



Research Paper

Index of severity or seriousness of cassava pathologies in the agro-ecological zone of Bengamisa, Territory of Banalia, DR Congo.

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Summary

The object of the study is to evaluate the index of gravity or severity of recurrent pathologies in cassava cultivation (*Manihot esculenta crantz*) in the agro-ecological zone of Bengamisa. The surveys were conducted in three forest strata: fallow, secondary and primary forest. The results obtained showed that in fallows, African cassava mosaic showed a greater severity index (62.91%) followed by anthracnose (55.57%), angular spot disease (33.37%), brown spot disease (33.07%), Cercosporiosis (23.33%) and bacteriosis (7.8%).

In secondary forest, the severity index of M.A, M has regressed (51.51%) also from anthracnose (16.95%) that of brown spot disease has progressed to progressed to 35.35%.

In primary forest, the trend towards regression is observed for M.A, M (42.71%), angular spot disease (27.19%) and Cercosporiosis (15.68%), bacteriosis (0.85 %). Growth was observed for brown spot disease (98.13%) and anthracnose (59.25%).

The varieties, the landscape, the technical itineraries, ... can explain the presence of the symptoms at best their gravity or severity.

Keywords: Severity-Cassava-pathology.

Received 02 Apr., 2024; Revised 09 Apr., 2024; Accepted 11 Apr., 2024 © The author(s) 2024.

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I. INTRODUCTION

The local importance of cassava is explained by the role it plays, associated with other food crops, in the diet and the basket of the rural housewife. Since cassava is a staple food, the diseases that affect it have an immediate impact on the food supply of populations. (FAQ, 2015, Fauquet and Fargette. 1990, Harrison et al., 1997, Mupenda and Walangululu, 2016).

The stagnation of African production is mainly attributable to pests and diseases; however, the extension of cultivated areas that will be required by demographic expansion can only exacerbate this situation. In DR Congo, yields are uniform and low (7.8T/ha to 15T/ha), viral, fungal and bacteriological diseases remain a major challenge, causing huge monetary losses estimated annually at 1 billion US dollars. (Legg et al., 2006), (Muhindo, H., 2020, Bakelana, 2019).

Cassava indeed contributes to the availability of food and financial means among the rural populations of the Bengamisa region. Unfortunately, he is under attack from several diseases and attacks. Little research has been carried out in this area to clearly determine the phytosanitary situation of the crop.

It is therefore interesting to inventory the diseases present as well as the risk factors to guide future studies on the means of their control as well as preventive measures.

II. MEDIUM, MATERIAL AND METHOD

The Bengamisa region is located in the territory of Banalia in the Province of Tshopo, RD. Congo. Its geographic coordinates are 1°32' North latitude and 25°20' East longitude. It straddles the equator. Its average altimetry is 445 m and varies from 420 to 450 m, (CTB, 2014).

The study material consists of cassava cultivation in all its diversity.

Disease inventories are conducted in ten (10) villages located in the Bengamisa region, more specifically the Bamanga/Bengamisa and Boumbua sectors in Banalia territory.

We proceeded by reviewing the literature and the phytosanitary survey in the targeted villages. The observation method is used to determine the diseases encountered and for identification 5 photographs were used (Autrique and Parreeaux, 1989).

Surveys were carried out on fields aged 3 to 6 months. They concern three strata of Fallow forest, secondary forests and primary forests.

The fields taken as samples have a minimum area of 0.5 ha and the targeted villages are approximately 10 km from each other. The surveys were made along the diagonals. (Metrick. T., 1996). They covered 125 fields, including 56 fallow land, 45 in secondary forest and 24 in primary forest. A total of 15 feet were observed making a total of 1875 feet.

The study system includes two types of variable. The explanatory parameters are the density, the variety, the age of the crop, the type of landscape, the surrounding vegetation, the origin of the propagation material, the frequency of leaf picking, the period of cuttings, the mode of cuttings, clonal diversity.

The variables or parameters explained or answers: Incidence (F ci severity of disease symptoms (2).

The calculation of the incidence made it possible to know the number of cassava plants attacked and those not attacked.

The disease rating scales are those established by the IITA and range from 1 to 5 for each disease. (Anonymous, 2011).

a) Scoring scale for African cassava mosaic;

- 1) No observable symptoms;
- 2) Slight discoloration and small distortion of the sheets;
- 3) Moderate discoloration and distortion of sheets;
- 4) Bright yellow discoloration covering many of the leaves severe distortion, reduced leaf size and upturned petioles;
- 5) Bright yellow discoloration affecting most of the leaf severe distortion of leaves with reduced size, petioles turned over with leaf fall, plant blasted.

b) Anthracnose rating scale

- 1) No observable symptoms;
- 2) Cankers on the lower and middle parts of old plants, depression on the lower and middle parts of old plants;
- 3) Canker on the lower and middle parts of old plants, depression on the lower and middle parts of old plants accompanied by constriction of some leaf lobes;
- 4) Enlargement, constriction of leaf lobes of young plants, cankers on green stems;
- 5) Enlargement of blemishes under discharged leaves, strangulation of stems distortion of stems, death of plants.

c) Rating scale for leaf spot (brown spots, white spots, etc.)

- 1) No observable symptoms;
- 2) Presence of white flakes or cure on less than 20% of the total surface of the plant;
- 3) Damage observed on 20 to 40% of the total surface of the plant;
- 4) Damage observed on 40 to 60% of the total surface of the plant.
- 5) Plant completely covered with the cure or the white bottles. plant completely defoliated, death of the plant.

Attacks are said to be weak for a severity rating of 2, medium for a severity rating of 3 and forests for a severity rating of 4 or 5.

The course symptom severity index (severity index) led to an assessment of the degree of severity of the disease on the seedlings.

The severities obtained made it possible to calculate the severity index of each disease according to the stratum using the formula of Mignouna et al. (2001).

$$IS = \frac{xi \cdot ni \cdot 100}{5 \times Nt} \quad (1)$$

Where: - Xi: Severity of disease

- Ni: Number of diseased plants

- Nt: Total number of plants

- 5: Index [the highest of the scale

- S.I.: severity index

III. Results

The results obtained during our investigations are presented according to the forest strata where cassava is grown in the fields.

Table n° 1: Severity index of diseases observed in fallow land

N°	Diseases	Total Number of plant	Diseased plants	Incidence	Severity	Severity index
01	African cassava mosaic	840	699	83,21	3,78	62,91
02	bacteriosis	840	191	22,74	1,72	7,8
03	Angular spot diseases	840	523	62,26	2,68	33,37
04	Anthracnose	840	701	83,45	3,33	55,57
05	Brown stains	840	583	69,4	2,38	33,04
06	Sigatoka	840	392	46,67	2,5	23,33

It was observed after surveys that the severity index of or the severity varies according to the diseases. First, we have African cassava mosaic (62.912) followed by anthracnose (55;57), angular spot disease (33.37), brown spot disease (33.04), Sigatoka (23.33%) and bacteriosis (78°).

Indeed, bacteriosis is more observed in exotic cultivars and practically a source in so-called local varieties.

Table N°2: Disease severity index in fields located in secondary forest.

N°	Diseases	Total number of plants	Diseased plants	Incidence	Severity	Index of severity
01	African cassava mosaic	675	485	71,85	3,56	51,58
02	bacteriosis	675	10	5,78	1,06	0,5
03	Angular spot diseases	675	423	62,67	2,57	32,21
04	Anthracnose	675	523	77,48	3,03	46,95
05	Brown stains	675	493	73,04	2,42	35,35
06	Sigatoka	675	196	28,82	2,29	13,23

The data in the table above show that the severity index varies according to the pathologies, it is 51.58% for African cassava mosaic, 46.95% for anthracnose, 35.35% for the disease of brown spots, 32.21% for angular spot disease, 13.20% for Cercosporiosis and too low for bacteriosis (5%).

Table 3: Severity index of plants observed in primary forest

N°	Diseases	Total number of plants	Diseased plants	Incidence	Severity	Severity Index
01	African cassava mosaic	360	248	68,89	3,1	42,71
02	bacteriosis	360	10	2,78	1,54	0,85
03	Angular spot diseases	360	219	60,33	2,26	27,49
04	Anthracnose	360	303	84,2	3,52	59,25
05	Brown stains	360	279	77,5	2,46	38,13
06	Sigatoka	360	103	45,3	2,74	15,68

The severity index in pinçure forest varies from 59.25% for Anthracnose, 42.71% for African cassava mosaic, 38.13% for brown spot disease, 27.49% for brown spot disease angular and 0.85% for bacteriosis.

IV. Discussion Of Results

Cassava is mainly produced by small producers who exploit land with low fertility and low yields. In the Bengamisa region, cassava cultivation is a significant source of food and a source of income for producers. It is considered the plant that can boost food security. Unfortunately, this behind is the subject of several attacks by diseases and pests. The incidence and severity vary from case to case. They are favored by multiple factors including the picking of leaves, the age of the crop, the stratum of forest sheltering the crops, etc.

Indeed, the fields located in fallow land are colonized by five pathologies with variable severity indices with the dominance of African cassava mosaic (62.9%) followed by anthracnoses (55.72%), diseases of angular spots (39 .37%), brown spot disease (93.04%) and others.

There are many explanatory factors: the use of contaminated propagation material, non-compliance with cultural techniques or technical production itineraries, the high frequency of leaf picking, the proximity of fields, the mixing of varieties with various genetic potentialities in the same fields, etc. The average ribs obtained according to the pathologies are high: African cassava mosaic (3.78%), anthracnose (3.33%), angular spot disease (2.68%), i.e. low (1.72%) for bacteriosis.

Indeed, several authors have estimated that the losses in the affected fields are significant and variable according to the diseases or according to the level of infection. They are 55 to 77% when the cassava is contaminated through the cuttings and 35 to 60% for a plant contaminated by the whitefly (*Bemisia tabaci*) in the case of mosaic (Fauquet C. and Thouvenel J.C., 1980). Yield losses for all its pathologies are significant (African cassava mosaic, Anthracnose, although other pathologies such as Sigatoka, spotting, etc. have not been the subject of specific studies (Théberge et al., 1985).

In secondary forest, the trend is reversed with respect to brown spot disease, it comes first instead of M.A.M, followed by anthracnose and the others.

The African cassava mosaic severity index dropped to 51.58% from 62.91% in fallow.

This can be explained by the reduction in the frequency of topping of the leaves as well as the distance from the fields of the landscape. On the other hand, the fungal pathologies evolve as an index that can be linked to the humidity due to the shade.

In primary forests far from villages, the anthracnose severity index is 59.25% followed by that of African cassava mosaic, leaf spots (angular and brown spots), the landscape can have a direct effect on the distribution of diseases as well as other factors such as the low frequency of leaves, the distance from the fields, etc.

The literature shows us that plants from infected cuttings have less ability to recover and plants from them are less productive. For anthracnose, no correlation has been established between the incidence and severity of the disease and the level of production (Théberge et al., 1985). On the other hand, brown spot disease can cause yield losses of around 20%. Cercosporiosis does not attribute significant losses as well as the disease of angular spots.

V. Conclusion

The object of the study is to evaluate the indices of severity of cassava diseases according to the three strata of forest (fallow, secondary forest and primary forest) in the agro-ecological zone of Bengamisa.

At the fallow level, the severity indices are 62.9% for mosaic, 55.57% for anthracnose, 33.37% for angular spot disease, 33.04% for brown spot disease, 23.33% for Sigatoka and 7.8% for bacteriosis.

In secondary forest, it was 51.58% for mosaic, 46.95% for anthracnose, 35.35% for brown spot disease, 32.21% for angular spot disease, 13.21 % for Sigatoka and 5% for bacteriosis.

In primary forest, they are 59.25% for anthracnose, 42.71% for mosaic, 38.13% for brown spot disease, 27.49% for angular spot disease, 15.68 % for cercosporiosis and too low for bacteriosis. The latter is more observed in exotic varieties.

The results show more clearly that certain risk factors such as the frequency of leaf picking, the landscape, the quality of propagation material, etc. influence the dissemination of certain pathologies.

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