International Journal of Research Studies in Biosciences (IJRSB)
Volume 3, Issue 2, February 2015, PP 1-6
ISSN 2349-0357 (Print) & ISSN 2349-0365 (Online)
www.arcjournals.org

Optimization of the Culture of Pericopsis elata by Mineral and Organic Amendments in the District of Yokadouma

Asseng Charles Carnot[1] *, Taffouo Victor Désiré[1], Nyate Parfait Claudert[1]

[1]University of Douala (Cameroon), Faculty of Science,
Laboratory of Plant Biology and Physiology
**carnot@mail.ru*

Ambang Zachée

University of Yaounde I
Department of Plant Biology and Physiology
Yaounde, Cameroon.

Abstract: *Production of plants Pericopsis elata (Assamela) has been optimized by mineral and organic amendments. NPK fertilizers (20-10-10) and dry chicken manure were used for this purpose. To carry out this study, three batches of 30 seedlings were established. Seedlings of lot 1 were the witness, those of lot 2 received NPK (20-10-10) and finally those of lot 3 were chicken droppings. After eight weeks, the growth parameters such as height and average diameter of the seedlings were measured. In the laboratory analyses were performed to determine the levels of chlorophyll a, b and a + b, and the protein, fat and total carbohydrates. The application of NPK (20-10-10) and chicken manure positively influence protein levels in seedlings Assamela, being 29.0, 27.7 and 19.1 g/gms respectively seedlings lots 3, 2 and 1. The amendments made have reduced the residence time of the seedlings in the nursery from September to June months have robust plants.*

Keywords: *Amendments, Growth, chicken droppings, NPK (20-10-10), Pericopsis elata*

1. INTRODUCTION

Pericopsis elata is a plant of the family of Fabaceae, known commercially under the names of Afrormosia or Assamela. It is a species of the dense forest guinéo-congolese, classified by the International Union for the Preservation of the Nature (UICN) as endangered species. In Cameroon, the area of distribution of Afromosia covers a surface about 4 071 857 ha (OIBT/CITES, 2008) and is essentially limited in the east province, in the ponds of the following four rivers: Dja, Boumba, Ngoko, and Sangha.

OIBT/CITES workshop on the sustainable trade of the wood of the afrormosia held from 02 till 04 April 2008 Kribi, was for the pond of Congo, the first activity realized within the framework of this project. During this workshop, the Cameroonian forest companies represented by the Grouping of the wood industry lifted among others, two problems: regeneration of Assamela and the minimum diameter of exploitability. A recent study of the deforestation in Central Africa (Duveiller et al., 2008) considers that from 1990 till 2000, the rate of clear deforestation in Cameroon was 0.14 %, the clear deforestation being the result of the difference enters the average of the raw deforestation (0.20 %) with that of the raw reforestation (0.06 %). The same study gives an estimation of the rate of clear degradation of bits in 0.01 % Cameroon. Even if this rate of deforestation makes of Cameroon the second country of the pond of Congo where the deforestation is the most raised after the Democratic Republic of Congo, it remains generally weak as moreover the average rate of deforestation in all the pond of Congo.

Cameroonian forest code recommends to the foresters to transplant the ligneous species with high commercial value in certain conditions. The complete program of this regeneration is often presented in the document of the development plan. The problem often met by the foresters is the lack of quality seeds and the long lasting time of good forestry of Afrormosia. The Ministry of Bits and the Crowd (MINFOF) is the main responsible institution for the sustainable management

of bit and crowd. The national Agency for the forest development (ANAFOR), has as attribution the support forest regeneration. This program was finalized with the support of the international partners in 2003 and is operational since 2004.

The main objective is to supply a concrete case of integrated survey factors of regulation biodiversity of a planting submitted to anthropological pressures, to develop eventually models integrated by sustainable management. This study implies that works of genetics, pedology and ecology are led on complementary themes in the semi-evergreen forests of the Southeast of Cameroon.

Within the framework of the ecological studies, diverse plans of ground were set up. Convincing data on the ecology of reproduction of the Iroko and the Assaméla are already available. They concern in particular the phénology of the reproductive phase of these species. The first analyses of the samples ground brought back by Cameroon reveal the presence of grounds which contain few nourishing elements. They are generally acid and homogeneous, distorted.

To protect the extinction of Assamela, the forest legislation of Cameroon (Arrested 0222 / ha / MINEF) puts a particular accent on the management of essences CITIES through the development plans. The implementation of this legislation meets difficulties with the cameroonian forest companies developer Assamela, namely: the necessity of a systematic regeneration, the non-control of the silvicultural techniques, the non-availability of quality seeds, etc... This study aims globally at optimizing the culture of Pericopsis elata by mineral and organic amendment in tree nursery.

Except those led to Ghana (Asare, 1994), very few researches were led to the agronomic level on the type of fertilization suited for this essence in tree nursery. A study was led through a trial with two variables and a witness. The purpose aimed by this trial was to determine the type of fertilizing the best adapted and the optimal time of stay in tree nursery of this essence.

2. MATERIAL AND METHODS

Site of the study: The study was realized in the locality of Ngolla35, in 35 km of the city of Yokadouma East Cameroon. The climate of this region is low-lying wet equatorial type with a bimodal pluviometry. Four seasons mark this zone; two seasons of rains were inserted by two dry seasons. The annual average precipitations of the last decade are situated around 1400 mm. The annual average temperatures are situated between 24 and 27°C. Material:

The collection of seeds was elaborated by the collectors beforehand trained. Seeds were collected in the UFA of the CFAC to Libongo, CFC to Ngola 35, Decolvenaer to Messok and the forest plantations of Bidou II to Kribi and to Ndengndeng. Visits of grounds and missions were made with the dealers of the east region (Mindourou, Lamedou, Yokadouma, AbongMbang, Batouri, Bertoua and Mbang). They facilitated the familiarization of the dealers with the activities of the project (more particularly those in touch with the research and the forestry). The works led in this frame allowed the identification of 05 groups of dealers (Pallisco, CFC, SFID, the group DECOLVENEARE and the STBK) targets. The silvicultural Councilors and the peasant committees' forests did a training course in the forestry of the Assamela. Afterward tree nurseries were installed in six (06) concerned concessions. Plantations produced in tree nurseries from the collected seeds allowed to enrich the forest concessions.

Experimental device: A device of 90 seedlings was set up. These seedlings were distributed in three lots of 30 (the Lot 1, the Lot 2 and the Lot 3). The Lot 1 received no treatment (witness), the Lot 2 was fertilized in the NPK (20-10-10), at the rate of 5g per seedlings, the Lot 3 received droppings of chickens at the rate of 15g per seedling. Experiment was three times reproduced.

Data collection: three lots are placed in the same environmental conditions (hygrometry, temperature, and period of sunshine) and the follow-up of the parameters of growth was made during two months. These parameters were the height of stalks and diameter in the snare of the seedlings of every lot. The measure of the height of stalks was taken from the snare up to the last fork of the top of seedlings.

In the laboratory, the contents in chlorophyll, in macroelements and in ash of the seedling were determined in leaves taken from every lot.

Chlorophylls a, b and a + b were measured according to the Harold H. Haskin method (1942). The absorbance of the chlorophyll is measured in 645 nm for the value x and in 663 nm for the value y

from a solution of raw chlorophyll in the acetone to 80 % (Bruisnma, 1963; Fabre, 2003, cit. Noubissi, 2004).

Total carbohydrates contained in the leaves of samples were determined by the method of difference (AOAC, 1980; Agbor-Egbe and Rickard, 1990; Taffouo, 1994).

The method of KJELDAHL (AOAC, 1980) allowed the determination of the content in nitrogen by mineralization.

The method of KJELDAHL (AOAC, 1984) allowed to determining the content in lipids. This same method is based on the total destruction of the very high-temperature of organic matter. The sample is cremated in 500 °C during at least 6 hours and in oxidizing atmosphere until the obtaining of the whitish residue of constant mass (ashes).

Statistical analyses: the registered data were analyzed by the statistical software SAS. 9. The Generalized Linear Model (GLM) was used for the analysis of variance, on one hand to see the general behavior of treatments witness, NPK and droppings and on the other hand to see the behaviour of treatments every week. The GLM was followed by the separation of the averages with the tests of Student-Newman-Keuls (SNK).

3. RESULTS

Effects of the mineral and organic amendments on the growth in height of seedlings: the figure 1 indicates the average growth of the seedlings of every lot per week. At the end of 8 weeks of observation, the seedlings of the lot 2 have an average height of 18.82cm, followed by the seedlings of lot 3 16.73cm and finally 13.61cm for the seedlings of lot 1. Thus there is a significant difference of 5.21cm and 3, 12 cm growth between the seedlings of lot1 and lot2, and lot1 and lot3 respectively.

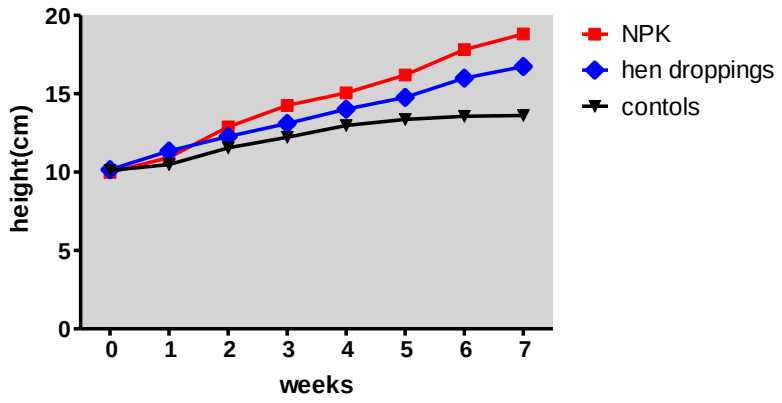

Fig1. *Average height (cm) of the young plants of every patch per week, alpha = 5%.*

Effect of the mineral and organic amendments on the development of the diameter of seedlings: the result of this study shows that, the fertilizer NPK (20-10-10) and droppings have almost similar results (4.103 and 4.076 cms respectively) significantly different compared with the witness (3.74 cm) (fig.2).

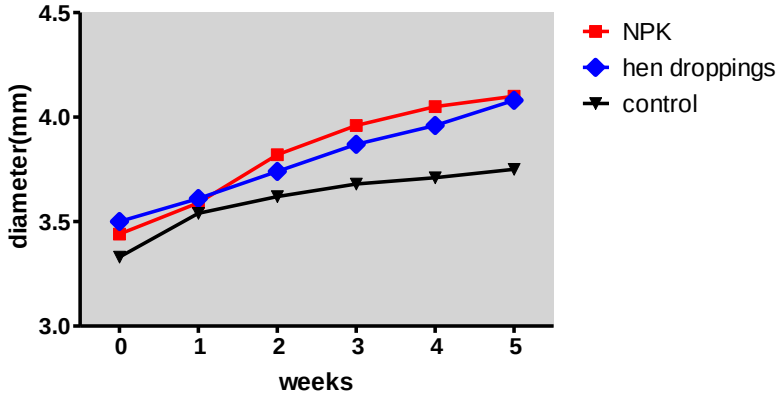

Fig2. *The behaviour of the average diameter of the plants during the experiment, alpha = 5%.*

Effect of the mineral and organic amendments on the concentration in chlorophyll: the rate of chlorophyll a is almost equal to the seedlings of lots 1, 2 and 3. On the other hand the rate of chlorophyll b is raised at the seedlings of lots 2 and 3 compared with the witness lot. The chlorophyll (a+b) of the lot 2 is slightly superior to the lot 3, the last two lots are superior to the witness lot (Fig.3).

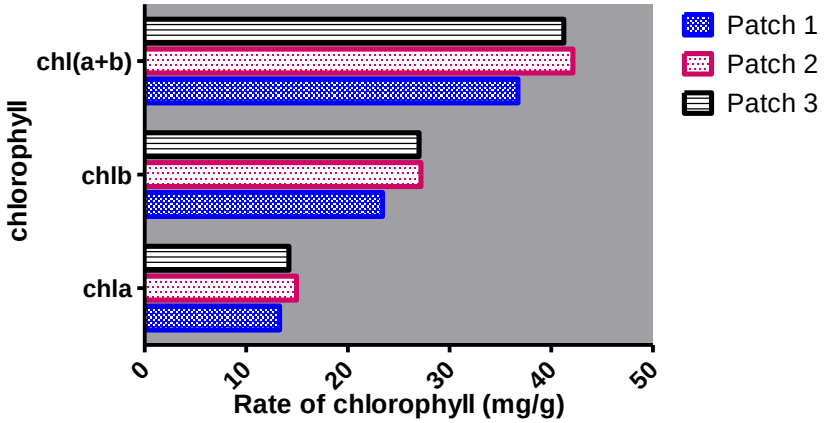

Fig3. *Average rate of chlorophyll (mg/g) per patch*

Effects of the mineral and organic amendments on the contents in organic matters: the figure 4 reveals that the contents in dry materials of the seedlings of lots 1 and 3 are almost equal, whereas they are slightly superior to those of the lot 2.

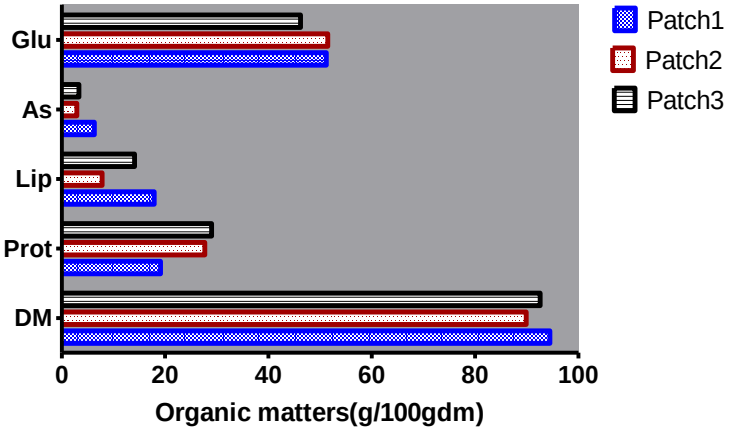

Fig4. *Effects of the amendments on the organic matters. Dm: Dry matters; Prot: Proteins; Lip: Lipids; As: Ashes; Glu: Glucides. Logiciele d'analyse descriptive : Graphpadprsim5*

The contents in protein of the seedlings of lots 2 and 3 are almost equal and they are superior to the contents of the seedlings of the witness lot. The contents in lipid are more raised at the seedlings of the lot 1, followed by those of the lot 3. The weakest contents being registered at the seedlings of the lot 2. The contents are respectively 17.9; 14.1 and 7.8 g / 100gms to them lot1, lot2 and lot3. The contents in carbohydrates are almost even to the seedlings of lots 1 and 2, and they are more raised compared with those of the lot 3. The rates are 51.5; 51.2 and 46.2 g / 100 gms respectively. Ash contents are more brought up at the seedlings of the lot witness compared with those of the lots 2 and 3. The seedlings of the lot 2 are the poorest in ashes.

4. DISCUSSION

The data on the optimization of the culture of the seedlings of P.elata by amendment allowed classifying the various treatments in order of performance. The NPK (20-10-10) gives results more successful than droppings of hens and compared with the lot witness. Fertilizer NPK (20-10-10) and droppings has significantly different resultscompared with the witness on the height of seedlings. Besides both treatments NPK and droppings are significantly indifferent for the growth of the diameters of seedlings compared with the lot witness. These results could be

understandable by the fact that the brought amendments improved the quality of the key nutriments of the substratum (NO-3, H2PO-4, K +, Ca +, etc.) seedlings (Ali, 2007). This result is also confirmed by the works of Asare (1994), in Ghana; during these works, the NPK was used compared with the pure compost. The latter had as for him no incidence on the parameters of growth.

Besides, the results of this study also showed that the amendments had positive effects on the contents in chlorophyll and organic matters. These results also confirm the conclusions of the research paper of the project OIBT/CITES (Mvondo, 2009), these indicate that the foliar analysis of the seedlings of Assamela of twelve months in the zone of Belabo show the content in nourishing elements in the following order: N> K> Na > P> Mg.

Within the framework of the silvicultural activities, in particular in production of plantations, the fertilization has positive effects in the growth of seedlings.

Bonneau (1963), indicate that in the field of application of the fertilization FRICKER, for example, obtained in two essays of Jura the earnings diminution interesting on spruce with a phospho-potassium fertilizer applied by foot at the time of the plantation. Positive answers were also registered on poplar groves, either with the nitrogen, or with the phosphor and the potassium.

The fertilization of the seedlings of P. elata can guarantee good results only if the nourishing elements are not washed by the water of irrigation. Fabienne et al. (2003) raise that losses in NO-3, in NH+4, P, K and That and in Mg were measured during the irrigation of the cultures produced in bowl in forest tree nursery. The loss of these mineral elements would be limited by a good management of the irrigation and the fertilization of seedlings.

5. CONCLUSION

Study on the optimization of the culture of P.elata by mineral and organic amendments gave better results onto the parameters of growth such as the height of stalks and diameter of the stalk. Two types of fertilizer were identified for these amendments, the NPK (20-10-10) and the droppings of Chicken. Other parts of the considerable results were so much obtained for the contents in chlorophyll has, b and a+b that for organic matters Besides, the organic or mineral fertilization allowed to reduce the time stay of seedlings to tree nursery of 30 % at least and to have strong plantations capable of resisting the hazards of its natural environment. Instead of 9 months, seedlings stay 6 months in tree nursery. This saving of time allows according to the Cameroonian forest Code, to reconstitute the populating of essences exploited with the same rhythm as the exploitation.

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