IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 17, Issue 5 Ser. 1 (May. 2024), PP 24-29
www.iosrjournals.org

Survey And Identification Of Main Pests And Pest Management In Cassava Crop In Uíge Municipality, Angola

Nzayadio Mampasi[1], Messias de Carvalho[2*], Mafayamo António[3], Matembele Makilutila[4], Betterncourt Munanga[5]

[1]*Department Of Agronomy, Kimpa Vita University, Angola*
[2]*Department Of Soil Science And Agrophysics, University Of Agriculture In Krakow, Poland, Department Of Agronomy, Kimpa Vita University, Angola*
[3]*Department Of Agronomy, Kimpa Vita University, Angola*
[4]*Department Of Agronomy, Kimpa Vita University, Angola*
[5] *Department Of Food Sciences, Department Of Process Engineering, Department Of Biological Sciences, Rainha Njinga A Mbande University, Angola*

Abstract:
A survey was conducted from September 2022 to September 2023 in Pumba loge, Aldeia 3 casas, and Bulungundo villages in the municipality of Uíge, northwestern Angola. The aim was to identify major insect pest problems, the prevalence of pests, and pest management practices used by cassava growers. A total of 135 cassava growers were interviewed using pretested, structured questionnaires, with 45 growers selected from each area. We identified three specific areas of 20 m² on each farm to assess the presence of pests in the field. Within each area, we counted plants (≥20 plants) and recorded the number of pests present, regardless of size. Based on their morphology, pests were categorised according to species and mouthparts. The identification of the pests was carried out both during the day and at night. Mastomys natalensis (23%), termites (16%), Zonocerus variegatus (14%), Ferrisia virgate (12%), and Solenopsis sp.(10%) were found to be the major pests in the study area. The most infested parts were cassava leaves (51-63%) and roots (25-29%). Only 29% of the farmers relied on cultural pest control methods without using pesticides or integrated pest management (IPM). This study highlights the gaps in pest management practices in Cassava cultivation.

KeyWord*: Cassava grower; Pest identification; Pest management practice*

Date of Submission: 16-05-2024 Date of Acceptance: 26-05-2024

I. Introduction

In Angola, the cultivation of cassava holds significant socio-economic importance, particularly for small-scale agriculture which employs labour in the production, processing, and commercialisation processes. Cassava is primarily cultivated for human consumption, and its raw material has been sold by small farmers to agro-industries to increase the production of food preparations.

The African continent is responsible for producing most of the world's cassava, according to FAO (2022). Nigeria is the largest producer of cassava, with a production of 60.8 million tonnes, accounting for 18.56% of global production. The top 5 cassava-producing countries, including the Democratic Republic of the Congo, Thailand, Ghana, and Cambodia, contributed a combined total of 57.03% of global production. In 2022, the global cassava production was estimated at 327 million tonnes. Angola contributed 10.5 million tonnes, which accounts for 6.90% of the total production (FAOSTAT 2022). In Angola, cassava production is concentrated in the North and West regions. Although Uíge is the largest cassava producer with 20%, Malanje has been identified as having strong national potential with 8,000 catalogued producers (Afonso et al., 2019).

The tuberous roots of cassava are the most useful vegetative part due to their high starch content, which makes them suitable for various purposes, including as raw material for the flour and starch industries. The aboveground parts are also interesting due to their good fermentability and their use as silage in animal feeds (Gameiro, 2003). Furthermore, the leaves contain a high amount of protein and vitamins A and C, along with other essential nutrients (Tinini et al., 2009).

Cassava is a staple food in Angola, with the leaves and roots being consumed in various ways, including raw, boiled, fried, and roasted. However, the crop is vulnerable to insect attacks, which can significantly reduce production and the quality of roots and propagation material (FAO, 2010). Detailed studies

on major insect pest problems of cassava in Angola are lacking. Previous works have focused on cassava suitability of climate risks, post-harvest pest management, and cassava genotypes based on agro-morphological traits (ACDI, 2016; IIA, 2018; Afonso et al., 2019). However, the prevalence of pests and pest management practices of cassava have only been marginally addressed. To address this issue, we aimed to identify and document pest problems, as well as the pest management practices employed by farmers.

II. Material And Methods

Location of study area

The survey to identify the main insect pests and pest management practices of cassava was conducted in Uíge Municipality, the capital of Uíge Province, located in northwestern Angola (Figure 1). The survey was carried out from September 2022 to September 2023 in the villages of Pumba loge (7°47'38.838" S, 15°0'47.164" E), Aldeia 3 casas (7°.44'52.98" S, 15°0'22.324" E) and Bulungundo (7°45'36.60" S, 15°0'33.122" E).

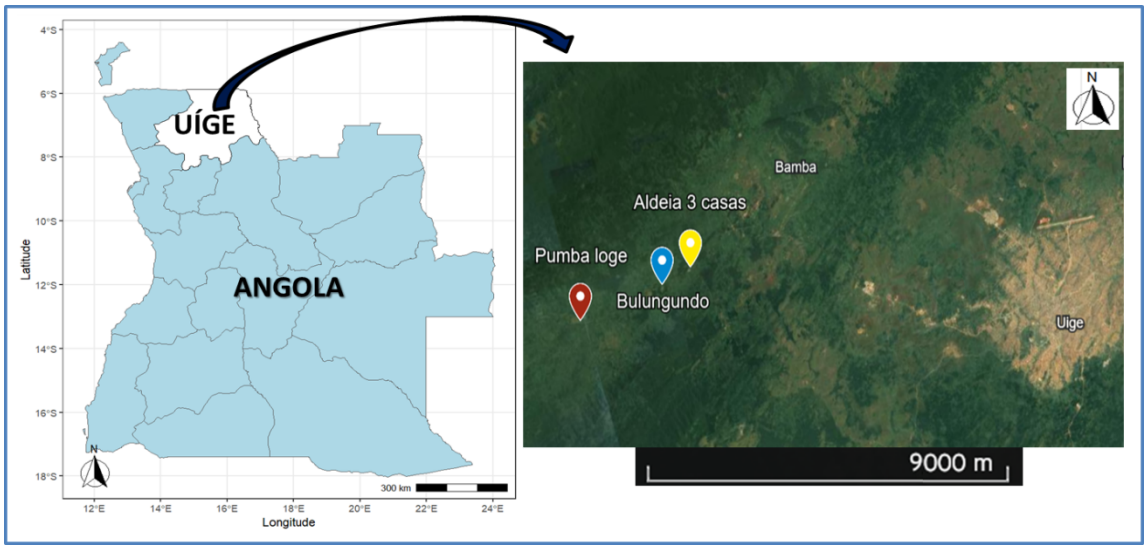

Figure 1: Map of the study area: This map displays the locations of Pumba loge, Aldeia 3 Casas, and Bulungundo Villages.

Survey and field methods

The primary data for this study was collected using a semi-structured questionnaire that was developed and reviewed by staff members of the Polytechnic Institute of Kimpa Vita University. Secondary data, on the other hand, was sourced from relevant literature. The information to be collected included major insect pest problems, prevalence of pests and pest management practices. The study encompassed a group of 135 farmers (45 for each village), specifically those engaged in the cultivation of cassava alongside those involved in cultivating other crops. This diverse list of participants was carefully selected to gather comprehensive insights into the farming practices employed within the region. To evaluate the presence of pests in the field, we identified three specific areas of 20 m² on each farm. Within each area, we counted the number of plants (≥20 plants) and recorded the quantity of pests present, regardless of their size. The pests were categorised based on their morphology, taking into consideration the type of pest and its mouthparts. Pest identification was conducted both during the day and at night (Picanço, 2010). Samples collected from the field were photographed and compared using Google Lens® for documentary identification. The genus and species of the pests were then verified by consulting specialized bibliographies on pest management, as outlined by Borror & De Long (1969), Barth, (1972), Maranhão (1978), Gallo et al., (2002) and GROSSI & CONTE (2016). The damage was assessed by direct contact, considering the evidence left by the pests on each part of the plant, such as stems, leaves, and, in the case of rodents, the roots (Gasparotto, 2022). The severity was rated according to the scale used by Macedo et al., (2022).

Statistical analysis

The collected data were coded, processed, and analysed using descriptive statistics, including arithmetic mean, standard deviation, minimum, and maximum. To study the differences in each parameter between the pests affecting the plants, one-way analysis of variance (ANOVA) was conducted. Tukey's post hoc test was used at $p<0.05$ to estimate the least significant differences between the means. Principal component

analysis (PCA) was used to demonstrate the relationships between the variables (main pest) and the parts of the plants infested by the pest. The analysis was conducted using R Studio v.4.3.0 software.

III. Result And Discussion

Main crops and occurrence of pests

According to Table 1, the survey revealed that cassava was the main crop grown in the study villages, although other crops such as maize, sweet potato, groundnut, beans, and vegetables were also recorded.

Table no 1: Crops grown by farmers in the surveyed area.

Main crops	% Farmers' respondent			
	Pumba loge	Aldeia 3 casas	Bolungundo	Mean
Cassava	52.1	43.3	53.5	49.6
Maize	15.4	21.7	14.3	17.1
Groundnut	8.9	10.5	6.4	8.6
Sweet potato	13,5	9.8	11.1	11.5
Beans	6,0	6.6	5.9	6.2
Vegetables	4.1	8.1	8.8	7

Respondents reported varying levels of pest presence in cassava crops. In Bulungundo, 35% of respondents perceived a constant presence of pests, while in Pumba loge, 66.7% of respondents reported the same. On the other hand, 33% of respondents in Pumba loge and 64.9% in Bulungundo reported fluctuating pest presence (Table 2).

Table no 2: Farmers' knowledge of pest prevalence.

Pest presence	% Farmers' respondent			
	Pumba loge	Aldeia 3 casas	Bulungundo	Mean
oftentimes	66.7	45.2	35.1	49
occasionally	33.3	54.8	64.9	51

Pests are an unavoidable aspect of cassava cultivation in the region, and farmers are greatly concerned about their negative impact on crop yields. The literature has extensively addressed the persistent presence of pest attacks on cassava plants during cultivation (Alan et al., 2022; Aloyséia, 2016; Junior & Alvez, 2016).

Major Pests

The study revealed that rodent infestation was the main issue affecting cassava production in all areas studied. *Mastomys natalensis* was the most common rodent species, accounting for 18-30% of infestations (Figure 2). Termites followed at 14-17%, with *Zonocerrus variegatus* and *Ferrisia virgata* at 12-16% and 9-13%, respectively. The less predominant pests in surveyed areas were *Agrottis* spp at 2-5%, *Phymateus* at 5-6%, and *Tetranychus* sp at 6-10%. These values were determined based on the frequency of pests in the crop (Table 3).

Figure 2 : shows *Mastomys natalensis* gnawing on cassava on the left and a nest with neonates on the right at one of the field study sites located in Pumba loge village.

Table no 3: Major cassava pest in the study area.

Main pest	Location						Mean
	Pumba loge		Aldeia 3 casas		Bolungundo		
	Number	%	Number	%	Number	%	
Ferrisia virgata	20	13	18	9	25	13	12
Zonocerus variegatus	18	12	32	16	26	13	14
Bemisia tabaci	10	7	11	5	20	10	7
Mastomys natalensis	45	30	41	20	35	18	23
Tetranychus sp	9	6	20	10	20	10	9
Solenopsis sp	14	9	24	12	20	10	10
Termites	24	16	35	17	27	14	16
Phymateus	9	6	15	7	10	5	6
Agrottis spp	3	2	6	3	10	5	3
Others	15	10	11.3	6	15	8	8
Total	152	100	202	100	193	100	108

Literature confirms farmers' observations on the severity of the aforementioned pests, with emphasis on Mastomys natalensis, termites, and Zonocerrus variegatus infestations in cassava cultivation (Carvalho, 2015; Edet, 2017; Donga, et al., 2022). According to FAO (2010), these pests have been found to decrease yields. Although some of these pests only attack the plant for a short period, the plant can recover under favorable environmental conditions. However, certain pests can attack the plant for an extended period, resulting in a significant reduction in crop (NDEM & OSONDU, 2018; Frimpong et al., 2021).

Damage of plant material and Seriousness rating

The study revealed a high prevalence of pests in cassava farming, with the leaf (51-63%) and root (25-29%) being significantly more affected than the stalk in all surveyed areas. Furthermore, the data indicates that the seriousness rating was statistically higher at the slight level (40-64%) compared to the moderate (19-33%) and severe (17-25%) levels in all areas studied (Table 4).

Table no 4: Parts of cassava crops affected by pests and the severity of the infestation.

Location	Plant material		
	Leaf	**Stalk**	**Root**
	%		
Pumba loge	56.4-69.2[1]	10.3-12.8	19.2-30.8
	63^{a}.2±6.45[2]	11.5^{c}±1.28	25.2^{b}±5.78
Aldeia 3 casas	40.2-57.7	12.8-27.5	25.6-32
	51^{a}±9.45	19.8^{b}±7.36	29^{b}±3.20
Bulungundo	50-55	20-22.5	25-30.2
	51.7^{a}±2.89	20.8^{b}±1.44	27.6^{b}±2.60
Location	**Seriousness rating**		
	Moderate	**Slight**	**Severe**
	%		
Pumba loge	16.0-21.3[1]	50.8-81.1	2.83-28.8
	19^{a}.2±2.79[2]	64^{b}.2±15.5	17.0^{a}±13.1
Aldeia 3 casas	22-33.3	43.4 -44.6	23.2-34.2
	26.0^{b}±6.31	44.0^{a}±0.603	30^{b}±5.94
Bulungundo	25-47.4	28.9 -52.5	22.5-31.3
	33.8^{a}±12.0	40.4^{a}±11.8	25.8^{a}±4.77

[1]min-max, [2]arithmetical mean ± SD. Different letters show significant differences, at $p < 0.05$.

Our results are consistent with those reported by Junior & Alvez (2016) and Orek (2023), who found that pests on cassava leaves can significantly reduce root yield by consuming cellular fluids, leading to decreased photosynthesis, premature defoliation, and death of apical meristems. The presence of pests on roots can be attributed to their susceptibility to crawling pests (Braima et al., 2002; Naloto et al., 2012). Although the

stalk did not suffer extensive damage, the pests significantly impacted the leaves and roots. Farmers in other regions have also reported concerns about pest infestations in cassava cultivation, which highlights the susceptibility of roots and leaves to such damages (Filho et al., 2013; NMADU & YAKUBU, 2015). A principal component analysis (PCA) showed that the main pest (*Phymateus, Agrottis* spp, *Solenosis* sp, and *Tetranychus* sp.) had the greatest impact (32.2% on PC1) and was mainly found on the stalk. Positive correlations were found between the pests and the parts of the crop affected; in particular, *Zonocerus variegatus* was associated with stalk damage and *Bemisia tabaci* with root damage, while *Ferrisia virgata* was associated with moderate and severe damage. The second factor (PC2), which accounted for 19.6% of the variation, showed that *Mastomy natalensis* and termites were associated with low severity (Figure 3).

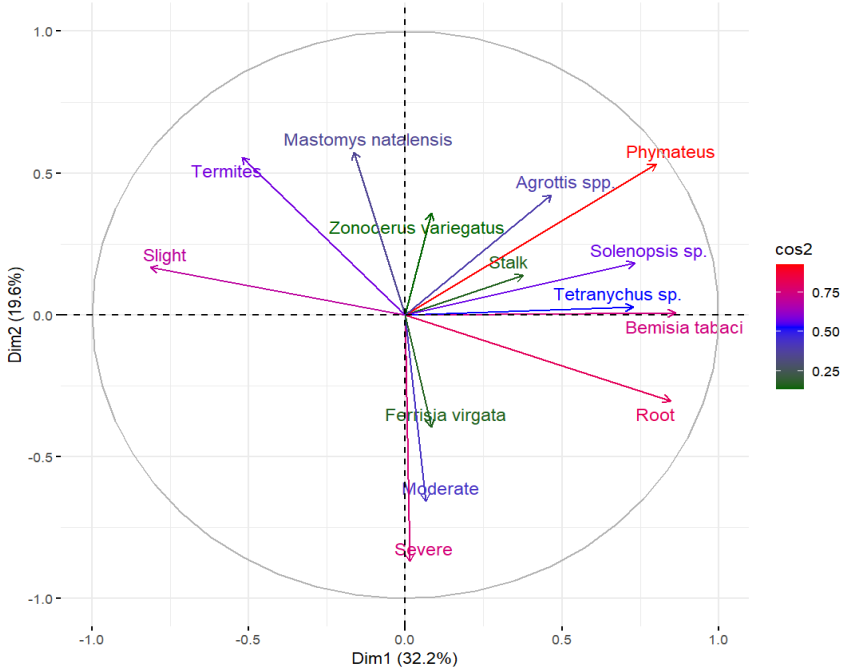

Figure 3: shows the relationship between the examined variables, namely pests and their damage to cassava crops, using principal component analysis (PCA). The parameters included in the PCA were the main pest, seriousness rating, and pest-infested parts.

Control of pests

Based on the collected data, it was reported that none of the farmers in the study area used pesticides and Integrated Pest Management (IPM) to control cassava pests. Instead, 31.7 to 35% of the respondents reported using cultural methods, while 13.4% to 24.4% used other methods (behaviour-based methods), (Table 5).

Table no 5: The measures taken by farmers to control insect pests.

Method of insect control	% Farmers' respondent			Mean
	Pumba loge	Aldeia 3 casas	Bolungundo	
IPM	---	---	---	---
Pesticides	---	---	-----	---
Cultural methods	35	22.3	31.7	29.6
Others	13.4	12.7	24.4	16.8

Family farmers mainly grow this crop using minimal or no pesticides. This is because cassava is staple food in Angola and the cooked leaves are commonly consumed as a food source during the growth and development of the crop making the use of pesticides dangerous (Afonso et al., 2019) Therefore, it is recommended to implement Integrated Pest Management (IPM) strategies without the use of insecticides, except in cases of calamity or severe pest attacks (Edet, 2017; IIA, 2018). In order to successfully implement phytosanitary products, significant knowledge is required. The use of pesticides is not recommended due to their potential to harm natural enemies, pose health risks to both humans and the environment, and their high cost, which is too burdensome for small traditional farmers and reduces profits for larger farmers (Bello et al., 2012;

Pac et al., 2016). To adhere to the principles of Integrated Pest Management (IPM), it is essential to have a valid economic justification for implementing pest or disease control measures on agricultural crops. As noted by (Ferreira, 2021), an organism is considered a pest only when it causes economic damage.

IV. Conclusions And Recommendations

The study found that the most common pests affecting cassava in all study areas are rodents (*Mastomys natalensis*), termites, *Zonocerus variegatus*, *Ferrisia virgata*, and *Solenopsis* sp. Farmers primarily use cultural methods to control pests, indicating their awareness of the harmful effects of pesticides on human health. Pests mainly infest cassava leaves and roots. To receive advice on pest control, farmers should seek guidance from knowledgeable extension workers at the Institute of Agrarian Development (IAD). Collaboration between research and extension services is essential to ensure the timely dissemination of the improved Integrated Pest Management (IPM) strategy. Workshops and field training sessions should be conducted to educate farmers on the use of Integrated Pest Management (IPM) practices.

References

[1]. Acdi. (2016). Study Undertaken In Support Of The International Fund For Agricultural Development Sadep Project In Angola [Summary Report And Recommendations]. Angola: University Of Cape Town.
[2]. Alan V. Saldanha., Rayana M.R Carvalho., Lessando M.G Mandioca: Do Plantio À Colheita:In Manejo De Pragas, 1. Ed. -- São Paulo : Oficina De Textos, 2022.
[3]. Aloyséia Cristina Da Silva Noronha. 2016. Cultura Da Mandioca: In Manejo Das Principais Pragas Da Cultura Da Mandioca, Editores Técnicos. - Brasília, Df : Embrapa, 172-183
[4]. Afonso, D. J. A., Carlos, A. D. S. L., Ricardo, F. C. M., Vanderlei, D. S. S., Viviane, P. B., & Pascoal, A. M. (2019). Selection Of Cassava (Manihot Esculenta Crantz) Genotypes Based On Agro-Morphological Traits In Angola. African Journal Of Agricultural Research, 14(7), 447–460.
[5]. Bellotti, A., Herrera Campo, B. V., & Hyman, G. (2012). Cassava Production And Pest Management: Present And Potential Threats In A Changing Environment. Tropical Plant Biology, 5(1), 39–72.
[6]. Borror, D.J.; Delong, D.M. Introdução Ao Estudo Dos Insetos. Editora Edgard Blücher. São Paulo. 1969. 720p.
[7]. Barth, R. Entomologia Geral. Fundação Instituto Osvaldo Cruz. Rio De Janeiro. 1972. 220p.
[8]. Braima J., John Y., Peter N., Anthony C., Wester M., Nnamdi E., Muaka T.2002. Pest Control In Cassava Farms, Ipm Field Guide. 16-23pp.
[9]. Carvalho, R. S. (2015). Índice Bad (Broca/Armadilha/Dia) Para Monitoramento Das Brocas Da Haste Da Mandioca (Sternocoelus Spp.) Utilizando A Armadilha Cnpmf (P. 8) [Relatorio Tecnico]. Brazilia: Emprapa.
[10]. Donga, T. K., Bosma, L., Gawa, N., & Meheretu, Y. (2022). Rodents In Agriculture And Public Health In Malawi: Farmers' Knowledge, Attitudes, And Practices. Frontiers In Agronomy, 4, 936908.
[11]. Edet, M. (2017). Comon Pests And Deseases And Cassava And Control (P. 10). Sapec: Ibadan, Nigeria.
[12]. Fao. (2010). Cassava Diseases In Africa A Majorthrea To Food Security (P. 74) [Anual]. Napolitano: Fao.
[13]. Food And Agriculture Organization (Fao) 2022. Agricultural Production – Crops Primary. Disponível Em: Www.Faostat.Fao.Org/Faostat/Collect.
[14]. Fao. (2022). Production: Crops And Livestock Products. In: Faostat. Rome. [Cited December 2023]. Https://Www.Fao.Org/Faostat/En/#Data/Qcl
[15]. Ferreira, G. S. (2021). Os Riscos Dos Agrotóxicos Para A Saúde Do Agricultor Rural (Monografia). Unisul Universidade, Florianópolis.
[16]. Filho, J. R. F. (2013). Cultivo, Processamento E Uso Da Mandioca. Em Cultivo, Processamento E Uso Da Mandioca (1a Edição, P. 34). Brasília, Df: Embrapa.
[17]. Frimpong, B. N., Oppong, A., Prempeh, R., Kubi, Z. A., Abrokwah, L. A., Mochiah, M. B., … Aduening, J. M. (2021). Formam Knowldge, Alttitudes And Pratices To Wards Managememt Of Cassava Pestes And Diseases In Forest Transition And Guinea Savannals Agro Ecological Zona Of Gana. 23.
[18]. Gasparotto, L. (2022). Glossário De Fitopatologia (4.ª Ed.). Brasília, Df: Embrapa.
[19]. Grossi, L. E., & Conte, H. (2016). Famílias De Coleoptera Com Ocorrência No Parque Do Ingá, Maringá, Paraná–Brasil. Revista Uningá, 47(1).
[20]. Gallo, D.; Nakano, O.; Silveira Neto, S.; Carvalho, R.P.L.; Baptista C; Berti Filho, E.; Parra, J.R.P.; Zucchi, R.A.; Alves, S. B.;Vendramim, J.D.; Marchini, L.C.; Lopes, J.R.S.; Omoto, C. Manual De Entomologia Agrícola. Piracicaba; Feaql., 920p.2002.
[21]. Gameiro, A. H., Cardoso, C. E. L., Barros, G. S. De C., Antiqueira, T. R., Guimarães, V. Di A. (2003) A Indústria De Amido De Mandioca. 1. Ed. Brasília: Embrapa Informações Tecnológicas, 201p Sas Institute. 2003. Sas Technical Report. Sas/Stat Software: Changes And Enhancement, Release 9.0, Cary Nc: Sas Institute.
[22]. Junior, M., & Alvez, R. (2016). Cultura Da Mandiocaaspectos Socioeconômicos, Melhoramento Genético, Sistemas De Cultivo, Manejo De Pragas E Doenças E Agroindústria. Em Cultura Da Mandioca. Brazilia: Emprapa.
[23]. Iia(2018). Programa Para O Aumento Da Produtividade Agrícola Na África Austral - Angola (Appsa) At: Https://Ewsdata.Rightsindevelopment.Org/Files/Documents/86/Wb-P164486_4qwnqen.Pdf
[24]. Macedo, A. F., Silva, L. F., Rocha, N. S., Nascimento, A. G. D. O., Oliveira, M. M. F., Cruz, C. G. D., … Fernandes, F. L. (2022). Métodos De Monitoramento De Pragas Na Agricultura Moderna. Em Desenvolvimento Rural E Sustentabilidade: Energia, Produção E Novos Mercados—Volume 2 (1.ª Ed., Pp. 107–117). Editora Científica Digital. Https://Doi.Org/10.37885/230212228
[25]. Maranhão, Z.C. Entomologia Geral Dos Insetos. Livraria Nobel S/A.1978. 396 P.
[26]. Naloto, A., Funai, C. H., Ribeiro, F. M., Bandeira, F. B., & Buffo, J. L. (2012). Mandioca. Mandioca, 140.
[27]. Ndem, C. M., & Osondu, C. K. (Sem Data). Risk Sources And Management Strategies Among Cassava Farmers In Abia State, Nigeria. Cientific Papers Series Management, Economic Engineering In Agriculture And Rural Development, 18, 10.
[28]. Nmadu, J. D., & Dankyang, Y. (2015). Sources Of Risk And Management Strategies Among Small Scale Farmers In Kaduna State, Nigeria. 14.
[29]. Picanço, M. C. (2010). Manejo Integrado De Pragas. Universidade Federal De Viçosa: Viçosa - Mg.