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Production of Cassava Nursery By Improved Cuttings Technique

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Abstracts

This study was conducted to produce cassava nurseries from dehydrated mini-cuttings. For this, two improved varieties of cassava (yavo and bocou 1) were used. These varieties were cut into mini-cuttings of 10 cm on average and dried during 3 days, 9 days and 30 days. These mini-cuttings dehydrated have been cultures on four different substrates (soil; mixture of 50% soil and 50% sawdust white; mixture of 50% soil and 50% sawdust red; mixture of 50 % soil, 25% of sawdust white and 25% sawdust red). 10 days after planting, the statistical analysis showed a significant difference in the rate of regeneration and seedling growth. There has been in a first step, a lack of regeneration mini-cuttings dried during 30 days. secondly, a delay in the regeneration and the average growth of 9 days mini-cuttings of 22% yavo and 5% bocou 1 while those 3 days 92% yavo and 66% bocou 1 normally comparatively evolves witness 91% yavo 65 % bocou 1. However, this technique will allow the peasantry to have more cuttings for more arable land, favoring spending cuts in order to maximize their profit.

Keywords: nursery, cassava, dehydration, wood's sawdust.

1. Introduction

Cassava is one of the most important food crops in the humid tropics. Annual cassava production in Africa accounts for more than half of world production, estimated at 256.56 million tonnes. In Côte d'Ivoire, cassava is produced throughout the country but mainly in the South, West and Central. Annual production reaches 2.41 million tonnes, with an average yield of 6.5 tonnes per hectare. (CNRA, 2013). However, in order to improve average production per hectare, several studies have been carried out. In particular, those of Raffaillac and Nedelec (1983) who were interested in the behavior of cassava at the beginning of the cycle as a function of the time of storage of the cuttings. Others, however, have emphasized the rate of cuttings recovery and final yield, such as Leihner (1984) and Ogbuehi (1981). Our study is in the same framework with the aim of using nurseries of mini-cuttings, allowing to increase the quantity of cuttings for more arable surfaces. The study will therefore focus on several points. It will begin with a brief description of the plant material (Manihot esculenta CRANTZ) as a whole. It will then present concisely the method to be used to produce cassava nurseries and finally it will focus on the limitations of this method with prospects for improvement.

2. Material and methods

2.1. Vegetable Equipment

The plant material used consists of mini-cuttings of two varieties of cassava (Manihot esculenta CRANTZ); variety Bocou 1 and Yavo.

2.2. Methods

2.2.1. Sampling of cassava stems

Mature manioc stems (6-8 months minimum) are collected from the University's cassava production site. These stems are taken with a machete at 25 cm from the ground to allow a future regrowth. This procedure is thus followed for the two different varieties (Yavo and Bocou 1).

2.2.2. Cutting of stems in mini-cuttings and labeling

- ✓ Cutting rods into mini-cuttings

Initially cut marks are made 10 cm apart on all the stems of the two varieties using a put tape and a marker. The stems are then cut out of the marks made with the marker while paying attention to the eyes, to obtain mini cuttings of 10 cm. Cutting is easier when the angle between the machete and the stem is between 200 and 600, (Figure 2.1).

Figure 2.1 position of the machete with respect to the stem

- ✓ Labeling of mini-cuttings

The labeling is done according to the variety, the substrate to be used, the total number of individuals in an experimental unit and also according to the dehydration time. All these parameters taken into account allow to follow the mini-cut from its cut to its nursery bagging knowing by what steps it will pass.
Example: B1T30J1. B1: variety Bocou 1; T: soil substrate; 30J: dehydration for 30 days; 1: individual n^0 1.

2.2.3. Dehydration of mini-cuttings

- ✓ Preparation of the bench

First, the bench is cleaned with a clean wet cloth, soap and bleach to remove any traces of impurities. Then, a plastic bag cover is added over the width of the bench to prevent the mini-cuttings from being in direct contact with the bench. To finish the mini-cuttings are arranged, arranged according to their label on the bench covered with plastic, having previously reserved spaces for mini-cuttings that will undergo dehydration of 9 days and 3 days, (Figure 2.2)

Figure 2.2 layout of mini-cuttings according to their label.

- ✓ Simultaneous weighing and dehydration

The mini-cuttings are all weighed using a precision scale, the same day the cutting of the mini-cuttings to obtain their fresh weight. The different weights are noted on the note sheet and the time of the first weighing. But for the rest, all mini-cuttings will be weighed every 3 days at the same time of the first weighing and this until the 30th day.

2.2.4. Physiological awakening

The base of the plastic bottles of mineral water is used here in the form of a container. These semi bottles are placed on the bench and with a 250 ml graduated test tube filled with 250 ml of water (Figure 2.3). The mini cuttings are then weighed after dehydration to obtain their mass before rehydration. After that they are added to the semi bottle (a mini-cut / container if not 4 mini-cuttings / maximum container)

Figure 2.3 semi bottle containing 250 ml of water.

2.2.4. Determination of the mass of mini-cuttings and the volume of water used during physiological awakening

Measurements are taken over 6 days at 2-day intervals. First, mini-cuttings are removed from the semi bottle and wiped with toilet paper. Their labels are also removed in order to carry out their weighing. Using two 250 ml graduated specimens A and B, the water of the container from which the mini-cuttings have been removed is transferred to the A test piece. The volume is read and noted. The test piece A is then emptied. Finally, test piece B is filled with water up to 250 ml, this volume of water is transferred to the emptied container. The mini cuttings are then added to the semi bottle. This process is the same for each semi bottle.

2.2.5. Nursery phase
The nursery substrates are constituted as follows:

- ✓ Substrate 1: 100% of soil
- ✓ Substrate 2: 50% soil + 50% white sawdust
- ✓ Substrate 3: 50% of soil + 50% of red sawdust
- ✓ Substrate 3: 50% of soil + 25% of sawdust of white wood + 25% of sawdust of red wood.

The nursery bagging of mini-cuttings requires the follow-up of many major rules. First, you must check

Figure 2.4 Provisions of nurseries based on substrates and delays in dehydration of mini-cuttings

the orientation of the eyes of the mini-cuttings (the eyes must be pointed upwards to allow a peaceful exit of the buds). Then place the mini-cuttings in the center of the bag so that the roots do not stick to the sachet and finally push them to 1/3 of their total size. Leave the nurseries in the shade, (Mahungu et al., 2014). For this study, the growth parameters considered are the regeneration date and the regeneration percentage of each lot studied at different dates. These measures are taken every day.

3. Results

The results of dehydration and regeneration of the mini-cuttings are presented in figures 6 to 7 and Table 1.

3.1. Dehydration

The analysis of the dehydration rate curve for the Bocou 1 variety reveals three (3) major phases. An ascending phase from the 1st to the 3rd day (phase I), where the speed reaches a maximum of 4.84 g /j on the 3rd day. Then a descending phase from the third day to the 12th day (phase II) with a large variation of the speed (from 4.84 g / d to 0.95 g / d on the 12th day). Finally, a stationary phase (phase III) where the speed varies little, (Figure 3.1). These variations in speed make it possible to understand that the dehydration of the plant material is not constant but that it is distributed over time.

However, the same phases are found in the Yavo variety with the same delay, showing a slight modification from the 24 th day (Figure 3.2). While the maximum dehydration reached for the Yavo variety is 4.2 g / j for an initial mass of 64 g that of the Bocou 1 variety is 4.84 g / j for an initial mass of 73 g both on day 3. The appearance of the curves of speed and the values being almost similar, allows us to say that the dehydration is the same for the two varieties.

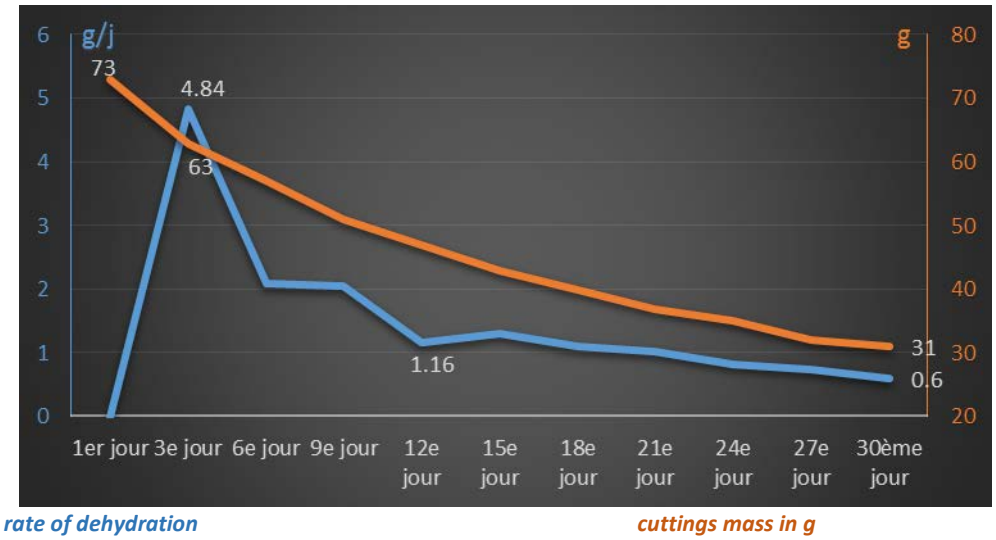

Figure 3.1 Dehydration curve and dehydration rate of the variety Bocou 1

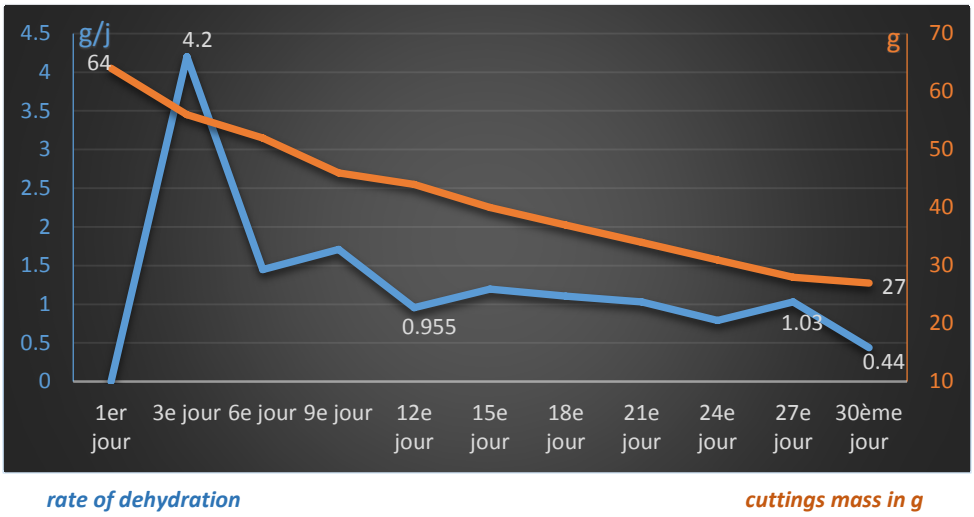

Figure 3.2 Dewatering curve and dewatering rate of the variety Yavo

3.2. Regeneration

The values obtained initially show that, the longer the dewatering time, the lower the percentage of regeneration, regardless of the substrate. Also, dehydration exceeding a period of 3 days has an inhibitory action on regeneration. However, the Yavo variety is more resistant to dehydration with great indifference in the substrates, whereas Bocou 1 develops optimally only on substrates 1 and 2 (Table 3.1)

Table 3.1 cumulative percentage regeneration for Yavo and Bocou 1

Age : 10 days after nursery								
Percentage of regeneration (%)								
substrate	Yavo variety				Bocou 1 variety			
	30 days	9 days	3 days	reference	30 days	9 days	3 days	reference
Soil (substrate 1)	0	16	96	96	0	0	88	84
Soil+sawdust white+sawdust red (substrate 2)	0	20	100	92	0	12	80	72
Soil+sawdust red (substrate 3)	0	24	92	88	0	0	64	44
Soil+sawdust white (substrate 4)	0	16	84	96	0	8	44	52
Age : 22 days after nursery								
Soil (substrate 1)	0	16	96	100	0	0	100	88
Soil+sawdust white+sawdust red (substrate 2)	0	24	100	100	0	12	96	72
Soil+sawdust red (substrate 3)	0	28	96	96	0	0	64	48
Soil+sawdust white (substrate 4)	0	20	88	100	0	8	52	52

30 days: mini-cuttings dehydrated within 30 days; 9 days: mini-cuttings dehydrated within 9 days;
3 days: mini-cuttings dehydrated over a period of 3 days

4. Discussions

During the study, it was found that the dehydration of cassava mini-cuttings was not constant, but that it evolved over time. This evolution is marked by the succession of phase with high dehydration, phase with low dehydration and finally of phase showing a quasi-zero dehydration. Indeed, the fresh plant material contains an enormous amount of water in the cell vacuoles as well as tissues, allowing a good hydric regulation of the entire vegetative apparatus. Moreover, the surplus of this water is eliminated from the plant by several phenomena in particular by the lenticular transpiration in the suber. The greater the tear, the sweeter is accelerated until the reserves are exhausted. This is what we see when we cut the stem into cuttings. The tears are so important that the plant material reaches maximum dehydration by the 3rd day. This rate of dehydration is reduced over time due to (i) the low water content remaining in the tissues after the first three days; (ii) the use of the remaining water in storage for the physiological needs of the cutting.

This allows us to also understand the decreasing percentage of regeneration according to the dehydration time. Plant cells and tissues undergoing water stress undergo physiological adaptations leading to a reduction in water expenditure in order to ensure the life of the plant. Thus, the longer the time for applying stress, the more internal metabolism is inhibited until death is followed. Cuttings that have reached this threshold can not regenerate. We also note that the Bocou 1 variety grows preferentially on substrates that do not contain red sawdust while the Yavo variety shows great indifference on the substrates. Red sawdust would therefore surely contain elements slowing down the internal metabolism of cuttings of the bocou variety1. However, these elements would be inhibited in the Yavo variety, which allows a harmonious development of the plant material. Our results are in contradiction with those of Raffaillac and Nedelec (1988) in the behavior of cassava at the beginning of the cycle, according to the duration of storage of the cuttings. They demonstrate that fresh cassava stems stored horizontally 1 to 3 months and then cut into cuttings have a faster growth expressed by a greater speed in the appearance of leaves and an outlet of a greater number of basal roots. However, the viability of the stems has been preserved through the use of chemical treatments.

From another point of view these results are also in contradiction with those of Miege (1957) in cassava crop trials. He shows in these works that the longer the cut size is, the higher the percentage of retention and stem formation. This, however, shows the need for the use of improved varieties for mini-cuttings technique.

5. Conclusions

This work initially made it possible to establish an experimental protocol for the production of cassava nursery from mini dehydrated cuttings and also to understand the influence of dehydration on the regeneration of mini cuttings. Then it directs us while highlighting the limits related to this technique. However, further analyzes on (i) the comparison of the regeneration percentages of the different parts (averted, semi-averted and apical) of the cassava stem; (ii) the composition of the suitable substrate for maximum productivity; could provide more explanation in order to perfect the technique. Finally, it will reduce the quantity of manioc stems per hectare for the same or better productivity, favoring maximum profit.

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