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Influence of the dynamics of *Albizia adianthifolia* and *Albizia zygia* on the dynamics of other woody forest

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ABSTRACT: The present survey aims at establishing the influence of the dynamic of two arborescent Legumes trees of the Mimosaceae family (*Albizia adiathifolia* and *Albizia zygia*) on the woody forest, their evolution during the reconstitution of post-cultural flora. It was conducted at Oumé (West-Center of Côte d'Ivoire) in semi deciduous forest zone. The main objective is to highlight the influence of *Albizia adianthifolia* and *Albizia zygia* two legumes tree, on the other woody forest species on the basis of the correlations between biological parameters (growth in height, growth in thickness) resulting of interspecific competition (Albizia-other woody forest species) in order to put it to use in the programs of forest regeneration. Flora inventories and measurements done in 45 gradual age plots (5 to 53 years) showed that at the youthful stadium (0 to 10 years), the growth in thickness of the woody forest is influenced by the one of the two arborescent Leguminous trees (*Albizia adianthifolia* and *Albizia zygia*). On the other hand, the influence of the height growth of the arborescent leguminous trees on the one of the woody forest is discernible between 0 and 25 years. Beyond of 25 years the woody forests are progressively higher than the Albizias and finish by imposing themselves after 65 years.

KEYWORDS: Albizia, Côte d'Ivoire, semi-deciduous forest, influence, woody forests.

1 INTRODUCTION

Among the major developments of the post-cultural vegetation there is a gradual variation of the diversity and richness of flora. These changes are observable through changes recorded in the physiognomy of the vegetation during the flora reconstitution in the forest zone of Côte d'Ivoire. The study of the dynamics of woody plants (growth, structure) requires a longer period of observation. Indeed, unlike the herbaceous layer characterized by numerous variations on the short or medium term, the changes occurring in the woody stratum are generally slow. This layer is mainly composed of species of the group "K" tardy in evolution and long life (CLAUDE *et al*., 1998 [1]). In addition, the overall analysis of the post-harvest reconstitution does not always gives a good understanding of the changes that are taking place within the community of woody arborescent. Also, the study of the process of recovery of arborescent woody vegetation is very important if we consider that, it is about an economic resource, multi-purpose utility and less available. In addition, this forest resource induces many changes in the vegetation, especially in the structure and appearance of it. AUBREVILLE (1947 [2]) and SCHNELL (1976 [3]) in their descriptions of the post-harvest flora have listed species of type Musanga, Trema, Terminalia etc. Moreover, KOUASSI *et al*. (2008 [4]) showed that the growth of *Albizia adianthifolia* and *Albizia zygia* in flora, inhibit shaded stage that of *Chromolaena odorata*. Thus, the decline in the adventice promotes the emergence of many sun-loving species including many woody forests. However, if these leguminous promote the emergence of these species, the nature of interactions between leguminous tree and woody forest remain unknown.

The present study aims to highlight the influence of the dynamics of *Albizia adianthifolia* and *Albizia zygia* in the evolution of other woody arborescent during the post-harvest reconstitution in semi-deciduous forest of Côte d'Ivoire; this in order to better understand the new models of reconstruction and new adaptations of plants in relation to climatic variations. This influence was evaluated at two levels. These are: annual average increases relations of Albizia and those of other woody forest, average height of Albizia and that of those woody species.

2 MATERIALS AND METHODS

2.1 STUDY ENVIRONMENT

The study was conducted at Oumé (Central West), in semi-deciduous forest of Côte d'Ivoire (Fig 1). The Department of Oumé covers about 2400 km ². It is located at 260 km north-west of Abidjan, with geographical co-ordinates: 6 ° and 7 ° N and 5 ° and 6 ° west longitude. The cultivation plots and fallow land studied are located around and within two classified forests (Tene, Sangoué) and on the setting of Côte d'Ivoire cultures Company (CCIC), a company of agriculture exploitation. Classified forests Téné and Sangoué respectively covers 29,700 ha and 36,200 ha (SODEFOR, 2012 [5]). As for the farm of the CCIC, it extends over 2000 ha. All sites are under the influence of a sub-equatorial climate bimodal with 4 seasons: two rainy seasons a large one (March to June) and a little one (September to October) and two dry seasons, the longest from November to February and the shorter July to August (SODEFOR, 2012). The annual rainfall average in the region is about 1215 mm. The rainfall has considerable variability. The vegetation of both classified forests bases on slightly lateritic soils medium destructed (MONNIER, 1983[6]). In plots (45) divided into parcels unit 50 m X 50 m (2500 m²) and sub plots (Fig. 2) 20 m X 20 m (400 m²), floristic inventories and measurements were carried out stems of *Albizia adianthifolia* and *Albizia zygia* trees and other woody arborescent. Life parameters (height, diameter at breast height) were measured on all tree species of the said plots. In the measurement of the height of the trees, only individuals over 2 m were taken into account. The estimate circumferences focused exclusively on the stems more than 20 cm in circumference. Tree vegetation over 70 years with the final stages of reconstitution (climax), were selected as control plots. The plots were all located on sandy clay soils.

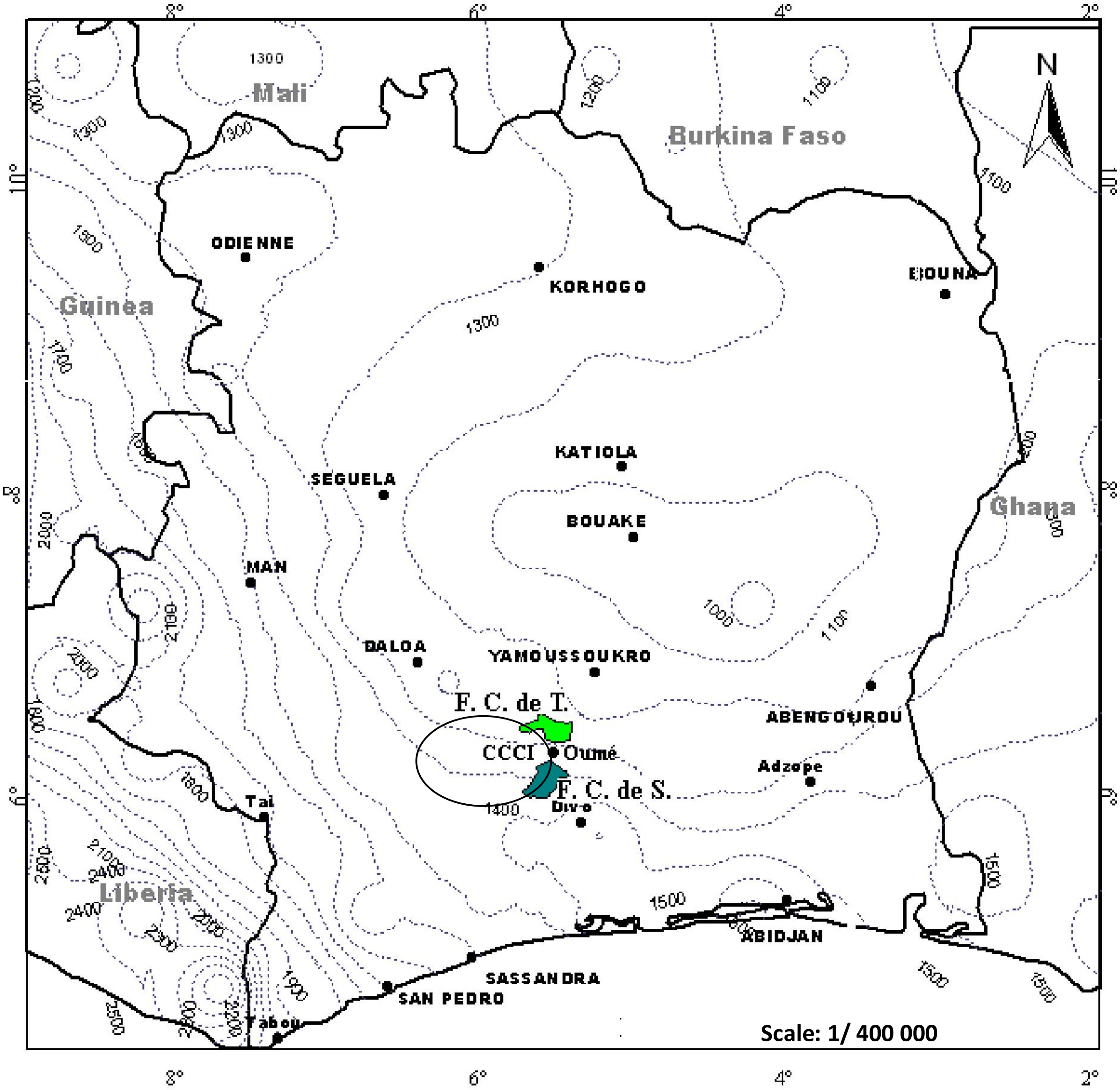
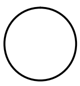


Fig. 1. Location of the study zone (MONNIER, 1983)

 Zone of study

F. C. T. = classified forest of Téné

F. C. S. = classified forest of Sangoué

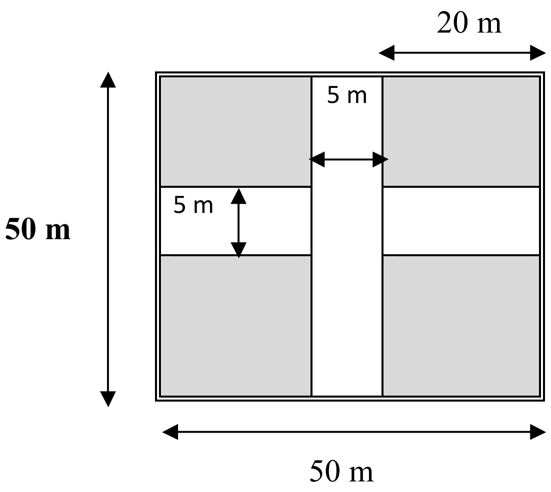


Fig. 2. Lie for the study plots

3 RESULTS

3.1 INTERACTION BETWEEN GROWTH IN THICKNESS OF *ALBIZIA ADIANTHIFOLIA*, *ALBIZIA ZYGIA* AND THAT OF THOSE WOODY FORESTS OVER TIME

The bilateral correlation realized between the evolutionary parameters (evolution of densities of Albizia adianthifolia, Albizia zygia and others arborescent woody forests) is significant at threshold 0.001 (table 1). And it shows an interrelation between those woody forests and Albizia during the thickness growth. Also a polynomial adjustment (Fig. 3) allows catching sight on this correlation nature. In fact, the obtained trend curves show an annual average growth of Albizia more accelerated at juvenile stage (0-10 years). After 10 years the increase in thickness of the other woody forests accelerate more, which is not the case with Albizia. This increase in thickness growth begins to slow for all species of trees after 30 years and eventually fade after 65 years for Albizia.

3.2 INTERACTION BETWEEN THE AVERAGE HEIGHTS OF ALBIZIA ADIANTHIFOLIA AND ALBIZIA ZYGIA AND OTHER WOODY FORESTS

The bilateral correlation (table 2) achieved between average heights of Albizia and others woody forests over time is significant at 0, 01 thresholds (table 2). Moreover, the polynomial curves adjustment (Fig. 4) achieved show that the average heights of Albizia exceed those woody forests up to 20 years. This adjustment shows height growth of Albizia more accelerated from 0 to 20 years. But beyond the age of 25 other woody forests take over up to the period of Albizia physiological decline (about 65 years).

Table 1. Correlation: Albizia annual average increases and other woody forests

		Annual growth average of Albizia	Annual growth average of others
Annual growth average of Albizia	Pearson Correlation	1,000	0,680
	Sig. (2-tailed)	0,000	0,000
	N	54	54
Annual growth average of others	Pearson Correlation	0,680	1,000
	Sig. (2-tailed)	0,000	0,000
	N	54	54

*** Correlation is significant at the 0, 01 level (2-tailed)*

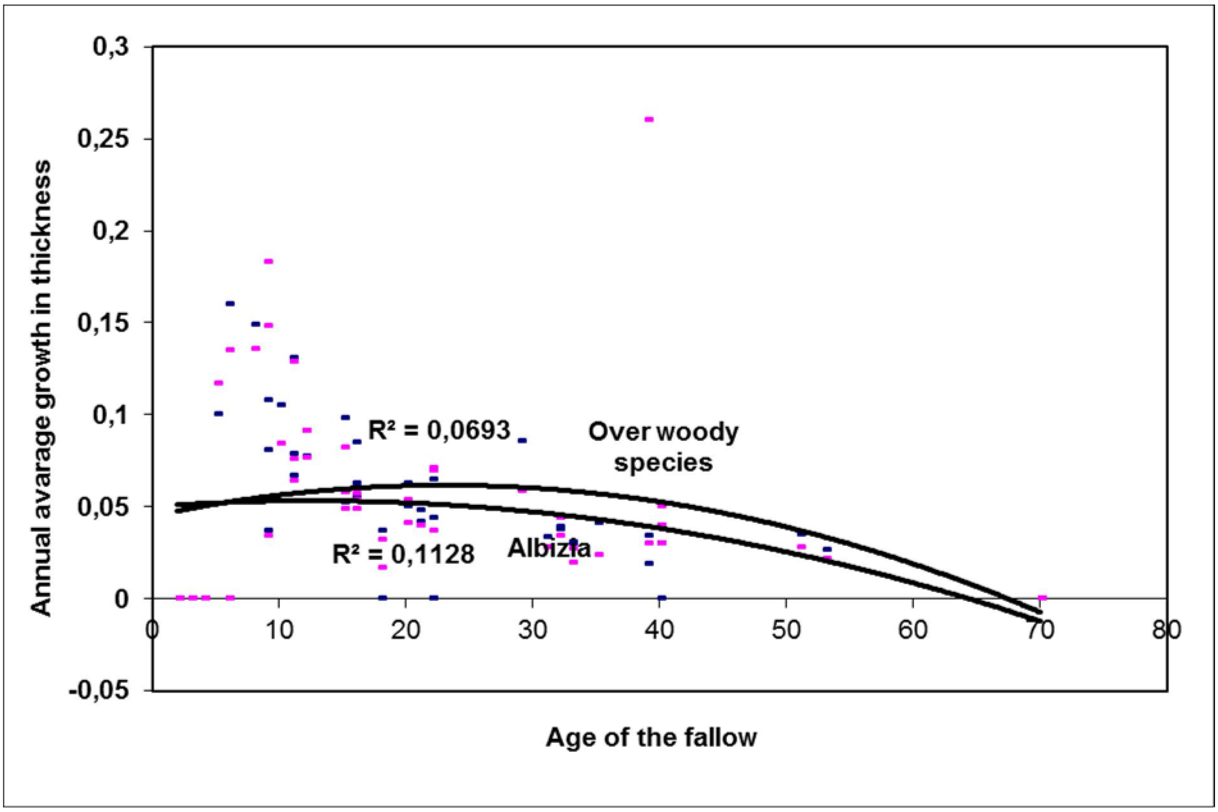


Fig. 3. Trend curves showing the evolution of the annual average increases in thickness of Albizia and over woody species over time

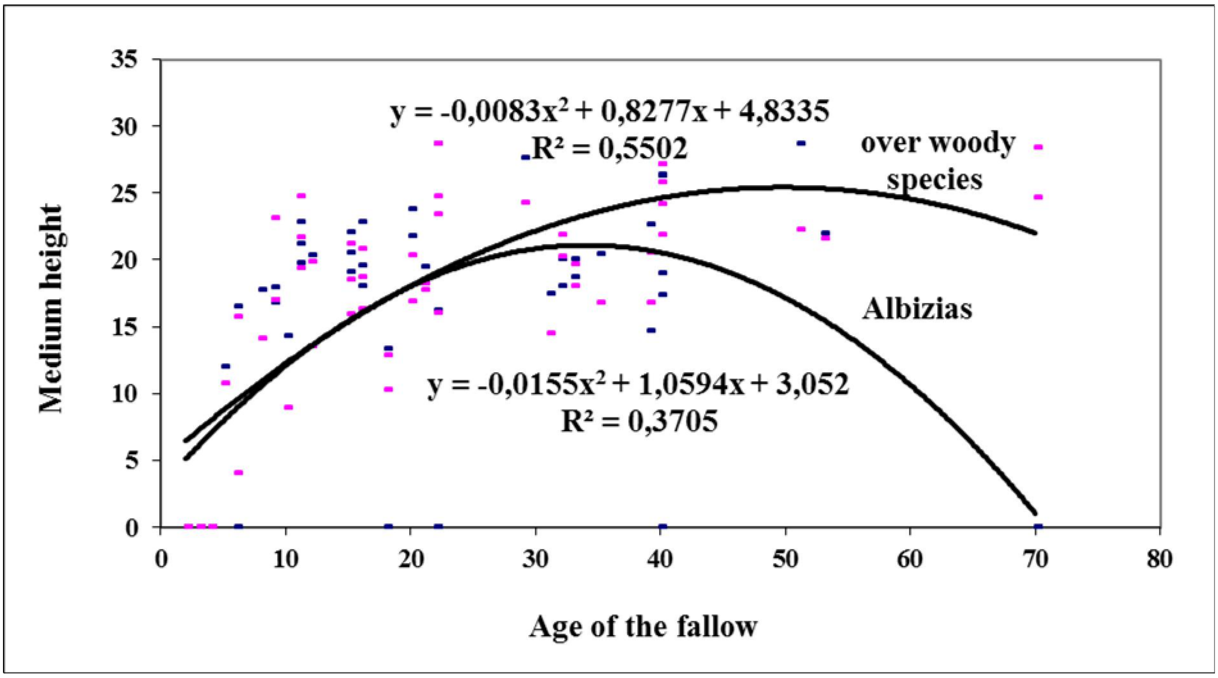


Fig. 4. Trend curves showing the evolution of the heights average evolution of Albizia and over woody species

Table 2. Correlation: average heights of Albizia and average heights of other woody forests over time

		Albizia	Average height of others woody forests
Average height of Albizia	Pearson Correlation	1,000	0,605
	Sig. (2-tailed)	0,000	0,000
	N	54	54
Average height of others	Pearson Correlation	0,605	1,000
	Sig. (2-tailed)	0,000	0,000
	N	54	54

***** Correlation is significant at the 0.01 level (2-tailed)***

4 DISCUSSION

4.1 INFLUENCE OF ALBIZIA DYNAMICS ON THE DYNAMICS OF OTHER WOODY FORESTS

The interpretation of mixed planting of multi-stratified structures in terms of competition or interaction is very complex as pointed out ROLLET (1970 [7]). That is why we have underlined the influence of the dynamics of Albizia on the other wood forests, basing the analysis on the sturdiness parameters such as thickness growth (annual averageincrease) and height growth (average heights). However, this simplification of analysis allows underlining the interactions (inter-specific competition, synergy, symbiosis ...), between individuals.

4.2 ANNUAL AVERAGE INCREASE

Albizia adianthifolia and *Albizia zygia* are more competitors and more qualified to develop early in fallow than other woody forests. This performance is between 0 and 10 years for the growth in thickness and is related to certain properties of Albizia such as, their rapid growth, fixation of atmospheric nitrogen and their ability to grow with little light in youthful stage. These skills were noted by ALEXANDRE (1989 [8]) and GNAHOUA (1997 [9]).

These skills make these arborescent leguminous species more competitors in youthful stage. This ability to influence others ligneous in juvenile stage of the thickness growth is illustrated by the trends with polynomial regression curves (Fig. 2). Indeed, the polynomial regression curve trend of Albizia is above that of other ligneous in the early fallow (0-10 years) period from which trend began to reverse. Moreover, the gradual decrease of annual average increase over the years is the proof that; the arborescent species do not grow indefinitely. However, the cohabitation Albizia and other woody forests lied in the fact that without inhibitor, the rapid development of Albizia in early fallows stills an indirect positive influence on the other woody forests slow growth. Albizia inhibits the development of one of *Chromolaena odorata* as is shown KOUASSI *et al*. (2008). This regression allows other woody forests to begin their development more easily.

4.3 AVERAGE HEIGHTS

The polynomial regression trend of height growth of Albizia adianthifolia, Albizia zygia and other woody forests highlight inter-specific interactions during development. Indeed, up to 25 years of fallow, Albizia grow more accelerated than other woody forests. This behavior is related to the reasons mentioned above. Moreover, BARIMA (2004 [10]) showed that under favorable conditions, the two arborescent leguminous can reach a height growth of more than 3 m / year. Abilities outlined above must be added the rapid seed germination which occurs between 3 and 6 days (TAYLOR, 1962 [11]), in contrast, the germination of other woody forests that sometimes occurs very slowly. The trend curves show the limits of the influence of Albizia up to 25 years of fallow period from which the trend reverses. Seen from this way, we could speak of mutual influences. Because, during competitions, intra-and inter-specific, each group of plant has its influence phase corresponding to a specific period.

The influence of Albizia is between 0 and 25 years. This period corresponds to the growth and development of Albizia. The longest influence phase of woody forests starts after 25 years, in the plant formations where often older stands of Albizia are undergoing regression phase and physiological decline. In addition, the influence of Albizia may be qualified as positive because it does not prevent the installation of ligneous rather promotes it. However, later, the action of other woody forests can be seen as a negative influence, because harmful to the development of Albizia. Indeed, although other woody forest with slow growth in early reconstitution, reaches after long years, considerable heights and form the forest canopy. Canopy formed thereafter becomes unfavorable to the development of Albizia, which explains their decline.

In this case, the assumption of the limited life of Albizia is not sufficient to explain this decline, because according to SCHNELL (1950 [12]) both species appear to be the remnants of semi humid dense forests. Albizia therefore, play the role of facilitating the installation of other woody forests in the post-harvest reconstitution. But it seems that this role is more noticeable in phases that characterize the transition from training under shrubs pioneer stages (stage to *Chromolaena odorata*) to the forested stages (stage woody pioneers).

5 CONCLUSION

The development of more woody forests is influenced by the dynamics of arborescent leguminous (*Albizia adianthifolia* and *Albizia zygia*). This influence is evident in the juvenile stage of growth in thickness and height. However, beyond 10 years, the density of other arborescent species negatively affects the growth in thickness of Albizia. This influence is seen over 25 years with regard to height growth. At these stages (beyond 10 for the growth in thickness and 25 years for height growth), it is rather woody forests which become more competitive. Actions performed by each group of plants appear as forms of mutual influences with Albizia at the juvenile stage and old stage for woody forests. Albizia play the role of forest pioneers and promote the installation of other woody forests. The influence phase of the two arborescent leguminous is not harmful to the development of other woody forests.

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