International Journal of
Advances in Scientific Research and Engineering (ijasre)

E-ISSN : 2454-8006

DOI: http://doi.org/10.31695/IJASRE.2018.32960

Volume 4, Issue 12
December - 2018

Evaluations of the Capacity and the Characteristics of Germination of *MyrianthusArboreus* (Cecropiaceae)by Cuttings Culture

AKAFFOU Doffou Sélastique[1], KOUASSI Kouadio Henri[1] and N'DAH Kouadio[2]

[1]Laboratory of Plant Biology, Conformation and plants Improvement of Jean

Lorougnon Guédé University, BP150 Daloa

Cote d'Ivoire

ABSTRACT

Myrianthusarboreus is a food and medicinal plant. The young sheets, rich in amino-acids and rock salt are consumed out of sauce vegetable and like sauce vegetable. The seed rich in linoleic acid is consumed from Côte d'Ivoire to Congo. In addition, the sheets, the fruits and the bark have many therapeutic virtues. Thus, the objective of this work is to contribute to the domestication of M. arboreus through his regeneration by cuttings culture. With this intention, three substrates of sowing (red sawdust, black soil and the mixture of black soil and red sawdust, three devices (under light barrier, greenhouse and open sky) and three types of explants (young stem, ripened stem and old stem), were tested. The results showed that the open sky device supports the best resumption of the cuttings culture with a rate of 61.48%.

The cuttings culture of the old stem presented the greatest successes (60.37%) and the black soil with 41.85% proved to be the best substrate of sowing. Ultimately, M. arboreus is propagated rather easily.

Keywords: *Myrianthusarboreus*, Cuttings culture, Regeneration of genotypes, Domestication, Sauce vegetable.

1. INTRODUCTION

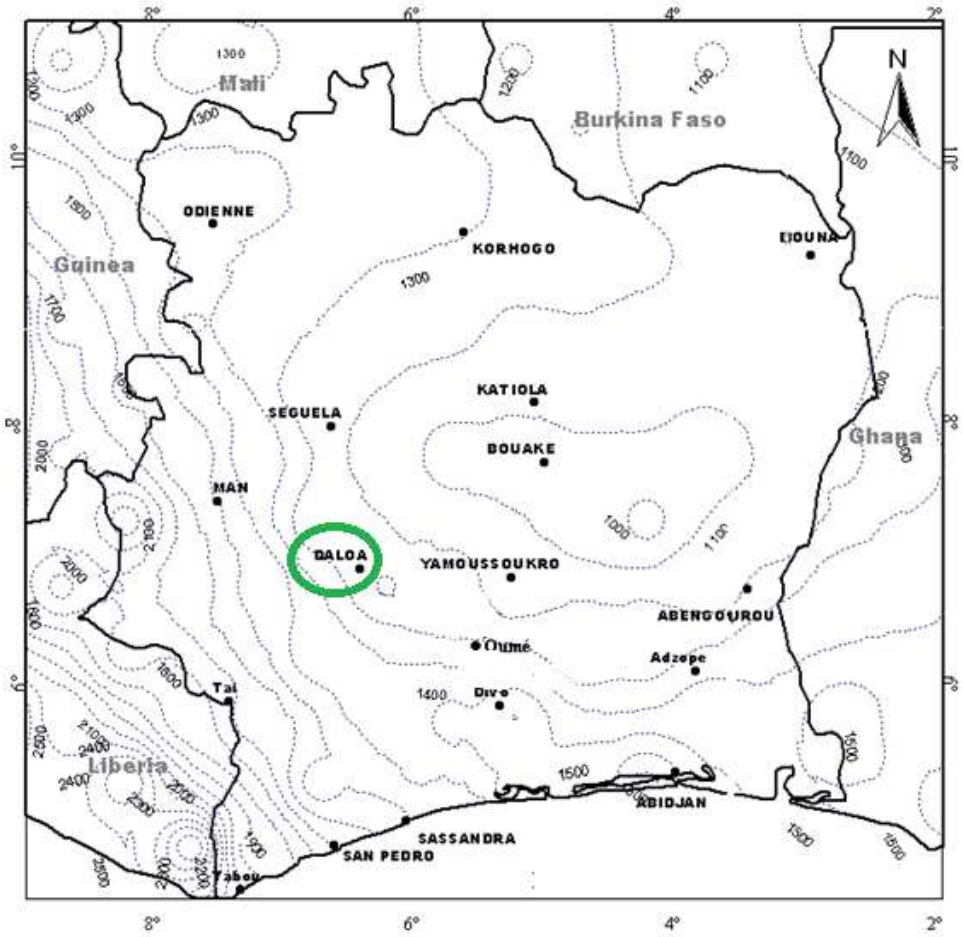
The plants were always useful for the mankind. This one makes use of it for its food, its care, its habitat etc. [1]Some are cultivated (domesticated) but of others remained in a wild state in spite of their interest [2-3].*Myrianthus arboreus* is part of this last category of plants. Its young sheets, consumed out of vegetable sauce and like legume in vegetable sauce, are very appreciated by the populations in many localities of Africa, particularly in the States of the Delta and Edo of Nigeria, in Côte d'Ivoire and in Ghana [2, 4].

A study of the nutritive elements of the young sheets revealed a wealth in amino-acids and rock salt [5]. In addition, the sheet, the bark, the fruit, the seed and the root have very recognized medicinal values. The sheets make it possible to treat the dysentery, the diarrhoea, the vomiting and the furuncles in Nigeria. In the democratic republic of Congo, the leaves are used to cure many diseases as cardiac disorders, the dysmenorrhoea, hernias incipient etc the juice from the air roots is a cough mixture and against diarrhea. This juice is a remedy against the blackwater fever and the blennorrhoea. In Côte d'Ivoire, the sheets are used against the pains of the back and the pains lumbar [5]. The seeds are used against the furuncles[6]The decoction of bark is drunk in the cases of diabetes and arterial hypertension [6].The trees attended for the harvest of the consumed parts and/or medicinal are found in the secondary fallow and forests. The dissemination of the species is made in a natural way by the animals such as the monkeys and the birds which consume the seeds [6]. In addition, the abusive and the intense exploitation of forest of Côte d'Ivoire faced to the problems of the availability of these spontaneous food plants among which appear *M. arboreus*[2]. In addition, an important variability is observed between genotypes. The domestication of this food species with high nutritional and/or medicinal value deserves to be then considered

1.2MATERIAL AND METHODS

1.2.1-Vegetable material

Vegetable material is composed of 810 cuttings of plants resulting from five wild genotypes from *M. arboreus* including three localized in the forest of Marahoué (06°54 NR, 006°09 W) and two, within the space of the Jean Lorougnon Guédé University of Daloa (06°54 NR, 006°26 W, Fig. 1).



Zone of study

Fig. 1. Location of zone of study

2-METHODS

2-1-Taking and preparation of the cuttings

Stems whose diameter lies between 2 and 3 cm were taken on the feet mothers. Each stem was subdivided in three parts: "young part (PJ)", it is the part in growth characterized by the green wood; "old part (PV)", corresponds to the old wood of maroon color and "ripened part (Pa)" which is the zone of transition between old wood and the young part (Fig. 2). 270 cuttings of each type were taken. Each cutting carries a node and measurement 14 cm length, is 10 cm below node and 4 cm above.

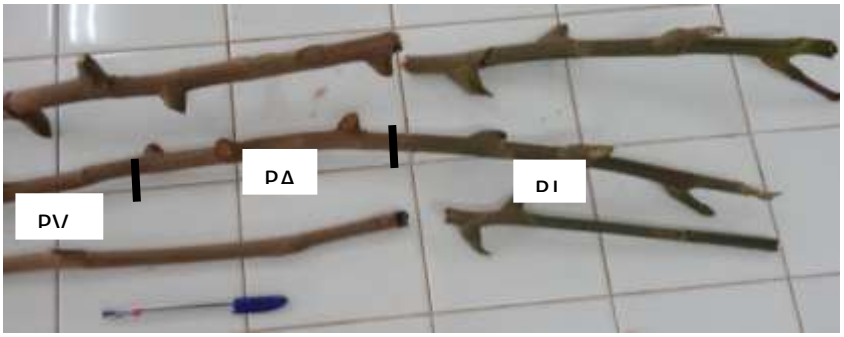


Fig. 2: Characteristics of the cuttings: PJ: young stalk, PA: a medium-aged stalk and PV: an old stalk

DOI: 10.31695/IJASRE.2018.32960

2-1-Substrates of sowing

Three substrates usually used for the propagation by cutting [7]were tested. It acts: (1) red sawdust (SC) taken in the Company of Transformation of the Wood of Daloa (STBO); (2) black soil (TN) taken in an old dump of household refuse (Figure 3); and (3) the mixture of red sawdust with the black soil (ml) in volume 50/50. These substrates after sterilization were reported in black sachets (25 X 14 cm) of seedbed

Figure 3: Red sawdust (SC) and black soil (TN)

2-2-Experimental device

The test was carried under three devices: 1) under shading (SO), under greenhouse (SS) and exposed in sun (CO; Fig. 3). The shading was built with oars of palm trees (*Elaeis guineensis*). The greenhouse is 8 m long, one (1) m broad and 0.8 m height. It was covered by a translucent plastic film. Each device comprised 270 sachets divided into three blocks of 90 sachets each one. Each block contained 30 sachets of each substrate of sowing, in total randomization.

Fig. 3: Experimental devices of propagation by cutting of *Myrianthus arboreus*; a) under shading; b) under greenhouse; c) exposed in the sun

2-3-Sowing of the cuttings and the conduct of the culture

Once installed, the sachets filled with soil were sprinkled three days successive with tap water before sowing. The cuttings were then sown by inserting them to 5 cm depth in the substrate. Each block comprised 30 cuttings of each type of body set out again in the following way: ten (10) established in the red sawdust, ten (10) in the black soil and ten (10) in the mixture of black soil and sawdust. Table I presents the distribution of the cuttings in the substrates within each device. The sachets containing the cuttings were marked with painting in order to facilitate the location of the types of cuttings in the substrates during the data-gathering. The green color indicated the cuttings of the young part; the red indicated the cuttings of the ripened part and the white color, the cuttings of the old part. The substrates of sowing are distinguished easily even with time. A watering was carried out per day for the devices under shading and the one which was exposed to the sun. The cuttings under greenhouse were sprinkled with five days interval in order to avoid exchanges with outside. Painting made it possible to make the distinction of the types of cuttings used (green, ripened and old cuttings). After the sowing of the cuttings the parameters of strength taken into account were: the budding and the mortality of the cuttings. For this purpose, each type of cuttings having developed a new stem with leafs is recorded. The measurements were taken by 5 days interval. The observations lasted 60 days of the period going from June to August.

2-4-Statistical analysis of the data

The data were analyzed from the software STATISTICA 7.1. The effects of the experimental devices and the treatments were discriminated by variance analyses (ANOVA) to test the effect of the 3 factors as well individually as in interaction. This test made it possible to check the individual influences and cumulated factors.

III-RESULTS

3-1-Development of buds (development of the cuttings).

The resumption of the cutting began with the formation of the bud starting from the 10th day after the setting in culture of those (Fig. 4 a) in the various substrates. The first sheets of the young stem appeared at the 20th day (Fig. 4 b). The blooming of the young plant took place to the 30th day (Fig. 4 c).

DOI: 10.31695/IJASRE.2018.32960

Fig. 4: Development of the buds

3-1-1-The development of the cuttings in the experimental devices

At the end of 30 days, the resumption of the cuttings was very weak under shading and very little marked under greenhouse while it was accentuated, with healthy plants in the device which was exposed in sun.lk On the level of the device under shading, thus, on the whole of the cuttings sown in the three devices, 37.53% started their development (Table 2). The variance analysis showed that the influence of the device on the resumption of the cuttings, is very highly significant with threshold 0.05 ((p =0.000). Indeed, the recovery was high in the device with exposed in sun, with a rate of 61.48%. The device under greenhouse showed a rate of resumption of 42. 22%. On the other hand, the device under shading had a low level development (8.88) %.

Table II :Rate of development of the cuttings in the devices

Devices	Rate of development (%)
Exposed In Sun	61.48^{a}
Under Greenhouse	42.22^{b}
Under Shading	8.89^{c}
Average	37.53

3-1-2-Development of the cuttings in the various typesof substrates

For the whole of the substrates the average rate of resumption of the cuttings was 37.53%. In addition, the variance analysis (Anova) concerning the influence of the substrates on the percentage of recoveries is significant at threshold 0.05 (p = 0.0123). Indeed, 41, 85% of the cuttings sown in the black soil developed themselves again against 37.40% and 33.33% for the mixture of black soil-sawdust of wood and sawdust respectively (Table 3). The black soil showed the best rates of budding compared to the sawdust and with the mixture red sawdust black soil.

Table III : Rate of development of the cuttings in the devices

Substrates	Rate of development (%)
Black Soil	4185^{ab}
Mixture	37.40^{bc}
Sawdust of Wood	33.33^{c}
Average	37.53

3-1-3-Development of the various types of cuttings

The average rate of resumption of the cuttings was estimated at 37.53%. But this recovery differs from some of cutting to another. Indeed the variance analysis of average rates of recovery according to the type of cutting is significant at threshold 0.05 (p= 0.000). Thus the recovery was high with the old cuttings (60.37%). This rate was 38.14% with the ripened cuttings and 14.07% with the green cuttings (Table 4).

DOI: 10.31695/IJASRE.2018.32960

Tableau IV: Rate of development of the cuttings

Cuttings	Rate of development (%)
Old Stalk	60.37[a]
Medium-Aged Stalk	38.14[b]
Young Stalk,	14.07[c]
Average	37.53

3-1-4-Development of various types of cuttings according to time

After sowings of the various substrates, the resumption of the ripened and old cuttings started at the 10th day under shading while the resumption of the young cuttings began at the 15th day. The resumption of the old cuttings reached average rates maximum at the 35th day with a rate of 21.11%. The ripened and green cuttings reached average rates maximum of recovery at 20th and 25th day with rates of about 3.33% and 2.22% respectively.

Under greenhouse, the young and old cuttings took again the 10th day except for the ripened cutting which started the recovery the 15th day. The maximum average rate of the resumption of the old cuttings was obtained the 40th day with values of about 77.77%.

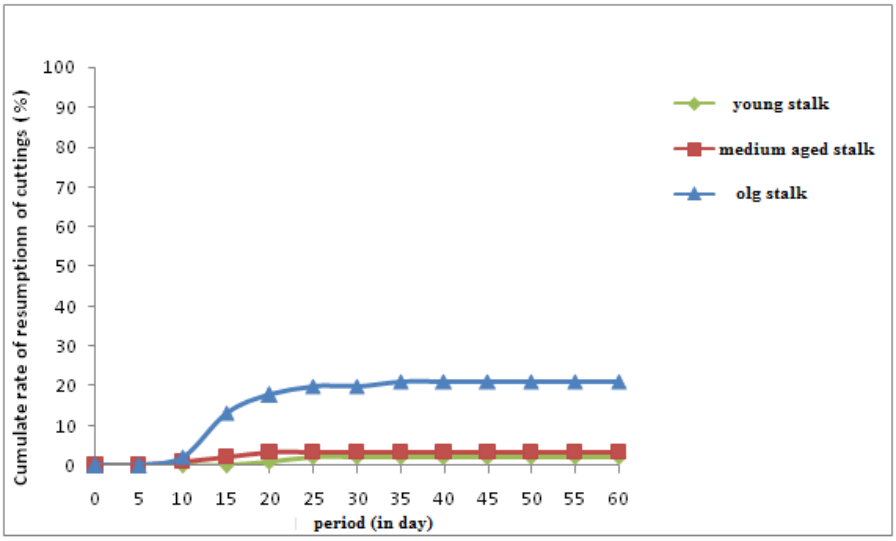


Fig.8 : Rate of resumption of cuttings in the curse of time under shading.

The maximum average rate of recovery for the ripened cuttings was obtained the 40th days with values of about 71%. That of the green cuttings was obtained the 20th day with values of about 12% (Fig. 9).

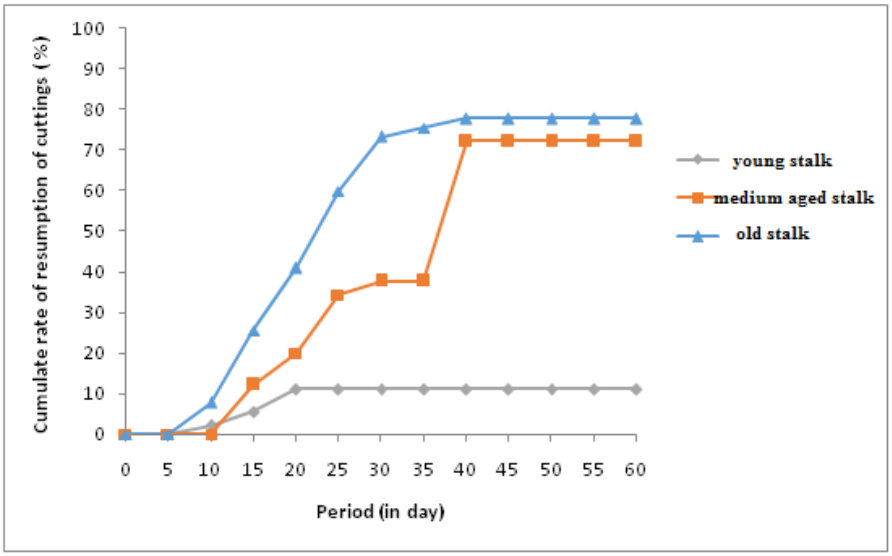


Fig. 9: Rate of resumption of cuttings in the curse of time under greenhouse

DOI: 10.31695/IJASRE.2018.32960

In the device exposed in the sun, the recovery on the level as of three types of cuttings began 10th during the day. The maximum average rate of the old cuttings was obtained at the 5th day with respective rates of about 82.22% for the old cuttings and 73.3% for the ripened cuttings the maximum average rate of the young cuttings of about 28.88% were obtained it 45th day (Fig. 10).

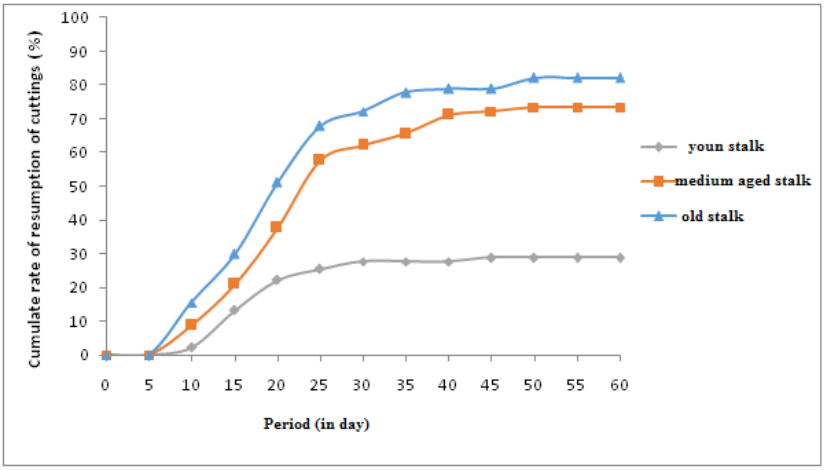


Fig. 10: Rate of resumption of cuttings in the curse of time exposed in sun .

III-DISCUSSION

3-1-Development of the cuttings in each experimental device

The mortality of the cuttings under the shading is higher than in the two other devices (under greenhouse and exposed in sun). Indeed, the weak luminosity created by the shade would become unfavorable to the development and the growth (formation, development and opening of buds) of *Myrianthus arboreus* which is a heliophilous plant. Similar observations were made by [8]which showed that the lack of light due to the shade and the relation air-moisture are among the external independent factors which influence the resumption and the rooting of the cuttings causing the death of those thus. Also, the excessive warming under greenhouse involves the rise of the temperature; which temperature causes the water loss, the drying and the death of the cuttings. However the temperature of the device exposed to the sun for which mortality is less low proves to be favorable for the resumption of the cuttings. It is what could note [9]with woody plants. Indeed, these authors showed that the temperature of the medium of test must be similar to the room temperature of the natural environment of the plant mother to support the recovery. In addition,[7] noted that the suitable device for the propagation of the cutting of *hibiscus sabdariffa* is the shaded tunnel.

3-2-Development of cuttings in various types of substrates

The highest mortality rate was observed in the red sawdust whereas the black soil induced the low level of mortality. The sawdust would be a substrate difficult to transform by the micro-organisms for mineralization like it noted by [10], on the effect of the composition of various farming substrates on the growth of *Gambeyan lacourtiana*. Indeed, the sawdust which contains sometimes toxic substances has an acid pH not supporting the development of the micro-organisms responsible for the degradation of wood.

3-3-Development of cuttings according to the types of cuttings

Mortality was very high on the level of the young cuttings. This mortality would be related to the excessive water loss by this one. Indeed, the cutting of stem which is a fragment, does not receive any more water and mineral salts when it is separated to the plant mother. Moreover, the growth regulators synthesized in certain bodies of the plant do not reach him anymore. Thus, to obtain the formation of the missing parts, the cutting must remain turgescent throughout the process. Little time after the development, the cells damaged by the cut and handling is desiccated and died. A plate necrotic is formed and the conducting cells of the wood are stopped. The result of such a mechanism of defense protects the wounds against the desiccation and several disease-causing agents like it underlined [9]. But during this process, the young cuttings very quickly lose their state of turgescence and this plate necrotic cannot be formed; what is not the case with the cuttings ripened and old whose desiccation is slower. Also, [11]reported that the failure of the propagation by cutting of the young branches of *Piliostigma reticulatum* is due to the fact that they do not contain enough nutritive reserves necessary to allow a possible development. In the present study, the old stem of *M. arboreus* had appeared as the best organ for the propagation contrary to *Dacryodes edulis* or it ripened wood would be the cutting appropriate to the propagation according to[12]. The cutting of the old part of the stem of *M. arboreus* gave satisfactory results owing to the fact

DOI: 10.31695/IJASRE.2018.32960

that with the 50th day of the test, certain growths produced cal and others of true roots for survival and the development of the growths

3-4-Development of cuttings in the various types of substrates

The black soil proves to be the best substrate for the propagation of cutting of stem of *M. arboreus* according to the test results. The success rate recorded on this substrate (black soil) lets predict that *M. arboreus* would be adapted to the physical, chemical and biological conditions of this substrate. These results are similar to those of[13] and [14] which showed that the black soil is a porous and light substrate. It has a good water holding capacity and facilitates at the same time a good circulation of water and oxygen at the base of the cuttings. In the same way, [7]showed that the rate of survival of the cuttings of *Hibiscus sabdariffa* is higher in the black soil than in the sawdust. We think like [15-16] that in seed nurseries, the substrate must be made up of easily degradable organic matters to give good performances. Indeed the quality of the substrate is a very important parameter for the success of the resumption of the cuttings. Because the rooting of the cuttings and the requirements of the species compared to the various substrates depend to hydromorphic nature or xeromorphe as it was mentioned by [17]

3-5-Development of various types of cuttings according to time

The tests showed that for the old cuttings, the recoveries proceeded over long period. The capacity of the cuttings to the development is higher with the old stems as the young stems. There is a gradient growing of resumption of the apex (end of the stem) towards the base of the stem. Indeed, the old cuttings would manage to preserve for a long time their nutritive elements for the formation and the opening of the buds. Whereas the young cuttings lose the nutritive reserves easily, that results in development of embryonic buds followed by the desiccation and the death of the cuttings according to[9]. The precocity of the resumption of the young stems expose them to an early mortality, especially when these cutting are placed under the unfavourable ecological conditions. The times of recovery which proves to be long for the old stems is an asset major for the consolidation of the young buds resulting from these cuttings?

4. CONCLUSION

The main objective of this study consisted tested the capacity of the regeneration of *Myrianthus arboreus* (a food plant) by the vegetative or asexual way. Thus, after experiments made on the devices under shading, under greenhouse and exposed to the sun, the device exposed to the sun proved to be the most suitable for the propagation of cuttings of this plant species. Between the three substrates of sowing tested, the black soil proved to be the good substrate. In addition the test of regeneration showed that the old part of the plant is more viable. Ultimately, the device exposed to the sun, the black soil and the old stem are the best elements of regeneration of cuttings by propagation of *M. arboreus*. The resumption of the cuttings starts with the formation of the bud followed by its opening as of the 10th day and the leaves appear 30 day after the culture of the cuttings. However, it would be interesting to improve the recovery and the rooting of the cuttings by the use of vegetable hormones.

REFERENCE

[1] Dupriez H., De Leener Ph., Arbres et agricultures multi étagées d'Afrique. Terre et vie, 1993, 85 : 82-90.

[2] Kouamé N M T., Gnahoua G M., Konan E., Kouassi K E., Traoré D., Plantes alimentaires spontanées de la région du Fromager (Centre-Ouest de la Côte d'Ivoire) : flore, habitats et organes consommés. Sciences et Nature, 2008, 5 : 61-70.

[3] Djaha A., N'da A., Kehe M., Espèces fruitiers sauvages comestibles de Côte d'Ivoire: inventaire, étude et essai de domestication, 1994, .29 p.

[4] Okafor JC., *Myrianthus arboreus*: Plant Resources, of Tropical Africa, 2004, 10 p.

[5]Amata I A., Valeur nutritive des feuilles de *Myrianthus arboreus* : Un parcourir des végétaux. International Journal of Agricultural Research, 2010, . 5: 576-581.

[7] Sie R.S., Akaffou.D.S., Koné D., Dogbo O D., Assohoun V., Charles G., Branchard M., Influence des conditions de culture et du substrat sur le développement des boutures de l'oseille de Guinée (*Hibiscus sabdariffa*) : Agronomie Africaine, 2008,. 20 : 141-149.

[6] Orwa C., Mutua A., Kindt R., Jamnadass R., Simons A.. Agroforesterie base de données : un guide de référence et la sélection arbre version4.0 (http//www.Worldagroforestry.org/af/treedb), 2009, 5 p.

[8] AmoahFM.. Review of vegetative propagation of cacao (*Theobroma cacao L.*) by rooted cuttings. 2. Environmental and technical considerations. Ghana Journal of Agricultural Science, 2006, 39 : 217-226.

DOI: 10.31695/IJASRE.2018.32960

[9] Hartmann H T T., Kester D E., Davies F T., GeneveJr R L,. Plant propagation principles and practices 6è edition, prendice-hall in somon et Schuster, upper saddle River, New Jersey 07458, USA, 1997, 770 p.

[10] Nguema N., Ondo A., Mouele B., Ntsame N., Souza A. (2014). Effet des substrats culturaux sur les paramètres de croissance de *Gambeyalacourtiana* en pépinière au Gabon : Journal of Applied Biosciences, 73 : 5902-591.

[11] Traore M., Etude de la phénologie, de la régénération naturelle, et des usages de *Piliostigmareticulatum*Hochst.en zone Nord soudanienne du Burkina Faso : Mémoire d'Ingénieur du Développement Rural ; Université Polytechnique de BoboDioulasso, 2000. 95 p.

[12] Aumeerudy Y., Pinglo F.,Phytopractices in tropical regions. A primary survey of traditional crops irnprovement techniques. UNESCO/MAB/LaboratoireBotaniqueTropicale.Montpellier, 1989, 71 p.

[13] Garbaye J., Tacon F.. Production de plants de chêne et de hêtre à partir des boutures herbacées. Académie d'agriculture de France, extrait du Procès-verbal de la séance du 21 juin, 1978, 7 p.

[14] Mapongmetsem M P., Djoumessi M., Fawa G., Doumara D G., Noubissie T J., Tientcheu A.. Domestication de *Vitexdoniana Sweet (verbenaceae) :* influence du type de substrat, de la stimulation hormonale, de la surface foliaire et de la position du nœud sur l'enracinement des boutures uni nodales 23 p. Journal of Agriculture and Environment for International Development, 2012, 106 : 23-45.

[15] Weigel J., Agroforesterie pratique à l'usage des agents de terrain en Afrique tropicale sèche, 1994, 208 p.

[16] Schippers C., Valorisation des pépinières villageoises : Rapport de mission, projet DACEFI, Nature Gembloux, 2007, 47 p.

[17] Loach K. Rooting of cuttings in relation to the medium: Combine proceeding of the International propagation Society, 1985, 35:472-485.

DOI: 10.31695/IJASRE.2018.32960