International Journal of Plant & Soil Science

Volume 38, Issue 9, Page 434-443, 2026; Article no.IJPSS.165507
ISSN: 2320-7035

Occurrence of Dry Rot and Associated Plant-Parasitic Nematodes in Early-harvested Yam Tubers

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Authors' contributions

This work was carried out in collaboration among all authors. Author YYFRK designed the study, performed the statistical analysis, and wrote the manuscript. Authors YYFRK, DCKB and GJNB sampled tubers. Author HAD reviewed the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/ijpss/2026/v38i96305

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://pr.sdiarticle5.com/review-history/165507

Original Research Article

Received: 04/06/2026
Accepted: 01/09/2026
Published: 05/09/2026

Abstract

Dry rot is a major constraint on the quality and commercial value of yam tubers in Côte d'Ivoire. This study assessed the occurrence and severity of dry rot and characterized the plant-parasitic nematodes associated with early-harvested yam tubers marketed in the country. A total of 1740 tubers representing five cultivars of the *Dioscorea cayenensis-rotundata* complex were examined across three agroecological zones. Dry rot prevalence and severity index were assessed, while nematodes were extracted from tuber peel, morphologically identified, and quantified. Dry rot occurred in tubers from all three zones. Tubers from the tropical dry savannah zone had the highest prevalence (31.20%), whereas the semi-deciduous dense forest zone had the lowest prevalence (9.10%). Among cultivars, Assawa had the highest dry rot prevalence (36.40%) and severity index (35.00%), while Krenglè had the lowest values. Three plant-parasitic nematode taxa were detected: *Scutellonema bradys*, *Pratylenchus coffeae*, and *Meloidogyne* sp. *Scutellonema bradys* was dominant, accounting for 99.87% of recovered nematodes. Its density was strongly and positively correlated with dry rot severity ($r = 0.98$; $P < 0.001$). These findings indicate marked variation in dry rot and *S. bradys* density among tuber origins and cultivars and provide a basis for further evaluation of cultivar responses, nematode population diversity, and integrated management strategies.

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***Cite as:** Kouakou, Y. Y. F. R., Bi, D. C. K., Beugré, G. J. N., & Diallo, H. A. (2026). Occurrence of Dry Rot and Associated Plant-Parasitic Nematodes in Early-harvested Yam Tubers. International Journal of Plant & Soil Science, 38(9), 434–443. https://doi.org/10.9734/ijpss/2026/v38i96305*

Keywords: Dry rot; early-harvested yam tubers; Dioscorea cayenensis-rotundata complex; plant-parasitic nematodes; disease prevalence; severity index

1. Introduction

Yams are among the world's major root and tuber crops. They are economically important crops in West Africa (Asem *et al*., 2024). Yam production, processing, and marketing employ thousands of people (Ansah *et al.,* 2023; Asem *et al*., 2024). Yams are the primary staple crop in Côte d'Ivoire based on production volume (A. M. Kouakou *et al*., 2023), with an estimated 7.66 million tons of tubers produced in 2024 (FAOSTAT, 2024). Yam production is primarily concentrated in the central and northern regions of Côte d'Ivoire, specifically above the 8th parallel north (Doumbia *et al*., 2014; A. M. Kouakou *et al*., 2019). Six major yam-producing basins exist within the country (Doumbia *et al*., 2006). The Bouna-Bondoukou basin is distinctive because it is the main production area for early-harvested yam tubers, whereas the other basins produce both early-harvested and late-harvested yams.

The two major yam species cultivated in Côte d'Ivoire are *D. alata* and the *D. cayenensis-rotundata* complex (A. M. Kouakou *et al*., 2023). The *D. cayenensis-rotundata* complex has two subgroups: the one-harvest and the two-harvest subgroups (Doumbia *et al*., 2006). In the two-harvest subgroup, tubers from the first harvest are called early-harvested yams and are available in markets mainly from July to December. Yam production has progressively shifted from subsistence to commercial production in response to increasing urban demand (Kassi-Djodjo *et al*., 2017). Among commercial cultivars, Kponan is particularly important in the District of Abidjan (K. P. Kouakou *et al*., 2019; Kouadio *et al*., 2025). Improved transport networks have facilitated the movement of yam tubers from production areas to urban markets.

Despite their economic importance, yam tubers are affected by plant-parasitic nematodes associated with dry rot. Yam tubers sold in Côte d'Ivoire often exhibit symptoms of nematode-associated dry rot, which reduces tuber quality, edible portions, and commercial value (Coyne & Affokpon, 2018). Affected portions are often removed before sale. This practice results in additional economic losses for traders and consumers. Previous studies in Côte d'Ivoire have documented the occurrence, morphological diversity, and pathogenicity of *Scutellonema bradys* populations associated with yam dry rot (Y. Y. F. R. Kouakou *et al*., 2021; Y. Y. F. R. Kouakou *et al*., 2025).

In addition, plant-parasitic nematodes have been associated with lesions in yam tissues and tubers in both experimental and field studies, including *S. bradys* in yam tubers (Yusuf & Claudius-Cole, 2018; Olaifa & Adekunle, 2021). Recent studies report *S. bradys* as a significant factor in initiating dry rot in yams. Variations in response to nematode infection have been recorded among different yam genotypes (Tariq *et al*., 2024; Kolombia *et al*., 2024). Field studies conducted in West Africa have confirmed that plant-parasitic nematodes affect yam tuber quality and storability (Nyaku *et al.,* 2026). Generally, these reports emphasize the need to consider the effect of nematode infestation on factors associated with tuber deterioration and consequent post-harvest losses.

However, information remains limited on the sanitary status of early-harvested yam tubers at the marketing stage, particularly across production origins and cultivars. Information is also limited on the relationship between *S. bradys* density and dry rot severity. This information is important because early-harvested tubers from different production areas and cultivars enter urban markets during the same marketing period. These tubers may differ in their susceptibility to dry rot and levels of nematode infestation.

This study aimed to evaluate the occurrence and severity of dry rot in marketed early-harvested yam tubers and to identify the plant-parasitic nematodes associated with the disease. Specifically, the study (i) assessed the occurrence and severity of dry rot by agroecological zone of origin and yam cultivar, (ii) quantified the associated nematode populations, and (iii) established the relationship between nematode density and dry rot severity.

2. Material and Methods

2.1 Sampling Areas

Yam tubers were sampled from major markets in Abidjan (southern Côte d'Ivoire) and Bouaké (central Côte d'Ivoire). Three markets (the Gouro market, the Abobo market, and the Siporex market) were selected in Abidjan, and one market (the wholesale market) was selected in Bouaké. A total of four markets were selected. These markets were selected because they receive direct tuber supplies from yam-producing areas. Within each market, three warehouses storing yam tubers were selected, for a total of 12 warehouses surveyed.

2.2 Tuber Sampling

Yam tubers were sampled during the main yam marketing period, from July to December, in 2023 and 2024. Tubers (symptomatic and asymptomatic) were sampled to investigate the relationship between nematodes and dry rot. Thirty tubers, with or without dry rot symptoms, were randomly sampled for each available cultivar within each warehouse. Because cultivar availability varied among warehouses, not all cultivars were represented in every warehouse, resulting in unequal numbers of cultivar-warehouse combinations among sampling sites. A total of 1740 tubers were sampled during the two-year study period. Traders were consulted to identify the cultivar and origin of each tuber.

2.3 Dry Rot Assessment

Dry rot was assessed using prevalence and severity index parameters. Thirty tubers were sampled per cultivar per warehouse and visually inspected for external dry rot. When symptoms were not externally visible, tubers were sliced with a knife to reveal and identify internal dry rot lesions. Dry rot prevalence was determined among the 30 tubers randomly selected for each cultivar per warehouse using the formula of Tenny and Hoffman (2023). Dry rot severity was rated using a 0-4 scale adapted from Plowright and Kwoseh (2000), where 0 = 0% of the surface affected (no dry rot); 1 = 1-25% affected (slight); 2 = 26-50% affected (moderate); 3 = 51-75% affected (severe); and 4 = 76-100% affected (highly severe). Subsequently, the severity index (SI) of dry rot was calculated following Zewain (2014).

2.4 Nematode Extraction and Identification

2.4.1 Nematode Extraction

Tuber samples of the same production origin, cultivar, and dry rot severity class were grouped for nematode analysis. All tubers of each group were peeled with a knife and sliced into pieces. The peels of each group were pooled into a composite sample. For nematode extraction, 5 × 5 g peel subsamples were taken from each composite sample. Nematodes were obtained from the peel using the maceration method (Coyne *et al*., 2007). Nematodes from each peel subsample were suspended in 100 mL of water.

2.4.2 Nematode Identification

Three 5 mL samples of each nematode suspension were placed on a counting plate and examined under a microscope at 10× and 40× magnification. Nematodes were identified to species level when possible and to genus level otherwise, based on morphological characteristics and identification keys (Fortuner, 1991; Hunt *et al*., 2018). Molecular confirmation of nematode identity was not performed in the present study.

2.5 Nematode Quantification

2.5.1 Nematode Density

Individuals of each nematode taxon were counted. The mean density of each nematode taxon per peel subsample was calculated following Y. Y. F. R. Kouakou *et al*. (2020a).

2.5.2 Nematode Abundance

The relative abundance of each nematode taxon was determined as:

$$\mathrm{RA}\ (\%) = \left(\frac{1}{\mathrm{n}}\right)\sum\left(\frac{\mathrm{Di}}{\mathrm{TD}} \times 100\right)$$

RA (%): relative abundance of taxon i; Di: density of taxon i; TD: total density of all taxa; n: number of replicates

A taxon was considered very abundant if RA ≥ 50%, abundant if 25% ≤ RA < 50%, fairly abundant if 10% ≤ RA < 25%, and rare if RA < 10%.

2.6 Data Analysis

Data were assessed for normality and homogeneity of variance, and appropriate transformations were applied when necessary. Differences among tuber origins and cultivars were assessed using analysis of variance (ANOVA), followed by Fisher's least significant difference (LSD) test at $P < 0.05$. Year was initially included as a factor; because no significant year effect was detected ($P > 0.05$), data from the two years were pooled for subsequent analyses. Pearson's correlation analysis was used to assess the relationship between nematode density and dry rot severity. Statistical significance was set at the 5% level, using RStudio 4.3.2.

3. Results

3.1 Sampling Distribution

A total of 1740 early-harvested tubers were sampled in this study, of which 67.5% were obtained from markets in Abidjan and 32.5% from those in Bouaké.

The sampled tubers originated from three agroecological zones of Côte d'Ivoire: the forest–savannah transition zone in the north-central region, the semi-deciduous dense forest zone in the central region, and the tropical dry savannah zone in the north-east. The largest proportion of tubers (47.5%) came from the tropical dry savannah zone, followed by the forest–savannah transition zone (32.5%) and the semi-deciduous dense forest zone (20%).

The tubers belonged to five cultivars of the *D. cayenensis-rotundata* complex: Kponan, Assawa, Kpassadjo, Lokpa, and Krenglè. Assawa, Kponan, and Krenglè each accounted for 30% of the sampled tubers. However, Lokpa and Kpassadjo represented 7.5% and 2.5%, respectively.

3.2 Occurrence and Severity Index of Dry Rot

3.2.1 Dry Rot Symptoms

Marketed yam tubers showed several symptoms (Fig. 1). Some showed no obvious external or internal signs (Fig. 1a). However, others appeared healthy externally but had slight cracks in the epidermis at the apical end. Peeling these tubers revealed yellow or brown lesions beneath the epidermis (Fig. 1b). Some had a scaled epidermis, exposing the cortex. Peeling these tubers revealed continuous brown lesions beneath the surface, approximately 5 mm thick (Fig. 1c). These symptoms were consistent with nematode-associated dry rot.

Fig. 1. Symptoms of dry rot in marketed yam tubers in Côte d'Ivoire

a. Healthy tuber; b. Tuber showing slight dry rot symptoms; c. Tuber showing advanced dry rot symptoms; Scale bar = 10 cm

3.2.2 Dry Rot Based on Tuber Origin

Dry rot prevalence ranged from 9.10% to 31.20%, and the severity index ranged from 15.74% to 26.85%, depending on tuber origin (Table 1). Tuber origin had a significant effect on dry rot prevalence and severity index ($P < 0.05$). The highest prevalence (31.20%) of dry rot was recorded in tubers from the tropical dry savannah zone. The highest severity index (26.85%) was recorded in tubers from the forest–savannah transition zone, while tubers from the tropical dry savannah zone had a similar value (26.67%). However, the lowest prevalence (9.10%) and severity index (15.74%) of dry rot were recorded in tubers from the semi-deciduous dense forest zone.

Table 1. Dry rot prevalence and severity index according to yam tuber origin

Tuber origin	Prevalence (%)	Severity index (%)
Semi-deciduous dense forest zone	9.10 ± 3.15**b**	15.74 ± 2.54**b**
Forest–savannah transition zone	14.13 ± 3.84**b**	26.85 ± 2.94**a**
Tropical dry savannah zone	31.20 ± 5.66**a**	26.67 ± 3.95**a**
P-value	0.022	0.011

Values with the same letter within a column are not significantly different according to Fisher's LSD test at P < 0.05

3.2.3 Dry Rot Based on Yam Cultivar

Dry rot prevalence ranged from 5.17% to 36.40%, whereas the severity index ranged from 12.50% to 35.00% (Table 2). Significant differences were observed among yam cultivars in dry rot prevalence and severity index ($P < 0.001$). Dry rot was more prevalent (36.40%) and more severe (35.00%) in Assawa tubers than in those of the other cultivars. However, dry rot was least prevalent (5.17%) and least severe (12.50%) in Krenglè tubers.

Table 2. Dry rot prevalence and severity index according to yam cultivar

Yam cultivar	Prevalence (%)	Severity index (%)
Kponan	12.00 ± 3.12**b**	20.83 ± 3.48**b**
Assawa	36.40 ± 6.41**a**	35.00 ± 3.88**a**
Krenglè	5.17 ± 2.48**c**	12.50 ± 2.62**c**
Lokpa	11.67 ± 3.89**b**	22.22 ± 3.60**b**
Kpassadjo	11.15 ± 1.74**b**	19.28 ± 3.22**b**
P-value	< 0.001	< 0.001

Values with the same letter within a column are not significantly different according to Fisher's LSD test at P < 0.05

3.3 Plant-parasitic Nematodes Associated with Tubers

3.3.1 Identified Nematodes

Three taxa of plant-parasitic nematodes were associated with dry rot in early-harvested yam tubers. These included *Scutellonema bradys*, *Pratylenchus coffeae*, and *Meloidogyne* sp. (Fig. 2). Both male and female individuals of *S. bradys* were observed in the nematode suspensions (Fig. 2a-b). Only females of *P. coffeae* were observed (Fig. 2c). However, individuals of *Meloidogyne* sp. consisted of second-stage juveniles (Fig. 2d).

Fig. 2. Plant-parasitic nematodes associated with dry rot in marketed yam tubers in Côte d'Ivoire
(a). Scutellonema bradys female; (b) S. bradys male; (c) Pratylenchus coffeae female; (d) Meloidogyne sp. second-stage juvenile; Scale bar = 150µm

3.3.2 Relative Abundance and Density of Nematodes

Relative abundance ranged from 0.01% to 99.87% among nematode taxa (Table 3). *Scutellonema bradys* accounted for more than 99% of the nematodes recovered from tuber peel across all three agroecological zones, whereas *P. coffeae* and *Meloidogyne* sp. each accounted for less than 1%.

Nematode densities ranged from 2 to 2265 individuals per 5 g of yam peel (Table 3). *Scutellonema bradys* was overwhelmingly predominant in the nematode populations recovered from tuber peel, reaching a density of 2265 individuals per 5 g of tuber peel. Therefore, *S. bradys* was identified as the main nematode associated with dry rot in early-harvested yam tubers marketed in Côte d'Ivoire.

Table 3. Relative abundance and density of plant-parasitic nematodes associated with dry rot in marketed yam tubers

Nematode taxon	Relative abundance (%)	Density (individuals/5 g tuber peel)
Scutellonema bradys	99.87	2265
Meloidogyne sp.	0.12	6
Pratylenchus coffeae	0.01	2

3.4 Variation in *Scutellonema bradys* Density

3.4.1 Density based on Tuber Origin

The density of *S. bradys* ranged from 1780 to 2795 individuals, depending on tuber origin (Table 4). Significant differences were observed in *S. bradys* density among tuber origins (P < 0.001). Tubers originating from the forest–savannah transition zone had the highest mean density of *S. bradys* (2795 individuals), while tubers from the tropical dry savannah zone had a statistically comparable density (2474 individuals).

Table 4. Density of *Scutellonema bradys* associated with dry rot according to yam tuber origin

Tuber origin	Density (individuals/5 g tuber peel)
Semi-deciduous dense forest zone	1780 ± 212**b**
Forest–savannah transition zone	2795 ± 470**a**
Tropical dry savannah zone	2474 ± 142**a**
P-value	< 0.001

Values with the same letter are not significantly different according to Fisher's LSD test at P < 0.05

3.4.2 Density based on Yam Cultivar

The density of *S. bradys* ranged from 586 to 4123 across yam cultivars (Table 5). There was a significant difference in *S. bradys* density among yam cultivars (P < 0.001). Assawa tubers had the highest density, with 4123 individuals. By contrast, Krenglè tubers, with 586 individuals, had the lowest density.

3.5 Relationship between *Scutellonema bradys* Density and Dry Rot Severity

3.5.1 Scatterplot

There was a strong positive linear relationship between the density of *S. bradys* and the severity index (SI) of dry rot in yam tubers (Fig. 3). The correlation coefficient was very strong (r = 0.98; P < 0.001), indicating that dry rot severity increased with *S. bradys* density. The fitted regression equation (SI = 0.0075X + 5.1095) indicated that an increase of 100 *S. bradys* individuals per 5 g of tuber peel was associated with a 0.75 percentage-point increase in dry rot severity.

Table 5. Density of *Scutellonema bradys* associated with dry rot according to yam cultivar

Yam cultivar	Density (individuals/5 g tuber peel)
Assawa	4123 ± 306**a**
Kponan	1572 ± 89**c**
Lokpa	2781 ± 622**b**
Kpassadjo	1382 ± 142**c**
Krenglè	586 ± 53**d**
P-value	< 0.001

Values with the same letter are not significantly different according to Fisher's LSD test at P < 0.05

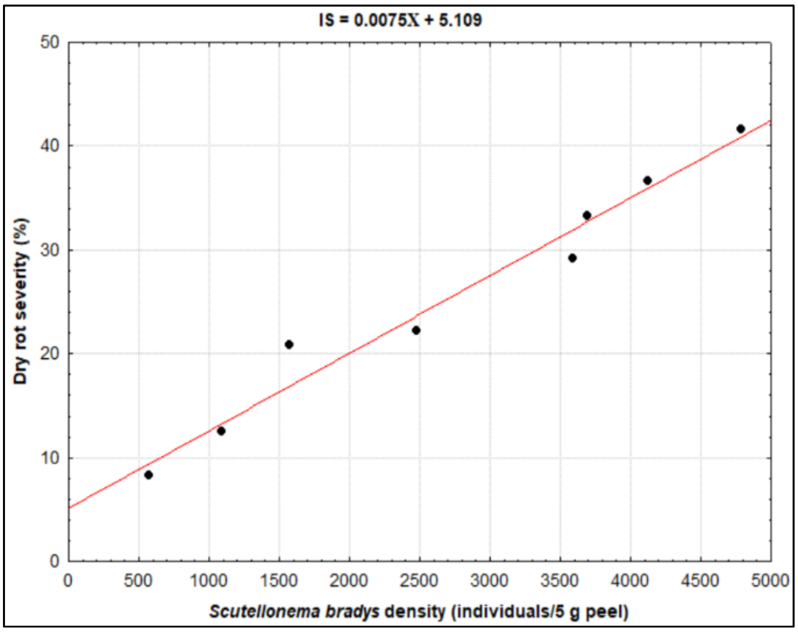

Fig. 3. Scatterplot of the relationship between *Scutellonema bradys* density and dry rot severity index in yam tubers
Each point represents an observation, and the solid line represents the fitted linear regression (SI = 0.0075X + 5.10), where SI is the severity index (%) and X is S. bradys density (individuals/5 g of tuber peel)

3.5.2 Correlation

Different correlation coefficients were obtained between nematode density and dry rot severity (Table 6). There was a strong positive correlation between *S. bradys* density and dry rot severity (r = 0.98; P < 0.001). This result suggests that dry rot severity increased significantly as *S. bradys* density increased. Conversely, weak, non-significant correlations were found between dry rot severity and the populations of *P. coffeae* (r = 0.23; P > 0.05) and *Meloidogyne* sp. (r = 0.17; P > 0.05). There were no significant correlations among the densities of the three nematode taxa.

Table 6. Pearson correlation coefficients between dry rot severity and nematode density

Variables	Dry rot severity	*S. bradys*	*P. coffeae*	*Meloidogyne* sp.
Dry rot severity	1.00	0.98***	0.23ns	0.17ns
S. bradys		1.00	-0.17ns	0.19ns
P. coffeae			1.00	0.01ns
***Meloidogyne* sp.**				1.00

*ns: not significant; ***P < 0.001; S. bradys: Scutellonema bradys; P. coffeae: Pratylenchus coffeae*

4. Discussion

The present study demonstrated that dry rot occurred at varying levels of severity among marketed tubers of cultivars belonging to the *D. cayenensis-rotundata* complex. The observed variation in *S. bradys* density among cultivars may reflect differences in cultivar susceptibility or suitability for nematode multiplication. The nematode feeds on plant tissues via intracellular pathways. This mechanical process causes cell wall rupture, loss of cell contents, and necrosis (Mathew & Opperman, 2020). The feeding activity of *S. bradys* promotes progressive tissue necrosis. This results in a continuous brown or black necrotic layer 1-2 cm thick within the parenchyma (Claudius-Cole, 2021). At this point, external cracks develop on the tuber's surface, and some parts may peel off, revealing decayed tissue (Coyne & Affokpon, 2018). Dry rot has been reported in tubers of several yam species (Coyne & Affokpon, 2018). *Pratylenchus coffeae* causes dry rot on *D. alata* (Y. Y. F. R. Kouakou *et al*., 2020b), whereas *S. bradys* is associated with dry rot on the *D. cayenensis-rotundata* complex (Y. Y. F. R. Kouakou *et al*., 2021). The variation in disease expression among cultivars therefore warrants further consideration of cultivar-specific susceptibility to *S. bradys.*

Additionally, the cultivars of the *D. cayenensis-rotundata* complex and agroecological zones affected the development of dry rot in tubers. Dry rot was more prevalent and severe in Assawa tubers than in those of the other cultivars. Dry rot development may vary among cultivars because of differences in susceptibility to *S. bradys*. To successfully infect a plant, the nematode must overcome a range of plant defense strategies (Chen, 2023). These strategies include the production of toxins, notably phytoalexins, terpenoids, and isoflavones (Chen, 2023). These toxins make the environment unfavorable for the nematode's pathogenic activity. However, some nematodes can produce compounds such as glutathione-S-transferase to neutralize plant toxins and provoke disease (Dubreuil *et al.,* 2011). This may partly explain the high level of dry rot in Assawa. In addition to cultivar effects, differences in agroecological conditions and production practices may also influence the development and spread of dry rot.

The prevalence of dry rot was highest in the tropical dry savannah zone. This pattern aligned with variation in yam production practices across yam production basins. The Bouna-Bondoukou basin in the dry savannah zone is renowned for the widespread cultivation of Assawa and Kponan. However, these cultivars appear to be susceptible to yam nematodes. Yam tubers were stored either on-site in the soil or elsewhere until sold (K. P. Kouakou & Anoh, 2019). In Ghana, *S. bradys* has consistently been associated with dry rot in stored yam tubers. Farmer surveys estimated dry rot losses of approximately 21% in the forest zone and 30% in the Guinea-Savannah zone. Farmers reported practices such as selecting clean seed tubers, fallowing, and using land not previously cropped with yam to reduce nematode problems (Kwoseh *et al.,* 2005). These findings are consistent with the present study, in which the highest dry rot prevalence occurred in tubers from the tropical dry savannah zone of Côte d'Ivoire, suggesting a possible influence of agroecological conditions and cropping history on *S. bradys* pressure. To further clarify the factors associated with dry rot development, the nematode taxa recovered from the affected tubers were also considered.

The maceration method showed that tubers of the *D. cayenensis-rotundata* complex contained the nematodes *P. coffeae*, *S. bradys*, and *Meloidogyne* sp. *Pratylenchus coffeae* and *S. bradys* are migratory endoparasites, whereas *Meloidogyne* spp. are primarily sedentary endoparasites of roots, although their juveniles may be detected in infected yam tissues (Singh *et al*., 2013; Mathew & Opperman, 2020). Among these taxa, *S. bradys* causes dry rot on tubers of the *D. cayenensis-rotundata* complex in West Africa (Coyne & Affokpon, 2018). The study indicated that *S. bradys* density increased with dry rot severity. This strong association, together with previous experimental evidence of the pathogenicity of *S. bradys* on yam, supports the epidemiological importance of this nematode in yam dry rot. However, nematode identification in the present study was based on morphological characteristics, and molecular confirmation was not performed. Although the morphological approach allowed the identification of *S. bradys*, *P. coffeae*, and *Meloidogyne* sp., molecular characterization would provide additional confirmation of species identity and could reveal genetic differentiation among *S. bradys* populations from different production areas. Such information would be valuable for understanding population diversity and potential differences in pathogenicity. The marked predominance of *S. bradys* and its association with dry rot severity further suggest that differences in host–nematode interactions may contribute to the observed variation among cultivars.

Furthermore, *S. bradys* was more frequent in Assawa tubers than in those of the other cultivars. This greater frequency may reflect the cultivar's susceptibility or suitability for *S. bradys* multiplication relative to the other cultivars evaluated. These interactions depend on factors related to the host (nutritional and immune status), the parasite (virulence and reproductive capacity), and the environment (González-Bernardo *et al*., 2025). Studies of plant-nematode interactions have shown that host plants can detect nematode-associated molecules and mount pattern-triggered immune responses, including defense signaling, production of reactive oxygen species, reinforcement of cell walls, and changes in hormone-regulated pathways. Plant-parasitic nematodes secrete effector molecules that can suppress or reprogram host defense responses, alter hormone signalling, and modify cellular processes required for successful parasitism (Chen *et al.,* 2024). Nematode effectors may target host proteins involved in immune signalling and, in some sedentary endoparasites, can also manipulate host gene expression and cellular reprogramming to establish feeding sites (Bali & Gleason, 2024). Although researchers have mainly characterized these molecular mechanisms in root-knot and cyst nematodes, they provide a useful framework for understanding how *S. bradys* may overcome host defenses and establish infection in yam tissues. Molecular studies specifically targeting *S. bradys* and yam are still needed to identify the effectors, host defense genes, and signaling pathways involved in this interaction. Beyond cultivar-related differences, the distribution of *S. bradys* also varied across agroecological zones, suggesting that environmental and production factors may influence its epidemiology.

Scutellonema bradys was predominant in tubers originating from the forest–savannah transition and tropical dry savannah zones. This result may be because yam cultivars grown in these areas are more susceptible to *S. bradys*. Kponan and Assawa are mainly cultivated in the tropical dry savannah zone in northeastern Côte d'Ivoire (Doumbia *et al*., 2006). According to the authors, this zone is the primary supplier of Kponan and Assawa tubers to the cities of Abidjan and Bouaké. Additionally, improved transport has made this area more accessible. These factors have led farmers to establish large yam farms, with the harvested tubers intended for sale (K. P. Kouakou & Anoh, 2019). Specific factors that contribute to the spread and persistence of *S. bradys* populations include the cultivation of susceptible cultivars and the exchange of infected plant material between yam-growing areas. Yam farming in these zones is therefore under high parasitic pressure. These observations can be better interpreted in the broader context of *S. bradys* occurrence in the West African yam production system. The occurrence of *S. bradys* in the present study is consistent with its recognized importance in yam-producing regions of West Africa. A regional survey detected *S. bradys* in marketed yams across all countries examined, with substantial variation in nematode density according to country, agroecological zone, yam species, and cultivar (Coyne *et al*., 2006). Ghana had the highest proportion of visually affected tubers, whereas Nigeria recorded relatively high mean *S. bradys* densities in tubers. These differences suggest that *S. bradys* pressure is influenced by interactions among cultivar, environment, cropping practices, and the movement of infected planting material.

5. Conclusion

Dry rot was widespread among early-harvested yam tubers marketed in Côte d'Ivoire and varied by tuber origin and cultivar. *Scutellonema bradys* was the predominant plant-parasitic nematode recovered from tuber peel, and its density was strongly and positively associated with dry rot severity. The Assawa cultivar and tubers from the tropical dry savannah zone showed the highest levels of dry rot and nematode density. These findings have practical implications for the management of yam dry rot. Farmers should use healthy planting material and, where available, less susceptible cultivars. Traders should minimize tuber injury and avoid mixing infected tubers with healthy lots. Policymakers and extension services should strengthen training on nematode management, promote the use of healthy planting material, and support *S. bradys* surveillance in major yam-producing and marketing areas. These results provide a basis for further investigation of cultivar responses, population diversity, and integrated management strategies. Future research should evaluate yam cultivar susceptibility to *S. bradys* under greenhouse and field conditions and characterize *S. bradys* populations at the molecular level to assess genetic diversity and its association with cultivar response and pathogenicity.

6. Limitation

The study assessed marketed tubers and therefore did not experimentally separate the effects of cultivar, production environment, cropping history, handling, and storage conditions on dry rot development. Cultivar availability also varied among warehouses, resulting in unequal cultivar–warehouse combinations. These limitations restrict causal interpretation of differences in dry rot occurrence and *S. bradys* density among cultivars and agroecological zones. Molecular confirmation would further strengthen species identification, while controlled cultivar-response studies are needed to clarify the factors underlying variation in *S. bradys* density and dry rot severity.

Declaration of AI Use

This manuscript was prepared through the intellectual contributions of the author(s) to the study design, data analysis, interpretation of results, and scholarly content. Grammarly and ChatGPT were used solely to assist with grammatical refinement and reference formatting during manuscript revision. The author(s) accept full responsibility for the accuracy, integrity, and final content of the manuscript.

Competing Interests

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://pr.sdiarticle5.com/review-history/165507