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**YIELD RESPONSE OF
YELLOW YAM
(DIOSCOREA CAYENENSIS)
AFTER DISINFESTING
PLANTING MATERIAL
OF PRATYLENCHUS COFFEAEE**

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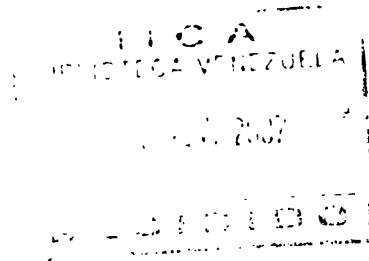
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YIELD RESPONSE OF YELLOW YAM (DIOSCOREA CAYENENSIS)

AFTER DISINFESTING PLANTING MATERIAL OF PRATYLENCHUS COFFEA

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DAVE G. HUTTON
ABDUL H. WAHAB
HOWARD MURRAY

July, 1981

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YIELD RESPONSE OF YELLOW YAM (DIOSCOREA CAYENENSIS)

AFTER DISINFESTING PLANTING MATERIAL OF PRATYLENCHUS COFFEAЕ ^{1/}

Dave G. Hutton, Abdul H. Wahab and Howard Murray ^{2/}

ABSTRACT

Several noxious nematodes are associated with yams (Dioscorea spp) in Jamaica but Pratylenchus coffeae is the only one found infesting yellow yam (D. cayenensis) tubers affected by a dry rot called "burning". The dry rot appears to be associated with injury to stem and root primordia and in cases where the injury is severe germination and plant vigour are seriously impaired.

Plants growing from yellow yam heads disinfested of P. coffeae by dipping for 30 min in a 2000 ppm solution of Oxamyl or for 45 min in water at 45C produced 36% and 23% greater quantitative yields of tubers which showed lower levels of the nematode-related dry rot than tubers borne by plants arising from undisinfested heads. Results suggest that growers should use yellow yam planting material with the least evidence of the dry rot. It is recommended that an agency be established whose immediate responsibility would be to disinfest available yam planting material and eventually be responsible for providing "clean" planting material.

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- ^{1/} Part of studies conducted jointly by the Plant Protection Division, Ministry of Agriculture (MINAG), Jamaica and the Inter-American Institute for Co-operation on Agriculture (IICA), at Allsides, Trelawny on the Project titled "Hillside Farming Development Project".
- ^{2/} Nematologist, Plant Protection Division, MINAG, Agricultural Research Specialist, IICA and Project Agronomist, MINAG, respectively.

P R E F A C E

Yams constitute one of the most important staples in the Jamaican diet. Yields continue to decline so that increased production is largely the result of using increased acreage. One of the main factors responsible for this situation is nematode infestation.

This paper is the first in a series which will be prepared with a view to developing corrective strategies. It provides yet another example of the joint effort between MINAG and IICA/Jamaica in identifying ways and means for redressing some of the problems confronting Jamaican agriculture.

Additionally this paper identifies another example in which simple and relatively low-cost technology can pay high dividends. I congratulate the authors on their presentation and I trust that the inherent implications for further research of an adaptive nature will be pursued and that its main recommendation will be adopted.

Percy Aitken-Soux
Director

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
5800 S. DICKINSON DRIVE
CHICAGO, ILLINOIS 60637
TEL: (773) 835-3100

1. The first part of the document discusses the general principles of the method used in the study. It covers the theoretical background and the experimental setup. The authors describe how the data was collected and the various parameters that were varied during the experiment. They also mention the specific materials used and the conditions under which the measurements were taken.

2. The second part of the document presents the results of the study. The authors show several plots of the data, including the dependence of the measured quantity on the various parameters. They discuss the trends observed in the data and compare them with theoretical predictions. The authors also provide a detailed analysis of the error sources and the uncertainty in the measurements.

3. The third part of the document discusses the implications of the results. The authors explain how the findings of the study contribute to the understanding of the underlying physical processes. They also mention the potential applications of the method and the materials used in the study. The authors conclude by summarizing the main findings and providing a perspective on future research in this area.

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INTRODUCTION

Yams (Dioscorea spp) have traditionally constituted the staple root crop in the Jamaican diet. The yellow yam (D. cayenensis) is the most popular variety and in 1978 constituted 33% of total yam production of 164,500 tons. Between 1970 and 1979, average tuber yield of yellow yam ranged from 10.8 to 12.8 tons/ha which is considerably below the yield potential of this cultivar.

In Jamaica, several parasitic nematodes are associated with yam plants in the field (5,6). Pratylenchus coffeae, Scutellonema bradys and Hoplolaimus sp. are involved in the etiology of a dry rot of yam tubers (2,3,4,7,8,10). P. coffeae, considered to be the most noxious of the nematodes affecting yams (7,8), is the only nematode found infesting yellow yam tubers which are affected by the dry rot, called "burning" in Jamaica. This condition is characterised by cracking in the skin underlaid by a brown, corky rot in the storage tissues (3,10). This rot progresses deeper into the yam tissues following harvest and prior to planting or consumption and is generally more pronounced towards the stem end of yam tubers. When a yellow yam tuber is harvested, the stem end ("head") is cut off and retained for planting and the remainder consumed. On heavily "burnt" heads, stem primordia appear to be damaged or destroyed by the dry rot resulting in such heads not sprouting or vines growing from them being less thrifty than those from less affected heads. The term "less affected" is used as a yellow yam tuber which was not infested by P. coffeae and affected to some extent by the dry rot has never been observed by the senior author.

When yam tubers affected by the dry rot were disinfested in previous investigations, populations of the invading nematode were reduced and development of the dry rot suppressed. There was a high incidence of sprouting and vines were more vigorous than those from untreated yams (2,3,4,6,7,8).

This trial was conducted to investigate qualitative and quantitative yield response after disinfesting yellow yam planting material of Pratylenchus coffeae.

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MATERIALS AND METHODS

This trial was carried out at the Allsides Pilot Development Project (1,9,11,12,13), on recently-terraced plots which had been cropped for two successive years to yellow yam. Recently-harvested yellow yam planting material showing distinct symptoms of the nematode-related dry rot was used. Examination of random samples from the selected heads showed them to be infested with P. coffeae (avg. 400/10 gm peeling). The following treatments were used:

1. No treatment (control)
2. Heads dipped for 45 min in water at 45C
3. Heads dipped for 30 min in a 2000 ppm solution of Oxamyl (Methyl N'N'-dimethyl-N-(methylcarbamoyl)oxy)-1-thiooxamidate).

Six days after being dipped, the heads were planted, 12 per plot, 0.67m apart into two continuous mounds 1.5m apart giving a plant density of 10,000/ha. The three treatments were replicated three times in a randomised complete block design. The soil, an Ultisol classified locally as Wire Fence Clay Loam, Map No. 32, is highly acidic (pH 4.9) and levels of available N, P and K are medium, low and very low respectively.

Cultural practices were those normally followed at Allsides. Weeds were controlled manually. Plants were supplied with a mixture of 200, 300 and 150 kg/ha of N, P₂O₅ and K₂O respectively divided equally at planting and at 16 and 25 weeks thereafter.

Forty weeks after planting, counts were made of P. coffeae in soil from each plot. At 43 weeks when the plots were harvested, every tuber was rated for the nematode-related dry rot on a 1 - 5 scale where 1 = 1-20%, 2 = 21-40%, 3 = 41-60%, 4 = 61-80% and 5 = 81-100% of the tuber's surface having the dry rot. The weights of heads (the top portion of the harvested tuber which is retained for planting) and table yams (the rest of the tuber) were taken separately. Counts were made of P. coffeae in the skin of harvested tubers.

1788. The first of these was the *Journal of the Proceedings of the Society for Promoting the Abolition of the Slave Trade*, published in 1788. This was a collection of letters and reports from members of the Society, which had been founded in 1787. The letters were written by prominent abolitionists such as Thomas Clarkson, William Dobbins, and Thomas Sturge. The reports described the activities of the Society, including the collection of signatures, the publication of tracts, and the organization of public meetings. The *Journal* was a valuable source of information about the early abolitionist movement in Britain.

1789. The second of the early abolitionist texts was the *Observations on the Effects of the Trade in Negroes, and on the Propriety of Abolishing It*, published in 1789. This was a pamphlet written by Thomas Clarkson, one of the leading abolitionists of the time. It was a detailed and persuasive argument for the abolition of the slave trade, based on moral, economic, and humanitarian grounds. Clarkson argued that the slave trade was not only morally repugnant but also economically detrimental to Britain. He claimed that the trade in slaves was a source of national shame and that it was in the best interests of Britain to abolish it. The pamphlet was widely read and played a significant role in the abolitionist cause.

1790. The third of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association*, published in 1790. This was a report written by the Committee of the Society, which was responsible for the Society's day-to-day operations. The report described the activities of the African Association, which had been founded in 1789. The African Association was a group of abolitionists who were active in the West Indies and who were working to abolish the slave trade in that region. The report was a detailed account of the Association's activities and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

1791. The fourth of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association, and on the Petition of the African Association*, published in 1791. This was another report written by the Committee of the Society, and it was similar to the one published in 1790. It described the activities of the African Association and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

1792. The fifth of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association, and on the Petition of the African Association*, published in 1792. This was a third report written by the Committee of the Society, and it was similar to the ones published in 1790 and 1791. It described the activities of the African Association and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

1793. The sixth of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association, and on the Petition of the African Association*, published in 1793. This was a fourth report written by the Committee of the Society, and it was similar to the ones published in 1790, 1791, and 1792. It described the activities of the African Association and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

1794. The seventh of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association, and on the Petition of the African Association*, published in 1794. This was a fifth report written by the Committee of the Society, and it was similar to the ones published in 1790, 1791, 1792, and 1793. It described the activities of the African Association and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

1795. The eighth of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association, and on the Petition of the African Association*, published in 1795. This was a sixth report written by the Committee of the Society, and it was similar to the ones published in 1790, 1791, 1792, 1793, and 1794. It described the activities of the African Association and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

1796. The ninth of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association, and on the Petition of the African Association*, published in 1796. This was a seventh report written by the Committee of the Society, and it was similar to the ones published in 1790, 1791, 1792, 1793, 1794, and 1795. It described the activities of the African Association and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

1797. The tenth of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association, and on the Petition of the African Association*, published in 1797. This was an eighth report written by the Committee of the Society, and it was similar to the ones published in 1790, 1791, 1792, 1793, 1794, 1795, and 1796. It described the activities of the African Association and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

1798. The eleventh of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association, and on the Petition of the African Association*, published in 1798. This was a ninth report written by the Committee of the Society, and it was similar to the ones published in 1790, 1791, 1792, 1793, 1794, 1795, 1796, and 1797. It described the activities of the African Association and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

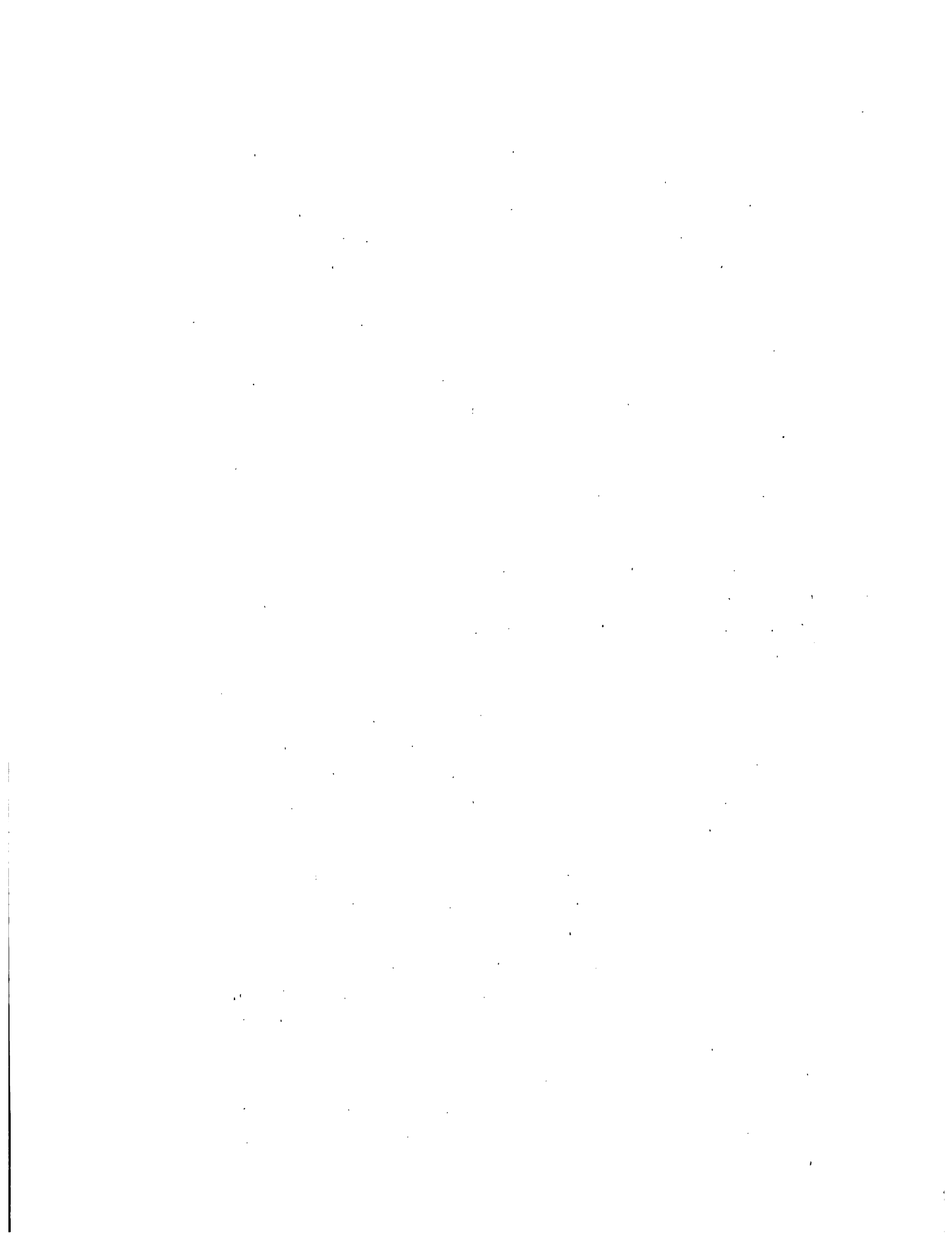
1799. The twelfth of the early abolitionist texts was the *Report of the Committee of the Society for Promoting the Abolition of the Slave Trade, on the Petition of the African Association, and on the Petition of the African Association*, published in 1799. This was a tenth report written by the Committee of the Society, and it was similar to the ones published in 1790, 1791, 1792, 1793, 1794, 1795, 1796, 1797, and 1798. It described the activities of the African Association and its achievements. It was a valuable source of information about the abolitionist movement in the West Indies.

RESULTS AND DISCUSSION

There was 100% germination of heads and every plant produced a tuber. Presented in Table 1 are the tuber yields and levels of dry rot for the different treatments. Tubers borne by plants growing from heads disinfested by Oxamyl or hot water showed lower levels of the nematode-related dry rot than tubers borne by plants from untreated heads. Plants from disinfested heads produced greater quantitative yields of heads and significantly greater weights of table yams than those from untreated heads. Overall, plants from disinfested heads bore significantly greater weights of tubers than plants from undisinfested heads. Substantially higher numbers of P. coffeae were found in the skin of tubers borne by plants arising from untreated heads but three weeks before harvest, there was no difference between treatments in the numbers of this nematode in the soil from plots (Table 2).

Results from this trial confirm previous findings that disinfesting yellow yam planting material of P. coffeae, the most noxious of the nematodes affecting Dioscorea spp, will result in significantly increased tuber yields (7,8). Disinfesting heads with hot water or Oxamyl resulted in increased quantitative yields of 23% and 36% respectively. Disinfesting yam heads can be costly (estimated at over \$100 per ton for Oxamyl treatment of yellow yam heads) but the high initial expenditure is easily recovered from the increased yields (estimated to result in revenue exceeding \$600 from each ton of planted yellow yam heads).

Tubers borne by plants arising from disinfested heads showed less of the nematode-related dry rot than those from plants growing from untreated heads. It has been observed in an on-going trial that plants growing from yellow yam heads with low levels of the P. coffeae-related dry rot sprouted earlier and are more vigorous than plants growing from heavily dry rotted heads. It appears that levels of P. coffeae infestation and dry rotting of yellow yam heads have a direct bearing on the performance of plants arising from such heads. Any treatment that will reduce populations of an invading nematode and levels of the dry rotting of yam planting material should therefore be beneficial.



RECOMMENDATIONS

It is recommended that growers should use yellow yam planting material with the least evidence of the dry rot. However, in Jamaica, yams are always infested with noxious nematodes and those involved in the dry rot, especially P. coffeae, are ubiquitous. In any event, good yam planting material is generally unavailable and costly and growers are generally forced to plant what they have or can obtain. Given this situation, it would be beneficial to the yam industry if an agency were established to see to the disinfestation of available planting material in the first instance and eventually be responsible for providing "clean" planting material. In this context, it is hoped that the Ministry of Agriculture would take the necessary steps which would assure increased production of this staple food crop.



Table 1. Quantitative and qualitative yields of yellow yam (*Dioscorea cayenensis*) tubers harvested 43 weeks after planting *Pratylenchus coffeae*-infested planting pieces (heads) or infested heads disinfested by hot water or nematicide dips.

Treatment	Levels of dry rot on tubers ^a	Wt. of table yams harvested from 36 plants (kg)	Wt. of heads harvested from 36 plants (kg)	Total wt. of tubers harvested from 36 plants (kg)	Wt. of yams harvested per kg planted (kg)	Calculated gross yields (tons/ha)
Untreated heads	2.6	58.0	46.8	104.8	3.82	29.1
Hot water-dipped heads	2.2	75.1	54.6	129.7	4.95	36.0
Oxamyl-dipped ² heads	2.0	91.1	51.7	142.8	5.05	39.7
LSD 5%	-	2.8	-	5.2	-	-

¹ Heads dipped for 45 min. in water at 45C.

² Heads dipped for 30 min. in a 2000 ppm solution of Oxamyl.

^a Tubers rated for the nematode-related dry rot on a 1 - 5 scale where 1 = 1-20%, 2 = 21-40%, 3 = 41-60%, 4 = 61-80% and 5 = 81-100% of the tuber's surface having the dry rot.



Table 2. Numbers of Pratylenchus coffeae in soil and in the skin (peeling) of yellow yam (Dioscorea cayenensis) tubers harvested from plots in which nematode-infested planting pieces (heads) or infested heads disinfested by hot water or nematicide dips were planted.

Treatment	No. <u>P. coffeae</u> / 100 cc soil at 40 weeks	No. <u>P. coffeae</u> / 10 gm tuber skin at harvest (43 weeks)
Untreated heads	27	48
Hot water-dipped ¹ heads	29	2
Oxamyl-dipped ² heads	13	5

¹Heads dipped for 45 min. in water at 45C.

²Heads dipped for 30 min. in a 2000 ppm solution of Oxamyl.

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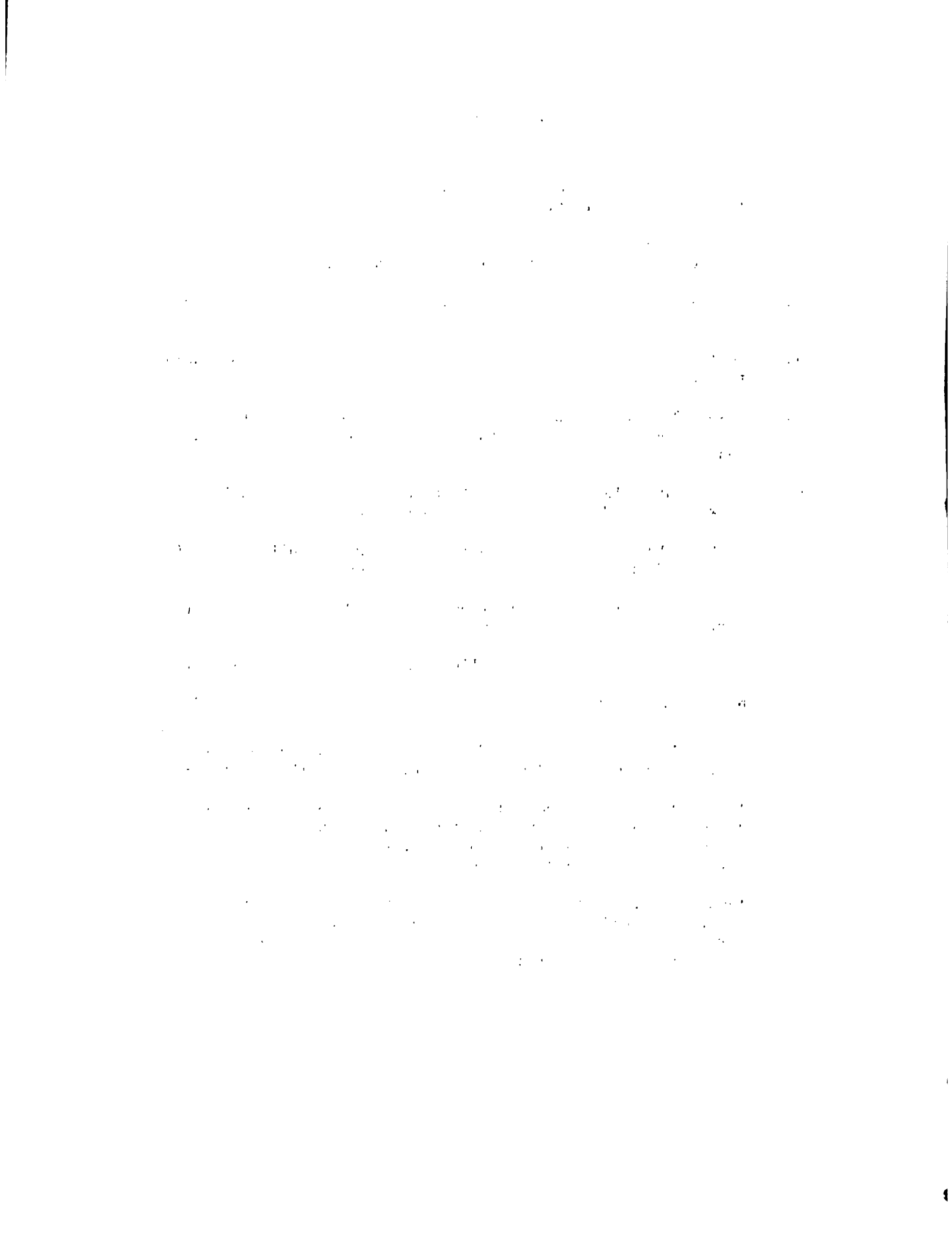
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3. The third part of the document addresses the issue of reconciling accounts. It explains how to compare the company's records with bank statements and other external sources to identify and resolve any discrepancies.

4. The fourth part of the document discusses the importance of regular audits. It highlights that audits are essential for verifying the accuracy of the financial records and for detecting any potential errors or fraud.

5. The fifth part of the document provides a summary of the key points discussed and offers some final thoughts on the importance of maintaining high standards of financial record-keeping.

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2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection procedures and the use of advanced analytical techniques to derive meaningful insights from the data.

3. The third part of the document focuses on the role of technology in data management and analysis. It discusses how modern software solutions can streamline data collection, storage, and processing, thereby improving efficiency and accuracy.

4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that the data remains reliable and secure throughout its lifecycle.

5. The fifth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of a data-driven approach in decision-making and the need for continuous monitoring and improvement of data management practices.

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- No. IV - 16 Abdul H. Wahab, Percy Aitken-Soux, Irving E. Johnson and Howard Murray, "The Allsides Project in Jamaica - Developmental Potentials of Hillside Agriculture", September 1980.
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- No. IV - 18 P. Aitken, I. E. Johnson, A. Wahab, "Assessment of Employment Among Small Hillside Farmers of Jamaica", November 1980.
- No. IV - 19 IICA/Jamaica "Pilot Hillside Agricultural Project", (PHILAGRIP), Final Project Document. October 1980.
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- No. V - 1 N. Munguia, P. Aitken, A. Wahab, I. Johnson, "Smoke Curing of Fish (as a household Industry in Rural Jamaica)", January 1981.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to support informed decision-making.

3. The third part of the document focuses on the role of technology in modern data management. It discusses how advanced software solutions can streamline data collection, storage, and analysis, leading to more efficient and accurate results.

4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that data is used responsibly and ethically.

5. The fifth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of ongoing monitoring and evaluation to ensure that data management practices remain effective and up-to-date.

- No. V - 2 P. Aitken, A. Wahab and I. Johnson, "Under-employment - It's Relation to the Agricultural Sector and Considerations for its Management", January 1981
- No. V - 3 D. D. Henry, J. R. Gayle, "The Culture of Grafted Pimento (as spice crop for Allsides, Jamaica)", January 1981
- No. V - 4 Abdul H. Wahab, Noel Singh, "Agricultural Research in Jamaica", February 1981
- ✓ No. V - 5 P. Aitken-Soux, A. H. Wahab, I. E. Johnson, "Country Level Action Plan (CLAP)", May 1981
- ✓ No. V - 6 P. Aitken-Soux, A. H. Wahab, I. E. Johnson, "Overview of Agricultural Development in Jamaica", May 1981
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- ✓ No. V - 9 Dave Hutton, Abdul Wahab, Howard Murray, "Yield Response of Yellow Yam (Dioscorea Cayenensis) After Disinfecting Planting Material of Pratylenchus Coffeae", July 1981

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YIELD RESPONSE OF
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