49	0.62	1.84	0.73	0.73	0.16	3.22	1.07	0.65	0.16
1 2 2 3	17A	M	0.17	0.10	0.98	0.04	0.06	0.87	0.55	0.28	0.17	0.45	0.04	0.31	0.07
1 2 2 4	19B	P	8.07	3.18	4.85	2.79	2.05	5.80	3.95	3.52	0.76	4.48	3.51	2.27	0.20
1 2 2 4	19B	M	0.97	1.01	1.13	0.52	1.37	3.31	2.66	1.74	1.35	1.87	1.62	1.63	0.23
1 2 3 1	3B	P	2.61	0.00	3.91	0.83	2.28	4.25	1.53	1.11	0.17	2.31	1.14	1.98	0.46
1 2 3 1	3B	M	0.12	0.02	0.74	0.27	0.07	0.83	1.27	0.76	0.17	0.10	0.29	0.50	0.39
1 2 3 3	14A	P	4.78	0.47	3.58	1.38	0.27	3.22	1.61	1.37	0.15	2.61	0.78	0.57	0.24
1 2 3 3	14A	M	0.18	0.23	0.32	0.09	0.05	0.91	0.61	0.07	0.03	0.72	0.68	0.19	0.18
1 2 3 4	20A	P	6.48	1.59	6.57	2.08	0.89	5.82	4.84	1.53	1.07	4.70	4.54	2.32	0.26
1 2 3 4	20A	M	1.25	1.23	1.68	0.90	1.21	2.49	2.73	2.24	0.95	2.61	1.81	1.01	0.18
2 1 1 1	4A	P	7.84	2.07	10.35	2.16	1.33	6.90	3.59	2.59	0.50	6.55	2.48	2.43	1.97
2 1 1 1	4A	M	0.03	0.09	5.79	3.75	3.80	3.85	3.62	3.18	0.79	3.42	3.11	2.62	1.28
2 1 1 3	16A	P	2.44	1.65	4.10	1.62	1.29	1.31	1.27	1.90	0.55	2.90	0.88	2.23	0.66
2 1 1 3	16A	M	0.80	0.69	4.44	1.34	2.51	2.58	1.94	1.92	0.25	2.49	2.21	2.05	0.99
2 1 1 4	24A	P	16.63	2.26	3.43	2.78	3.79	6.00	3.58	4.68	1.95	3.09	3.25	3.87	1.74
2 1 1 4	24A	M	2.47	1.75	4.86	3.76	7.24	6.29	5.00	4.38	1.25	5.32	4.28	5.40	2.83

			10-06-'91		02-07-'91			24-07-'91				19-08-'91			
code	depth:		0-10	10-20	0-10	10-20	20-30	0-10	10-20	20-30	30-40	0-10	10-20	20-30	30-40
2121	6A	P	3.33	1.28	6.94	1.77	2.27	7.88	2.99	2.95	0.43	5.44	2.75	3.33	1.56
2121	6A	M	0.11	0.08	3.18	1.25	0.47	2.93	3.25	2.50	0.92	3.43	1.91	1.84	1.92
2123	18A	P	2.79	0.67	3.53	2.50	1.05	4.25	1.97	1.72	0.14	3.15	1.92	1.49	0.27
2123	18A	M	0.26	0.58	1.23	0.55	0.28	2.71	1.32	2.03	0.16	1.50	1.23	1.45	0.72
2124	21B	P	11.70	1.69	9.76	6.01	5.10	9.08	6.11	5.93	0.29	8.00	4.70	5.95	1.18
2124	21B	M	1.59	1.88	3.11	1.58	0.66	2.12	4.37	4.46	0.39	2.55	3.66	4.74	0.56
2131	1A	P	1.56	1.74	12.22	8.17	1.19	16.29	2.59	0.41	0.10	4.66	1.85	1.59	0.53
2131	1A	M	1.10	0.04	2.24	0.26	0.21	2.21	0.59	0.34	0.12	2.21	0.68	0.13	0.28
2133	13A	P	3.96	0.64	4.43	3.39	1.86	2.98	1.62	1.46	0.06	3.57	1.60	1.69	0.46
2133	13A	M	0.16	0.12	1.67	0.38	0.24	2.17	0.15	0.16	0.15	1.51	0.49	0.88	0.48
2134	23B	P	13.09	3.56	6.03	3.33	1.83	9.14	5.43	3.78	0.66	15.21	3.52	2.64	1.72
2134	23B	M	1.82	2.71	1.77	1.09	0.66	2.46	4.36	0.38	0.97	2.02	1.44	2.43	2.16
2211	2B	P	4.70	1.00	1.14	2.64	1.05	5.11	1.40	1.59	0.52	6.54	1.66	2.59	1.05
2211	2B	M	0.05	0.00	1.15	1.70	0.88	0.82	1.26	1.53	0.50	2.03	2.99	3.59	1.03
2213	15B	P	4.22	0.65	2.69	1.18	0.87	3.66	1.57	0.98	0.72	2.07	0.62	1.02	0.86
2213	15B	M	0.43	0.32	2.32	0.91	0.17	1.13	1.05	0.74	0.18	1.35	0.83	0.30	0.51
2214	22B	P	3.38	0.86	5.24	1.09	1.46	4.20	3.69	2.86	1.25	11.67	3.10	1.96	1.35
2214	22B	M	0.19	0.15	4.63	2.05	4.07	3.72	3.94	3.80	0.49	3.56	3.94	4.16	1.27
2221	5A	P	6.91	0.78	4.39	1.96	1.28	8.72	3.26	1.48	0.26	2.85	1.39	0.73	0.32
2221	5A	M	0.00	0.10	2.49	0.68	0.54	0.65	0.65	1.71	0.46	1.52	0.71	1.27	0.92
2223	17B	P	3.08	1.19	5.52	1.54	0.61	2.82	1.11	1.04	0.05	2.64	1.27	1.29	0.90
2223	17B	M	0.24	0.29	0.46	0.16	0.19	1.38	0.89	0.51	0.13	1.34	0.58	0.73	0.14
2224	19A	P	6.44	0.78	7.09	1.20	1.48	2.45	3.10	2.36	1.55	5.94	2.60	3.76	0.84
2224	19A	M	1.08	1.25	1.06	1.12	1.19	4.75	1.30	3.05	1.47	1.67	1.07	1.49	0.23
2231	3A	P	3.35	1.23	5.24	3.35	0.37	7.87	1.19	1.21	0.11	2.12	1.97	1.65	0.30
2231	3A	M	0.21	0.65	0.25	0.14	0.20	0.51	0.35	0.71	0.20	1.37	0.69	0.90	0.32
2233	14B	P	3.05	0.65	2.13	1.43	0.36	5.48	0.69	0.32	0.12	3.24	1.73	0.53	0.17
2233	14B	M	0.17	0.17	0.71	0.36	0.20	0.47	0.11	0.17	0.04	0.23	0.16	0.24	0.22
2234	20B	P	9.66	2.27	6.33	1.69	1.19	5.12	3.46	3.55	1.61	12.61	3.44	1.12	0.19
2234	20B	M	1.74	2.07	1.30	0.89	0.91	2.47	2.06	2.66	0.46	3.99	0.98	1.60	0.27

1992

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

code					06-07-'92				24-08-'92			
					P0-20	P20-40	M0-20	M20-40	P0-20	P20-40	M0-20	M20-40
1	1	1	1	5	2.05	0.61	2.24	1.20	1.91	1.14	2.73	1.27
1	1	1	2	24	3.55	1.61	2.53	1.51	3.72	3.48	2.80	1.91
1	1	1	3	52	2.59	2.06	4.65	2.27	2.93	2.10	5.16	2.71
1	1	1	4	63	3.28	1.46	2.65	1.14	4.20	1.88	4.15	2.60
1	1	3	1	10	1.81	1.74	0.63	0.61	4.59	2.17	2.16	0.33
1	1	3	2	22	4.94	3.17	1.40	0.62	7.06	2.78	2.52	1.41
1	1	3	3	83	8.71	4.11	0.83	2.01	8.47	3.32	3.17	0.85
1	1	3	4	66	5.40	1.26	0.47	0.45	5.18	1.41	1.70	0.75
1	2	1	1	36	1.31	1.50	1.12	1.64	2.81	1.88	1.97	2.52
1	2	1	2	20	3.13	1.83	2.32	1.23	3.01	2.00	0.91	1.75
1	2	1	3	56	5.98	2.71	3.23	2.04	5.39	3.67	1.44	2.20
1	2	1	4	67	3.43	1.31	2.69	1.84	2.61	1.68	2.67	0.51
1	2	3	1	3	4.36	1.56	0.66	1.59	4.12	1.05	1.98	3.74
1	2	3	2	16	6.11	2.34	1.79	2.57	5.68	0.67	0.90	1.81
1	2	3	3	78	8.32	2.06	1.15	1.07	6.69	1.87	1.17	0.35
1	2	3	4	93	1.44	1.54	2.19	0.57	3.96	2.49	1.57	1.80
2	1	1	1	6	2.55	1.40	2.50	0.86	2.68	1.57	3.43	1.44
2	1	1	2	47	5.24	2.49	3.70	2.65	5.08	1.96	6.27	1.05
2	1	1	3	51	6.98	2.44	7.44	3.87	18.42	2.65	3.56	2.91
2	1	1	4	87	5.38	4.08	4.50	2.72	5.44	3.30	4.26	1.28
2	1	3	1	33	3.15	1.11	0.17	1.31	5.28	2.41	1.45	1.47
2	1	3	2	21	6.94	1.57	1.99	1.32	5.99	2.68	2.84	2.13
2	1	3	3	60	7.09	2.29	3.22	0.85	5.79	2.39	3.52	2.24
2	1	3	4	65	8.18	2.85	1.72	1.31	6.14	3.92	2.53	1.16
2	2	1	1	35	2.42	1.76	0.81	1.37	3.65	1.99	2.33	1.64
2	2	1	2	19	3.71	3.19	4.06	2.61	4.28	2.47	3.15	2.84
2	2	1	3	80	5.98	3.62	3.12	3.48	5.36	2.04	3.90	2.41
2	2	1	4	91	5.18	2.39	3.38	2.18	3.47	1.42	8.23	3.67
2	2	3	1	28	6.14	1.58	0.19	1.54	2.58	1.58	0.79	2.71
2	2	3	2	15	10.53	3.01	1.21	1.95	3.39	2.65	2.56	1.23
2	2	3	3	53	10.40	2.03	1.33	0.94	17.65	3.30	2.58	1.86
2	2	3	4	70	10.25	7.03	0.16	1.01	3.85	2.97	1.84	2.08

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

code					06-07-'92				24-08-'92			
					P0-20	P20-40	M0-20	M20-40	P0-20	P20-40	M0-20	M20-40
3	1	1	1	29	2.40	2.59	1.23	0.92	1.46	0.83	2.00	2.54
3	1	1	2	48	4.98	2.84	3.09	2.27	3.97	1.15	3.11	3.14
3	1	1	3	76	3.34	2.82	4.27	1.05	4.43	2.06	2.45	0.50
3	1	1	4	88	3.07	1.52	5.21	1.49	4.71	1.71	3.13	1.76
3	1	3	1	9	2.57	2.23	0.70	0.64	2.70	0.75	0.83	1.54
3	1	3	2	46	4.56	2.56	1.64	1.68	6.06	2.52	2.03	2.04
3	1	3	3	84	6.81	3.25	1.19	0.83	5.64	2.08	2.27	2.05
3	1	3	4	90	7.14	1.83	0.46	0.25	5.25	0.70	1.23	0.73
3	2	1	1	12	2.76	1.40	1.58	1.16	2.23	0.55	1.48	1.19
3	2	1	2	44	5.54	3.39	3.09	2.93	3.56	2.40	2.57	2.23
3	2	1	3	55	4.95	1.92	3.05	2.16	4.32	4.01	1.94	2.49
3	2	1	4	68	6.82	3.82	3.26	0.26	2.67	1.11	0.96	1.85
3	2	3	1	27	3.06	1.25	0.09	1.19	4.49	3.36	0.70	1.94
3	2	3	2	39	5.64	1.80	1.39	1.72	5.26	2.99	0.64	1.90
3	2	3	3	77	5.72	2.11	0.44	0.48	4.70	1.23	1.72	0.83
3	2	3	4	94	10.98	2.16	0.68	0.64	2.53	1.77	0.91	2.55
4	1	1	1	30	1.85	1.68	2.66	1.86	2.44	1.31	2.43	2.20
4	1	1	2	23	3.26	1.18	4.11	1.77	6.56	2.68	5.56	1.31
4	1	1	3	75	4.95	2.49	4.17	0.60	4.69	1.44	3.69	1.23
4	1	1	4	64	3.95	2.16	3.09	0.36	2.20	3.05	2.36	2.41
4	1	3	1	34	3.09	2.02	0.12	0.97	5.64	1.38	2.37	0.47
4	1	3	2	45	4.47	5.20	2.05	1.26	3.19	2.26	1.72	2.11
4	1	3	3	59	7.54	5.00	1.06	2.62	7.82	1.54	4.14	0.91
4	1	3	4	89	13.59	2.49	0.47	0.84	11.45	2.38	2.40	1.47
4	2	1	1	11	1.76	2.85	2.05	1.96	0.91	1.56	1.69	1.08
4	2	1	2	43	4.71	2.25	4.00	4.57	3.96	2.96	2.49	2.19
4	2	1	3	79	2.97	3.30	1.68	1.72	4.32	1.61	2.27	1.57
4	2	1	4	92	4.78	1.99	3.25	1.39	4.71	1.50	2.09	1.07
4	2	3	1	4	3.08	1.40	1.67	1.11	5.41	1.84	2.96	1.78
4	2	3	2	40	5.83	3.32	1.60	1.52	7.32	2.09	1.44	1.92
4	2	3	3	54	12.31	3.23	1.88	2.03	5.60	3.95	8.88	4.03
4	2	3	4	69	4.31	3.78	1.48	0.22	1.84	1.74	1.72	0.38

Appendix VI:

Nutrient concentrations (g/kg)

harvest 1:10-06-'91.

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

code					Leaf				Stem			Tuber		
					Ntot	NO_3	Ptot	K	Ntot	Ptot	K	Ntot	Ptot	K
1	1	1	1	4B	62.4	6.81	4.82	46.9	42.8	3.21	77.7	18.1	2.07	26.4
1	1	1	4	24B	71.7	7.07	6.16	55.2	44.6	4.61	84.4	18.3	3.01	25.0
1	1	2	1	6B	62.9	4.70	4.77	43.8	31.8	2.70	57.2	17.4	1.91	21.9
1	1	2	4	21A	63.3	4.42	5.37	46.0	35.8	2.57	45.8	18.1	2.48	21.4
1	1	3	1	1B	61.3	4.53	3.51	44.8	31.8	1.65	58.8	19.2	1.51	24.1
1	1	3	4	23A	61.4	3.80	4.40	39.6	31.7	1.98	51.7	17.6	2.06	21.7
1	2	1	1	2A	61.4	6.23	4.50	39.7	36.7	2.21	55.9	18.3	2.06	16.0
1	2	1	4	22A	65.3	6.01	4.37	45.4	40.4	3.34	67.2	20.2	2.35	24.9
1	2	2	1	5B	57.7	3.86	3.94	36.3	28.7	1.99	49.0	17.6	1.64	21.0
1	2	2	4	19B	57.4	3.70	4.39	39.7	32.1	2.20	57.3	17.1	1.80	23.8
1	2	3	1	3B	62.2	4.58	4.38	37.0	31.7	2.33	50.6	17.8	2.07	24.0
1	2	3	4	20A	58.7	3.61	4.30	39.1	32.6	2.52	59.0	17.5	2.20	25.1
2	1	1	1	4A	64.9	7.45	5.11	46.6	40.8	3.36	77.1	19.5	2.47	25.1
2	1	1	4	24A	72.2	7.68	5.91	49.4	46.1	4.20	84.3	20.5	2.89	26.6
2	1	2	1	6A	65.7	6.23	5.52	42.9	36.6	3.36	63.5	20.2	2.55	24.1
2	1	2	4	21B	63.9	5.47	5.19	40.9	46.4	3.41	66.4	21.0	2.62	24.0
2	1	3	1	1A	62.4	4.80	3.61	40.7	33.4	2.09	52.0	20.5	2.07	23.1
2	1	3	4	23B	67.7	4.01	5.74	44.2	38.4	3.22	65.3	20.9	1.29	*
2	2	1	1	2B	57.6	4.47	3.83	39.4	30.3	1.88	57.7	19.1	1.79	24.8
2	2	1	4	22B	66.2	5.55	5.31	44.9	39.8	3.30	67.9	*	*	*
2	2	2	1	5A	59.4	4.13	4.38	40.7	29.2	2.32	60.3	17.0	1.92	23.7
2	2	2	4	19A	59.0	3.86	4.19	40.3	30.7	2.41	59.7	19.1	2.07	*
2	2	3	1	3A	55.1	2.65	3.12	34.1	22.1	1.33	36.8	18.3	1.93	23.8
2	2	3	4	20B	67.5	3.59	4.27	36.8	33.1	2.52	54.4	18.4	2.48	23.4
harvest 2:02-07-'91.														
1	1	1	1	4B	47.5	3.13	4.95	62.6	25.7	5.44	87.6	*	*	*
1	1	1	4	24B	52.1	4.87	5.18	68.6	36.2	5.57	93.1	*	*	*
1	1	2	1	6B	44.6	2.00	5.16	44.8	24.7	5.08	68.0	*	*	*
1	1	2	4	21A	46.1	1.94	4.80	60.2	21.2	4.66	62.8	*	*	*
1	1	3	1	1B	30.0	0.20	3.62	36.8	15.6	3.48	35.2	*	*	*
1	1	3	4	23A	41.1	0.75	4.47	57.1	17.4	4.25	45.2	*	*	*
1	2	1	1	2A	42.4	1.88	2.78	51.7	19.8	1.93	48.8	*	*	*
1	2	1	4	22A	42.6	0.78	5.20	56.6	17.8	4.64	46.6	*	*	*
1	2	2	1	5B	31.0	0.09	3.86	34.6	12.4	3.14	27.4	*	*	*
1	2	2	4	19B	37.6	0.46	4.12	37.8	15.3	3.25	29.6	*	*	*
1	2	3	1	3B	32.8	0.14	3.07	42.1	12.0	2.82	30.1	*	*	*
1	2	3	4	20A	33.2	0.15	2.74	30.7	13.0	2.98	18.8	*	*	*
2	1	1	1	4A	53.4	4.49	5.95	56.8	33.7	5.93	87.5	*	*	*
2	1	1	4	24A	53.0	6.13	5.52	77.3	39.6	6.14	94.3	*	*	*
2	1	2	1	6A	46.4	1.51	4.94	63.8	22.6	4.88	75.6	*	*	*
2	1	2	4	21B	44.0	0.51	5.06	56.2	19.0	4.82	65.4	*	*	*
2	1	3	1	1A	52.5	0.10	3.61	28.6	15.5	3.73	31.4	*	*	*
2	1	3	4	23B	36.6	0.10	4.35	52.4	12.4	3.92	37.6	*	*	*
2	2	1	1	2B	49.5	2.64	5.28	48.0	27.0	4.63	68.0	*	*	*
2	2	1	4	22B	40.2	0.43	5.40	49.6	17.0	4.52	45.2	*	*	*
2	2	2	1	5A	39.7	0.20	3.68	39.8	15.1	3.54	44.0	*	*	*
2	2	2	4	19A	35.9	0.17	4.43	36.1	13.5	3.86	36.0	*	*	*
2	2	3	1	3A	34.5	0.28	3.59	37.7	14.3	2.87	33.4	*	*	*
2	2	3	4	20B	28.3	0.05	3.23	29.6	11.8	3.18	24.9	*	*	*

code					Leaf				Stem			Tuber		
					Ntot	NO_3	Ptot	K	Ntot	Ptot	K	Ntot	Ptot	K
harvest 3:24-07-'91.														
1	1	1	1	4B	43.0	0.94	2.82	53.5	17.6	2.32	56.3	11.3	2.52	20.1
1	1	1	4	24B	47.5	1.23	3.80	56.0	22.3	3.52	76.6	22.3	2.91	20.0
1	1	2	1	6B	38.8	0.37	3.28	48.5	11.7	2.84	46.8	9.94	2.81	19.8
1	1	2	4	21A	44.1	0.73	3.50	51.5	17.4	3.43	53.3	13.2	3.16	21.2
1	1	3	1	1B	31.9	0.38	1.89	40.9	11.5	0.96	22.8	10.8	1.70	17.5
1	1	3	4	23A	41.6	0.42	3.15	46.4	13.6	2.50	42.0	10.1	2.57	16.0
1	2	1	1	2A	37.0	1.18	1.95	26.2	15.3	1.02	17.7	11.5	1.70	13.6
1	2	1	4	22A	30.2	0.14	2.27	37.8	10.8	1.86	28.4	11.2	2.56	17.2
1	2	2	1	5B	37.2	0.89	2.14	23.7	14.3	1.21	16.9	10.1	1.90	14.1
1	2	2	4	19B	30.5	0.02	2.42	26.4	11.4	1.47	19.8	9.20	2.26	15.2
1	2	3	1	3B	25.9	0.47	1.60	24.4	14.4	1.40	20.8	10.4	1.83	15.7
1	2	3	4	20A	29.7	0.09	2.37	24.7	11.6	1.40	16.8	9.43	2.33	15.4
2	1	1	1	4A	43.7	1.16	2.87	47.3	16.6	2.37	47.2	11.5	2.31	15.6
2	1	1	4	24A	47.2	2.22	3.46	47.0	21.1	3.23	49.8	11.7	2.69	17.2
2	1	2	1	6A	47.0	2.21	3.93	37.8	19.8	3.99	46.8	12.1	2.99	18.8
2	1	2	4	21B	42.2	0.68	4.17	48.0	15.8	4.10	53.5	10.9	3.15	21.0
2	1	3	1	1A	30.1	0.34	2.18	44.8	10.7	1.64	27.0	10.6	1.91	17.1
2	1	3	4	23B	48.5	1.17	3.39	46.6	20.2	2.91	54.5	11.1	2.58	19.3
2	2	1	1	2B	41.6	2.19	2.74	32.3	17.0	1.90	28.6	10.5	2.08	15.0
2	2	1	4	22B	39.2	0.25	3.33	41.5	11.2	2.80	35.9	8.47	2.38	14.8
2	2	2	1	5A	35.7	0.16	2.59	27.8	16.0	2.13	27.6	8.78	2.02	14.6
2	2	2	4	19A	34.1	0.06	2.97	36.8	9.39	2.41	28.1	7.38	2.29	17.9
2	2	3	1	3A	41.8	2.20	2.81	29.7	18.0	2.16	23.1	11.2	2.21	16.4
2	2	3	4	20B	30.8	0.02	2.92	28.9	11.2	2.53	21.1	7.7	2.28	13.9
harvest 4:19-08-'91.														
1	1	1	1	4B	*	*	*	*	*	*	*	*	*	*
1	1	1	4	24B	37.6	2.14	29.8	27.1	23.6	0.95	31.2	12.3	2.14	18.2
1	1	2	1	6B	52.5	2.96	25.1	24.2	23.3	1.60	28.5	12.1	2.26	17.2
1	1	2	4	21A	41.8	2.49	32.6	24.7	13.5	1.49	18.1	11.5	2.51	18.3
1	1	3	1	1B	55.6	2.77	27.2	30.5	33.9	1.68	31.6	21.8	1.63	17.4
1	1	3	4	23A	47.5	2.39	30.4	28.5	22.4	1.20	29.3	11.2	2.13	18.3
1	2	1	1	2A	*	*	*	*	*	*	*	9.59	1.16	15.1
1	2	1	4	22A	40.5	*	*	*	15.6	0.94	21.5	10.9	2.22	16.3
1	2	2	1	5B	38.8	1.86	29.5	38.1	21.7	1.11	9.8	11.4	1.53	14.5
1	2	2	4	19B	*	*	*	*	*	*	*	9.71	2.15	15.6
1	2	3	1	3B	38.5	1.87	*	*	18.1	1.17	11.2	11.2	1.91	14.4
1	2	3	4	20A	34.0	1.96	27.0	30.3	15.2	1.06	14.2	10.1	2.00	15.2
2	1	1	1	4A	45.6	2.44	23.9	29.7	13.4	1.03	18.9	11.0	1.92	24.3
2	1	1	4	24A	42.5	2.51	29.3	22.8	10.4	1.41	24.5	11.3	2.30	17.9
2	1	2	1	6A	42.8	2.48	29.3	29.3	9.2	1.10	18.0	10.0	2.07	17.0
2	1	2	4	21B	50.4	3.19	38.1	22.0	21.6	2.52	42.6	11.5	2.51	20.3
2	1	3	1	1A	40.3	2.57	33.7	30.4	13.8	1.35	26.0	10.0	1.59	16.0
2	1	3	4	23B	45.9	2.47	30.5	28.4	23.5	1.39	34.1	10.3	1.93	17.3
2	2	1	1	2B	40.6	2.14	20.2	28.4	14.9	1.24	19.8	9.11	1.27	13.7
2	2	1	4	22B	45.8	2.27	23.5	29.8	15.3	1.21	24.6	9.67	1.69	15.3
2	2	2	1	5A	38.1	1.76	29.7	31.6	14.8	1.11	20.1	8.28	1.36	15.2
2	2	2	4	19A	36.7	2.30	24.7	25.8	13.2	1.68	22.2	7.85	1.90	13.6
2	2	3	1	3A	52.1	2.80	16.7	32.2	30.7	2.19	18.0	20.3	1.70	14.9
2	2	3	4	20B	36.8	2.68	23.4	28.0	12.7	2.12	21.3	7.96	2.19	14.0

code	Leaf				Stem			Tuber		
	Ntot	NO_3	Ptot	K	Ntot	Ptot	K	Ntot	Ptot	K
harvest 5:22-10-'91.										
1 1 1 1 4B								13.4	2.03	16.4
1 1 1 4 24B								14.7	2.48	19.2
1 1 2 1 6B								13.5	2.07	16.5
1 1 2 4 21A								13.8	2.56	18.5
1 1 3 1 1B								13.9	1.53	17.0
1 1 3 4 23A								13.6	1.85	18.0
1 2 1 1 2A								12.2	1.45	14.2
1 2 1 4 22A								12.0	2.16	16.2
1 2 2 1 5B								12.1	1.55	12.4
1 2 2 4 19B								10.6	2.25	15.8
1 2 3 1 3B								12.1	1.53	14.6
1 2 3 4 20A								10.8	2.03	14.1
2 1 1 1 4A								*	*	*
2 1 1 4 24A								13.2	2.39	18.3
2 1 2 1 6A								13.6	2.13	15.2
2 1 2 4 21B								12.9	2.08	17.7
2 1 3 1 1A								12.0	1.72	14.8
2 1 3 4 23B								12.7	1.73	16.3
2 2 1 1 2B								13.5	1.57	14.6
2 2 1 4 22B								12.2	1.60	14.5
2 2 2 1 5A								11.9	1.56	14.0
2 2 2 4 19A								10.8	1.72	15.9
2 2 3 1 3A								13.8	1.82	14.6
2 2 3 4 20B								11.2	2.08	16.2

harvest 1: 15-06-'92

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

code	Leaf			Stem			Tuber		
	Ntot	Ptot	K	Ntot	Ptot	K	Ntot	Ptot	K
1 1 1 2 24	67.4	4.84	58.5	46.5	3.75	79.5			
1 1 1 3 52	64.5	4.78	58.2	45.8	4.89	82.8			
1 1 3 2 22	67.7	4.62	52.1	50.1	3.57	75.0			
1 1 3 3 83	68.7	4.64	59.2	48.0	3.66	88.8			
1 2 1 2 20	68.0	4.78	49.6	45.2	3.45	66.3			
1 2 1 3 56	59.8	4.05	52.9	40.3	3.36	68.7			
1 2 3 2 16	64.5	3.92	47.5	56.4	2.94	74.4			
1 2 3 3 78	60.7	4.09	46.9	41.5	3.57	60.6			
2 1 1 2 47	69.2	5.76	57.4	51.1	4.42	87.6			
2 1 1 3 51	69.9	5.02	63.9	51.6	5.31	79.5			
2 1 3 2 21	69.1	4.63	54.7	47.5	2.71	78.5			
2 1 3 3 60	71.4	3.99	58.3	42.9	3.98	78.5			
2 2 1 2 19	63.1	4.29	55.9	44.2	2.97	70.3			
2 2 1 3 80	62.7	3.94	54.2	45.2	3.26	72.8			
2 2 3 2 15	62.6	3.80	53.5	40.5	2.82	69.3			
2 2 3 3 53	62.5	4.09	55.0	43.6	3.44	70.9			
3 1 1 2 48	72.8	4.88	70.3	50.1	4.21	71.3			
3 1 1 3 76	71.2	5.81	57.9	53.6	5.27	75.9			
3 1 3 2 46	66.9	4.74	52.8	45.3	3.24	73.3			
3 1 3 3 84	70.7	4.89	56.7	48.0	3.57	76.4			
3 2 1 2 44	64.8	5.00	49.1	45.8	3.59	64.9			
3 2 1 3 55	78.5	5.23	52.5	49.3	3.96	70.8			
3 2 3 2 39	62.6	4.11	48.2	41.9	3.09	63.2			
3 2 3 3 77	68.9	4.94	50.9	48.8	3.98	69.9			
4 1 1 2 23	71.6	5.45	59.7	51.5	3.41	81.7			
4 1 1 3 75	65.7	4.48	55.5	50.9	3.78	76.5			
4 1 3 2 45	67.4	4.48	60.1	49.3	3.14	77.3			
4 1 3 3 59	59.7	4.16	52.3	41.1	2.91	72.2			
4 2 1 2 43	67.4	4.81	56.0	52.5	3.20	75.6			
4 2 1 3 79	62.1	4.37	55.8	45.5	2.87	72.3			
4 2 3 2 40	61.1	4.03	49.2	44.2	2.39	72.1			
4 2 3 3 54	60.3	3.96	49.5	41.7	3.33	61.1			
harvest 2: 06-07-'92									
1 1 1 2 24	50.2	2.63	34.1	45.3	2.30	66.7	17.8	2.07	24.6
1 1 1 3 52	54.9	2.89	37.8	41.6	2.47	74.8	16.4	2.01	23.4
1 1 3 2 22	49.0	2.28	34.8	34.7	1.70	50.4	15.2	1.45	22.3
1 1 3 3 83	52.1	2.57	42.2	42.9	2.09	75.7	15.4	1.46	25.5
1 2 1 2 20	41.5	3.21	38.8	44.0	2.95	77.7	16.5	2.19	29.1
1 2 1 3 56	52.3	3.05	41.9	41.6	2.46	75.5	15.1	1.89	25.1
1 2 3 2 16	48.3	2.47	34.2	38.1	1.94	54.8	15.5	1.40	25.0
1 2 3 3 78	48.3	2.61	38.6	37.4	1.76	60.9	15.3	1.56	22.8
2 1 1 2 47	56.5	3.59	48.1	41.6	3.79	83.0	17.2	2.91	27.2
2 1 1 3 51	55.0	3.54	51.9	39.1	3.51	77.2	15.3	2.58	26.6
2 1 3 2 21	49.8	2.70	41.7	38.1	2.25	66.3	16.1	1.93	24.6
2 1 3 3 60	44.4	3.10	43.8	38.3	2.60	73.2	16.4	1.98	25.7
2 2 1 2 19	50.6	2.85	37.0	35.7	2.42	58.5	15.8	2.12	22.2
2 2 1 3 80	48.5	2.77	34.5	33.9	2.41	54.7	16.2	2.13	22.7
2 2 3 2 15	49.9	2.66	40.8	33.4	2.21	54.4	16.9	2.01	26.1
2 2 3 3 53	53.0	2.87	43.7	42.8	2.56	78.4	19.1	1.88	28.8
3 1 1 2 48	48.7	2.99	44.7	34.8	2.60	68.3	17.9	2.55	24.3
3 1 1 3 76	55.5	2.70	46.6	44.4	2.26	69.6	18.0	2.04	25.6

3	1	3	2	46	49.3	2.42	46.5	37.2	2.15	64.9	19.1	2.02	25.7
3	1	3	3	84	54.5	2.48	47.5	42.8	1.93	73.7	17.6	1.65	24.5
3	2	1	2	44	46.7	2.85	46.6	39.0	2.34	64.0	19.3	2.53	25.6
3	2	1	3	55	45.8	2.39	38.2	35.9	1.94	62.0	17.9	1.89	23.3
3	2	3	2	39	47.4	2.21	42.7	32.7	1.84	51.9	19.8	2.14	26.3
3	2	3	3	77	44.8	2.33	39.6	38.1	2.04	65.5	18.4	2.00	26.2
4	1	1	2	23	49.5	2.43	41.8	36.7	1.93	68.3	16.9	2.26	24.6
4	1	1	3	75	49.7	2.33	41.1	35.3	1.67	62.2	15.5	1.93	22.6
4	1	3	2	45	51.9	2.44	48.1	35.9	1.40	53.9	18.4	1.73	25.3
4	1	3	3	59	51.5	2.36	45.5	38.1	1.67	71.9	16.6	1.67	24.5
4	2	1	2	43	50.8	2.45	41.9	36.7	1.70	63.2	16.3	2.06	23.2
4	2	1	3	79	50.5	2.10	37.9	36.1	1.33	58.0	15.7	1.52	22.9
4	2	3	2	40	49.8	2.39	43.0	40.9	1.92	69.9	17.2	1.65	25.0
4	2	3	3	54	50.2	2.39	45.3	38.2	1.76	68.8	20.0	1.82	26.6
harvest 3: 03-08-'92													
1	1	1	2	24	46.5	2.69	36.7	30.4	1.97	49.8	14.6	1.97	20.7
1	1	1	3	52	53.1	3.16	43.8	27.9	2.13	45.4	13.6	2.28	20.7
1	1	3	2	22	50.8	2.85	35.4	34.3	2.27	47.5	14.5	1.77	20.3
1	1	3	3	83	47.7	2.68	36.5	27.8	2.02	49.0	13.7	1.91	21.2
1	2	1	2	20	50.6	2.49	28.6	30.7	1.46	41.7	12.2	1.67	18.3
1	2	1	3	56	47.4	2.77	32.8	24.5	1.98	31.1	12.4	1.74	15.6
1	2	3	2	16	49.6	2.62	31.7	30.5	1.80	40.4	14.4	1.67	21.3
1	2	3	3	78	50.7	2.72	40.6	31.4	1.79	53.2	15.7	1.90	24.1
2	1	1	2	47	49.1	3.91	50.3	20.4	3.77	53.2	10.6	2.83	21.4
2	1	1	3	51	56.2	3.81	47.5	36.9	4.47	61.2	13.0	2.87	21.8
2	1	3	2	21	54.0	3.28	37.3	26.9	2.77	51.8	13.5	2.24	21.9
2	1	3	3	60	54.3	3.30	34.5	23.1	2.61	38.4	16.1	2.08	19.8
2	2	1	2	19	50.6	2.99	34.2	24.7	2.47	43.2	12.2	2.22	19.9
2	2	1	3	80	48.5	2.70	39.2	24.8	1.94	43.1	12.3	1.82	19.3
2	2	3	2	15	56.6	3.14	35.7	28.1	2.40	41.0	12.5	1.76	19.2
2	2	3	3	53	51.8	2.94	38.3	27.8	2.37	50.4	11.6	1.72	20.5
3	1	1	2	48	48.4	3.14	58.7	24.5	3.27	58.9	17.1	2.99	22.2
3	1	1	3	76	49.0	2.61	49.4	26.4	2.53	34.0	17.6	2.68	22.3
3	1	3	2	46	41.1	2.27	43.1	32.6	1.93	44.4	19.4	2.08	22.6
3	1	3	3	84	44.5	2.09	44.1	33.3	1.66	41.4	17.5	2.02	20.1
3	2	1	2	44	44.3	2.03	43.0	26.3	1.35	38.4	17.2	2.08	20.5
3	2	1	3	55	45.7	2.01	41.9	27.4	1.35	42.9	16.2	1.95	16.6
3	2	3	2	39	37.9	1.88	42.4	32.7	1.50	38.8	19.9	2.13	20.9
3	2	3	3	77	42.8	1.80	43.7	31.0	1.34	47.7	17.8	1.79	21.5
4	1	1	2	23	45.0	2.32	45.7	30.6	1.61	48.2	15.4	2.15	19.7
4	1	1	3	75	43.4	2.31	43.7	26.3	1.39	45.5	15.0	1.84	18.8
4	1	3	2	45	44.9	2.17	40.1	29.3	1.72	42.5	16.2	1.89	21.8
4	1	3	3	59	46.3	2.26	54.3	29.7	1.66	51.3	16.2	2.02	21.5
4	2	1	2	43	49.8	2.28	48.2	31.0	1.35	52.0	14.9	1.76	18.7
4	2	1	3	79	41.5	1.70	48.3	30.6	0.97	51.6	14.3	1.38	18.9
4	2	3	2	40	39.9	1.92	36.6	25.5	1.03	30.5	15.8	1.54	18.3
4	2	3	3	54	46.3	2.17	44.3	30.3	1.24	48.1	18.2	1.85	22.4

harvest 4: 24-08-'92

1	1	1	2	24	34.7	2.16	33.9	22.9	1.50	41.6	15.5	2.27	21.7
1	1	1	3	52	35.7	2.12	32.9	24.1	1.46	27.7	15.3	2.54	20.0
1	1	3	2	22	43.8	2.46	36.6	26.8	2.04	40.1	16.2	2.07	22.4
1	1	3	3	83	39.7	1.82	38.7	24.1	1.36	34.1	15.7	1.92	22.1
1	2	1	2	20	40.2	2.06	31.1	23.2	1.30	30.2	15.7	2.04	19.7
1	2	1	3	56	46.0	2.06	33.3	19.6	1.03	24.4	14.2	1.64	19.0
1	2	3	2	16	36.4	1.76	23.1	22.1	0.98	24.7	15.9	1.73	20.8
1	2	3	3	78	32.2	1.82	33.9	23.0	1.17	25.4	20.5	1.74	20.8
2	1	1	2	47	41.3	2.99	40.0	17.1	2.34	36.1	15.6	2.14	19.6
2	1	1	3	51	42.0	2.54	35.4	22.2	1.84	30.1	11.1	2.41	18.2
2	1	3	2	21	41.4	2.57	24.7	21.0	2.05	30.7	13.2	2.13	20.6
2	1	3	3	60	46.4	2.52	36.3	24.8	2.16	31.3	12.7	2.17	20.0
2	2	1	2	19	43.8	2.49	34.1	22.0	1.62	28.8	13.7	2.01	19.6
2	2	1	3	80	44.4	2.68	37.6	24.5	1.60	37.6	14.6	2.02	19.0
2	2	3	2	15	42.5	2.20	33.7	18.8	1.30	25.5	13.0	1.86	19.6
2	2	3	3	53	44.7	2.27	33.8	23.1	1.78	32.1	12.1	1.71	19.7
3	1	1	2	48	29.6	1.69	40.3	28.5	1.39	43.8	19.0	2.67	21.1
3	1	1	3	76	36.4	1.78	36.0	25.0	1.07	34.1	18.7	2.12	19.8
3	1	3	2	46	25.8	1.41	30.1	23.3	0.97	31.9	19.0	1.75	19.6
3	1	3	3	84	35.5	2.06	25.4	28.6	1.19	46.2	18.4	1.69	19.5
3	2	1	2	44	31.5	1.91	35.5	24.2	1.51	34.8	18.8	2.29	21.3
3	2	1	3	55	32.7	1.34	35.6	16.8	1.02	29.9	18.3	2.00	19.3
3	2	3	2	39	24.8	1.48	27.8	25.2	1.49	35.9	23.2	2.45	22.1
3	2	3	3	77	36.6	1.80	23.9	24.3	1.14	32.1	19.7	1.79	20.8
4	1	1	2	23	32.4	1.87	38.0	21.7	1.13	37.1	17.0	2.27	20.1
4	1	1	3	75	35.2	1.70	43.7	25.4	1.05	32.4	15.2	1.82	18.5
4	1	3	2	45	31.9	1.65	34.0	23.8	1.34	31.5	18.4	2.22	21.8
4	1	3	3	59	40.6	1.90	42.3	26.0	1.45	36.5	17.8	1.92	20.7
4	2	1	2	43	29.3	1.58	34.6	21.6	0.97	34.5	15.5	1.72	19.5
4	2	1	3	79	41.1	2.15	30.7	22.4	0.92	28.0	16.4	1.51	18.7
4	2	3	2	40	28.3	1.55	37.9	23.7	1.02	36.7	17.4	1.71	21.6
4	2	3	3	54	37.0	1.68	40.2	18.2	0.81	31.4	17.3	1.75	20.5

Final harvest: 14-09-'92 (Bintje & Mentor); 21-10-'92 (Darwina & Elles)

Code: Variety, Nematodes, Compaction, block number, plot number

Variety:	Nematodes:	Compaction:
1=Darwina	1=fumigated	1=loose
2=Elles	2=not fumigated	2=moderately compacted
3=Bintje		3=severely compacted
4=Mentor		

code	Tuber Ntot	Tuber Ptot	Tuber K	code	Tuber Ntot	Tuber Ptot	Tuber K
1 1 1 1 5	16.4	2.30	19.7	3 1 1 1 29	18.5	2.48	20.0
1 1 1 2 24	15.0	2.11	19.8	3 1 1 2 48	19.0	2.70	21.6
1 1 1 3 52	14.7	1.99	18.2	3 1 1 3 76	19.4	2.70	19.9
1 1 1 4 63	16.8	2.11	19.0	3 1 1 4 88	17.8	2.58	19.9
1 1 2 1 26	15.7	1.90	18.5	3 1 2 2 13	20.4	2.49	21.0
1 1 2 2 38	15.5	1.98	19.6	3 1 2 1 25	19.4	2.17	20.8
1 1 2 3 49	14.8	1.88	17.6	3 1 2 4 72	26.0	2.54	21.4
1 1 2 4 95	17.4	2.13	21.1	3 1 2 3 73	18.8	1.88	19.6
1 1 3 1 10	15.9	1.90	19.0	3 1 3 1 9	19.6	2.10	21.4
1 1 3 2 22	15.8	2.10	19.5	3 1 3 2 46	20.0	2.32	21.8
1 1 3 4 66	14.8	1.95	19.6	3 1 3 3 84	20.8	2.47	17.7
1 1 3 3 83	17.3	2.10	20.4	3 1 3 4 90	22.7	2.57	21.8
1 2 1 2 20	15.8	1.74	18.8	3 2 1 1 12	18.9	1.93	20.5
1 2 1 1 36	14.3	2.00	19.2	3 2 1 2 44	19.1	2.31	20.6
1 2 1 3 56	15.0	1.57	17.8	3 2 1 3 55	18.7	2.10	19.1
1 2 1 4 67	16.4	1.87	17.9	3 2 1 4 68	19.4	2.38	20.9
1 2 2 1 8	15.0	1.58	18.8	3 2 2 2 17	20.7	2.07	20.4
1 2 2 2 42	15.7	1.69	19.4	3 2 2 1 31	19.4	1.91	20.8
1 2 2 3 81	21.1	1.72	19.4	3 2 2 3 57	20.8	2.28	22.7
1 2 2 4 86	16.2	1.39	18.2	3 2 2 4 62	20.0	2.43	21.9
1 2 3 1 3	17.2	1.86	21.3	3 2 3 1 27	21.3	2.11	21.7
1 2 3 2 16	18.0	1.80	20.5	3 2 3 2 39	21.7	2.32	24.0
1 2 3 3 78	17.0	1.90	22.6	3 2 3 3 77	20.8	2.04	22.4
1 2 3 4 93	16.9	1.84	20.0	3 2 3 4 94	20.9	2.05	21.2
2 1 1 1 6	15.2	2.65	19.9	4 1 1 2 23	17.1	2.29	21.3
2 1 1 2 47	14.8	2.76	20.1	4 1 1 1 30	15.8	2.13	19.4
2 1 1 3 51	15.1	2.42	19.1	4 1 1 4 64	15.1	2.61	20.5
2 1 1 4 87	15.0	2.27	17.4	4 1 1 3 75	16.2	1.85	18.2
2 1 2 1 2	15.4	2.30	19.1	4 1 2 1 1	19.0	2.14	22.0
2 1 2 2 14	16.6	2.31	18.9	4 1 2 2 37	14.8	2.06	19.7
2 1 2 3 74	17.0	2.08	17.5	4 1 2 3 50	15.7	1.91	19.3
2 1 2 4 96	15.2	2.14	17.7	4 1 2 4 71	17.5	2.17	19.9
2 1 3 2 21	15.9	2.34	19.6	4 1 3 1 34	16.1	1.85	20.2
2 1 3 1 33	14.8	2.30	18.1	4 1 3 2 45	18.2	2.23	20.8
2 1 3 3 60	15.0	2.44	19.3	4 1 3 3 59	16.8	2.01	19.1
2 1 3 4 65	14.4	2.32	19.2	4 1 3 4 89	17.7	2.13	20.8
2 2 1 2 19	15.5	2.12	16.3	4 2 1 1 11	16.9	1.64	18.8
2 2 1 1 35	14.4	2.43	18.4	4 2 1 2 43	17.3	1.93	19.7
2 2 1 3 80	15.1	1.95	17.3	4 2 1 3 79	16.3	1.51	18.6
2 2 1 4 91	15.8	1.99	17.9	4 2 1 4 92	15.8	1.53	17.5
2 2 2 1 7	16.3	2.06	18.6	4 2 2 1 32	17.6	1.85	20.9
2 2 2 2 18	15.3	9.55	17.6	4 2 2 2 41	18.0	1.87	20.8
2 2 2 3 58	14.3	2.00	17.9	4 2 2 3 82	16.4	1.57	18.6
2 2 2 4 61	14.6	1.90	16.7	4 2 2 4 85	16.6	1.41	19.2
2 2 3 2 15	14.2	1.95	18.7	4 2 3 1 4	17.7	1.64	18.4
2 2 3 1 28	14.3	2.03	17.0	4 2 3 2 40	17.8	1.82	21.2
2 2 3 3 53	14.8	1.70	17.2	4 2 3 3 54	18.5	2.02	21.2
2 2 3 4 70	16.7	2.17	18.2	4 2 3 4 69	17.5	1.90	20.6