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Conference Paper · December 2019

DOI: 10.4314/jae.v24i1.28S

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Proceedings of the Annual Conference of the Agricultural Extension Society of Nigeria
Number: Twenty-Fourth Annual Conference
Theme: Enhancing Agricultural Extension Capabilities for Improved Agricultural Improved Agricultural Value Chain in Nigeria
Date: 7th -10th April, 2019. **Venue:** Raw Material Research and Development Council, Abuja Nigeria
ISSN: 1595 – 1421.http://aesonnigeria.org/ConfProc . **Email**: editorinchief@aesonnigeria.org

Farmer Knowledge of Cassava Mosaic Disease and Management Practices in Ogun State

https://dx.doi.org/10.4314/jae.v24i1.28S

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Abstract

This study assessed CMD knowledge and management practices of farmers in Ogun state Nigeria during a farmers' training exercise. A total of 101 farmers (80 male and 21 females) participated in this study. Only a few farmers (35.22%) however, were aware that whiteflies are vectors of cassava begomoviruses. Farmers generally obtained their planting material from neighbours'farms (42.71%) and previous planting season (41.67%). This study has shown poor knowledge of CMD amongst farmers in Ogun state and underpins the need for interventions towards farmer education in the study region.

Keywords: Cassava mosaic disease, farmers, farmers' knowledge

Introduction

Cassava mosaic disease (CMD) continues to devastate cassava production in Africa where cassava serves as a major staple for over 700 million persons (Legg et al., 2014). Annual estimates show that cassava tuber losses due to CMD are between 12-23 million tons, the equivalent of over 2 billion USD (Legg et al., 2015). CMD is caused by geminiviruses which are transmitted by the whitefly vector *Bemisia tabaci* and via the propagation of infected cassava planting materials. Several surveys have shown the widespread occurrence of CMD across Nigeria and across all cassava growing areas around the world (Eni, Efekemo, Soluade, Popoola, & Atayero, 2018; Harimalala et al., 2015; Zinga et al., 2013). Past and current efforts towards management of CMD have focused primarily on the production and distribution of virus-free and virus-resistant cassava varieties. While this strategy has proven useful, its effectiveness is severely undermined by small-holder cassava farmers who have little or no knowledge of CMD and as such indulge in practices that promote the spread of the disease. Previous studies have shown the efficacy of farmer education in improving farmer knowledge and ultimately farmer productivity(Guo, Jia, Huang, Kumar, & Burger, 2015). Designing effective interventions towards farmer education requires an assessment of current levels of knowledge as well as training needs. This study sought to assess the knowledge of CMD and disease management practices of farmers in two local governments in Ogun state Nigeria in a bid to identifying training needs. Specifically, this study sought to :

1. assess CMD specific knowledge of farmers;

2. assess CMD and cassava cultivation practices of farmers;

Methodology

A cross-sectional study was conducted in two local government areas (LGA); Ota (6°38′N 3°06′E) and Abeokuta (7°9′39″N 3°20′54″E) both in Ogun State Nigeria. Farmers were recruited into the study during trainings put together by the authors in these LGAs. To invite cassava farmers for our trainings in Ota LGA, we contacted community heads who helped spread word of the training to farmers in their communities. To recruit farmers in Abeokuta LGA, we conducted our training during the LGA monthly farmers meeting. A total of 112 cassava farmers attended the trainings however 11 of them were not included in the study based on an unwillingness to participate and/or incompleteness of information in the returned questionnaire. A total of 101 cassava farmers were included in the analysis presented here. A semi-structured questionnaire was used to obtain information from participants. The questionnaire comprised of 30 close-ended questions and was divided into three sections. The first section collected information regarding the farmer characteristics; the second section assessed knowledge of CMD and its management; and the third section assessed farmer practices promoting the management of CMD. Questionnaires were made available in English and the local language. Farmers who could not read and write were provided assistance by researchers.

Questionnaire was administered prior to the commencing of the training. To aid in answering the knowledge questions, images showing symptoms of CMD and the cassava mosaic virus vector were displayed in a PowerPoint slide. A subset of eight (7) and seven (6) questions were used to assess knowledge of CMD and management practices respectively. One (1) point was awarded for each correct response and zero (0) points for incorrect or missing responses. Responses were then pooled to obtain knowledge and practice scores for each farmer.

The dependent variables in this study were the knowledge and practice scores. The dependent variables were first analysed using descriptive statistics. A chi-squared test was used to assess the differences in proportions. Dependent variables were assessed for normality using the Shapiro-Wilk and Kolmogorov-Smirnov tests. To assess the influence of covariates such as previous traning, previous extension officer visit amongst others on the dependent variables, one of two tests were performed; a Mann-Whitney test for covariates with two categories or Kruskal-Wallis test for covariates with more than two categories. Pair-wise tests were performed for post hoc Kruskal-Wallis comparisons. Spearman's correlation was also computed to assess relationship between the dependent variables. Analysis was performed using the following python packages; Pandas (v0.24.1) package for descriptive statistics, Scikit Posthocs (v0.4.0) for posthoc comparisons. All analysis was implemented in Python version 3.6.4. $P < 0.05$ was considered statistically significant for all tests.

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Results and Discussion

Knowledge of Cassava Mosaic Disease

Knowledge of Cassava mosaic disease (CMD) and its management was generally poor amongst participants with an average of 1.95±1.71 (range 0-6) correct responses out of 7 questions. Most farmers (69.31%) did not know the etiology of the mosaic and distortion symptoms seen on leaves of infected plants (Table 1). Study participants (71.29%) were also generally unaware that whiteflies are vectors of cassava begomoviruses. Only 12.9% of the respondents knew that chemicals did not prevent the spread cassava mosaic virus while only 29.70% knew that infected plants should be burned to prevent spread (Table 1).

Previous reports have shown the widespread occurrence of CMD with up to 50% of farms surveyed in the study region reported to be infected (Eni et al., 2018). Despite the high CMD incidence observed, results obtained indicate that farmers in the region are largely unaware of CMD. The levels of awareness in this study was lower than those reported in other countries where farmers are generally more aware and could identify symptoms (Houngue et al., 2018). This disparity in awareness may be due to lower symptom severity which is a characteristic of endemic regions such as Nigeria or the wrong assumption by farmers that the CMD symptoms are due to other reasons such as soil type, delayed rainfall and/or varietal differences. Results from this study provide evidence for the efficacy of farmer education in improving farmer knowledge as shown by the higher knowledge scores obtained by farmers who had previously attended trainings. The results further suggest that farmers associations and agricultural extension services are pivotal to farmer trainings. This reinforces the need for renewed efforts from all stakeholders towards farmer education.

Table 1: Proportion of correct responses to questions assessing knowledge of cassava mosaic disease

	%
What causes the patterns seen in Image 1? ***Correct response = Cassava Virus***	30.69%
Do you recognize Image 1 as a symptom of cassava Virus Disease? ***Correct response = Yes***	50.50%
Does the type of cutting planted lead to symptoms in Image 1? ***Correct response = Yes***	26.73%
Do the flies in image 3 cause the symptoms in Image 1 ***Correct response = Yes***	28.71%
Does the use of chemicals prevent Cassava Virus Disease? ***Correct response = No***	12.87%
Does burning plants showing the symptoms in Image 1 help in preventing the spread of cassava virus disease ***Correct response = Yes***	29.70%
Does planting during the rainy season lead to the symptoms in images 1 ***Correct response = No***	15.84%

Note: Image 1 contained foliar symptoms of Cassava Mosaic Virus while image 3 showed pictures of whiteflies in cassava leaves

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Cassava Mosaic Virus Disease Management Practices

Cassava viral disease management practices were good amongst study participants who scored an average of 4.10±0.94 (range 0-6) correct responses out of total of 6 questions. About half (46.15%) of the respondents reported practicing rouging of infected plants and 50% burnt infected plants after removing infected plants. Planting materials were mostly obtained from sources that increase the risk of CMD spread such as collection from neighbours' farm (42.71%) and the use of cuttings from previous planting season (41.67%). Noteworthy though is that most of the farmers in this study did not practice obtaining planting materials from outside of Ogun State (85.15%) or from outside Nigeria (99.01%) (Table 2). The few farmers who had obtained planting materials from outside Ogun State, obtained them from neighbouring States such as Oyo and Osun States.

Table 2: Correct responses to questions assessing knowledge of cassava virus disease management practice

Questions	Correct responses %
Do you use chemicals to prevent Cassava virus disease? ***Correct response = no***	67.33%
Do you remove plants showing symptoms in Image 1? ***Correct response = yes***	41.58%
From where do you obtain your planting materials? ***Correct response = Reputable Source***	36.63%
Have you ever obtained cassava stems from outside your state? * ***Correct response = no***	85.15%
Have you ever obtained cassava stems from outside Nigeria? * ***Correct response = no***	99.01%
Do you constantly monitor your farm for abnormal changes? ***Correct response = yes***	81.19%

* There were a few missing responses to these questions. Missing responses were treated as correct practice.

Previous studies outlined various practices for controlling CMD such as planting of virus free seeds, phyto-sanitation and rouging. The farmers in this study generally had good practice scores however practice did not correlate with their knowledge of CMD. Planting materials were generally obtained from the previous planting season or neighbouring farms. This is consistent with a previous report from another region (Houngue et al., 2018) and has serious implications for control efforts since there is growing evidence to support the fact that CMD is largely propagated by the distribution of infected cuttings (Maruthi, Jeremiah, Mohammed, & Legg, 2017). Cassava farms belonging to farmers who do not perceive CMD as a threat or farmers who are unaware that their planting materials are infected may serve a major source of Cassava mosaic virus inoculum for the whitefly vectors. A few farmers in the current study reported that they obtain planting materials from neighbouring States, however upon closer inquiry, we found that some of these farmers owned cassava farms in these neighbouring states and moved cassava planting materials between

their farms. This may also have implications for inter-State spread of diseases. While it is logical that farmers who have multiple farms across several States would move planting materials between farms, this practice should be discouraged especially with States such as our study area which borders Benin Republic. This is to prevent the spread of any exotic pathogens that may be inadvertently transmitted to border farms by the whitefly vectors or imported through our porous land borders.

Conclusion and Recommendations

There was low knowledge of cassava mosaic disease management knowledge amongst farmers in the study area. This has serious implications for CMD management in West African where cassava is a food security crop. Bridging this knowledge gap would require efforts from all stakeholder. Stakeholders should invest in demonstration farms where farmers can see, first hand, the possibilities vis-à-vis yield when good practice is embraced. Stakeholders should renew efforts towards extension officer and farmer education. These trainings should ensure that both genders are adequately represented and should cover disease recognition as well as effective practices for maximum yields.

Disclosure Statement

The authors declare no conflict of interest

Data availability statement

Data used in this study is available on request from the corresponding author

Acknowledgements

Funding for this work was provided bythe Bill and Melinda Gates Foundation and Department for International Development (DFID) Grant no. OPP1082413 “West African Virus Epidemiology (WAVE) for root and tuber crops” through a subgrant from Université Félix Houphouët-Boigny (UFHB).

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