International Journal of Biosciences (IJB)
ISSN: 2220-6655 (Print) 2222-5234 (Online)
Vol. 2, No. 12, p. 85-89, 2012
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

Influence of two environmental parameters on the dynamics of *Chromolaena odorata* in semi deciduous forest zone of Côte D'Ivoire

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Received: 02 November 2012
Revised: 26 November 2012
Accepted: 27 November 2012

Key words: Semi-deciduous, ecological parameters, *Chomolaena odorata*, weed, Côte d'Ivoire.

Abstract

The present study relates the influence of two environmental parameters (environment of the plot and previous crop) on the dynamic of *Chromolaena odorata*, a weed fallow post-harvest. The study was conducted in Oumé area in semi-deciduous forest of Côte d'Ivoire. The linear method was used to estimate the recovery of this taxon. The main objective was to identify the ecological parameters that control the dynamics of this weed to offer its integrated management in the post-fallow cropping. The estimation results showed that the development of *C. odorata* was fostered by a closed formed by surrounding plant formations such as primary forests and secondary forests. In addition, previous crops such as rice, maize, niebe promote the development of *C. odorata*, which development is hampered by previous crops such as coffee, cocoa, yam and cassava.

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Introduction

The problem caused by *Chromolaena odorata* in cultivated fields and degraded areas has been the subject of much research. Of Yadav and Tripathi (1982), Gautier (1992) to Slaats *et al.* (1996), all were framed as research, dynamics and the role of this taxon in environments that harbor (cultivated fields, space gradients, windthrow, etc.). In addition, the shortening of fallow periods promotes the development and rapid expansion of this species in many agro-ecological environments. In Côte d'Ivoire, the situation is favored by the degradation of forest environments. Nowadays, *C. odorata* flora is essential early stages of post-harvest succession (De Foresta and Swartz, 1991).

Native to Southern and Central America (Gautier, 1993), *C. odorata* spread in West Africa and Asia. This is a colonizer of open middle (Gautier, 1992), greatly feared by farmers because of its spontaneity in educated circles and its influence on post-harvest plant (Holm *et al.*, 1977; Audru *et al.* 1988).

Many studies on the ecological parameters that control the dynamics of this species are mainly based on the needs eco-bio-climatic (nutritional needs, environments, nature of the support etc.). This study as it relates to the influence of two environmental parameters namely the preceding crop and the environment of the plant formation which houses *C. odorata*, the objective of this integrated management of this taxon to better control its invasive growth.

Materials and methods

The study took place in the Central West at Oumé in semi deciduous forest zone of Côte d'Ivoire (Fig. 1). The study plots are located on the perimeter of classified forests (Téné and Sangoué) on the website of the Company Cultures of Côte d'Ivoire (CCIC). All sites under the influence of equatorial sub-bimodal climate of 4 seasons: two rainy seasons a large March to June and September to October small and two dry seasons a large November to February and July to August a small (Anonymous, 2006). The average annual rainfall in the region is about 1215 mm. The rainfall has considerable variability. The vegetation of the site based on lateritic soils low to medium desaturated (Monnier, 1983).

Chromolaena odorata is a perennial shrub very fragrant, diffuse and rapid growth of up to 3 m tall and spreading by seed or basal shoots. The stem is cylindrical, upright dichotomous rather robust and moderately hairy. The leaves are opposite, ovate to triangular.

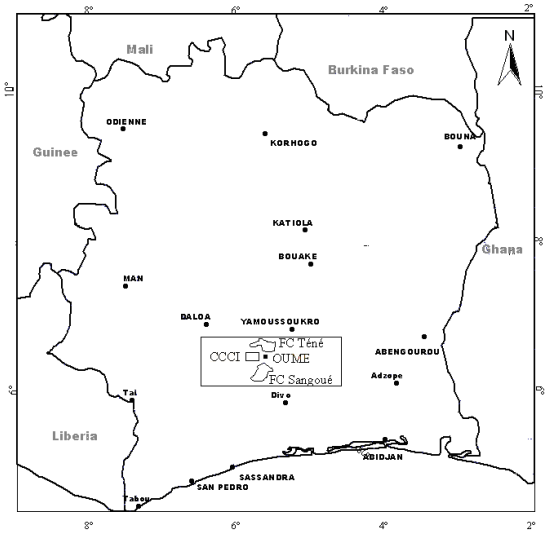

Fig 1. Map of Côte d'Ivoire (origin : Monnier, 1983)
Scale : 1/ 400 000

Area gathering the 3 sites of survey
F C classified forest

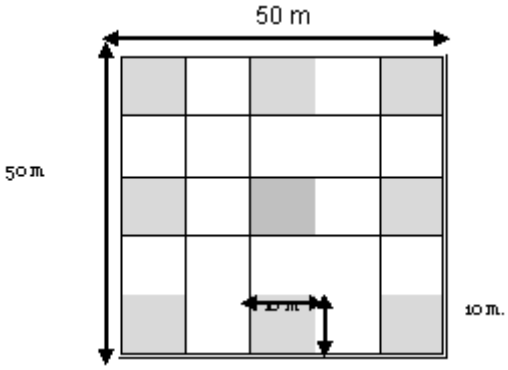

Fig. 2. Plots configuration to estimate the recovery of *Chromolaena odorata*

Young leaves are often purplish, but maturity limbo is greenish, 12 cm long and 5 cm wide with a pointed apex. Lamina margins are toothed or higthentier. The leaves are glabrous or slightly pubescent. They are usually glandular dots which emanates a strong

odor. The inflorescence is a terminal corymb compound, sometimes located in the axils of the upper leaves. The flowers are pale blue, purple or whitish with finials stalked clusters.

This is a troublesome weed found in cultivated fields in fallow, in open and degraded environments in early recovery (Akobundu et al., 1989). C. odorata recovery estimated was performed in 54 fallow 1-53 years, with 2 readings per plot. The choice of plots was based on age, previous cropping and cultivation techniques for the crop. Two primary forests were taken as control plots.

Two methods have been associated in the floristic inventories. He is the linear combination method statements and grixels (Gautier *et al.*, 1994). The survey method linear Gautier *et al.* (1994) is a combined method of transect and point of contact. It is to descend vertically a very fine needle (4 mm diameter) along a line indicated by a flexible tape held tautly in vegetation. We note only contact between the needle and the species. The contact points are marked every 10 cm or 100 points for every 10 m. The number of contact points of *C. odorata* is to this effect, noted and expressed as a percentage. Grixels which are the squares of 20 m have been subdivided into 4 squares each of side 10 m. Each square area of 100 m² has a specific number (Figure 2). Thus, the recovery of *C. odorata* was estimated in each square from the subdivision of a Grixel. Inventories have been carried out in plots on trays with fine-textured soils (sandy clay).

Results

2-1 - Evolution of *Chromolaena odorata* recovery depending on the type of plant formation surrounding. The analysis shows a strong correlation between the recovery of *C. odorata* and type of plant formation surrounding the plot that houses (correlation significant at 0.01, Table 1). In addition, high rates of recovery of *C. odorata* (50-70%) are obtained in plots near the forests.

Plots nearby secondary forest overlaps have minimum order of 10% and maximum recoveries of approximately 60%. By cons, recovery rates obtained in plots surrounded fallow, modern plantations and crops are similar, with mean values between 10 and 40%. Low rates of recovery were obtained in parcels at roadside and those bordering villages.

Table 1. Pearson Correlation (parcel environment and the recovery of *Chromolaena odrata*).

Correlated parameters	Pearson correlation (P)	Level	Nature of the correlation
Parcel environnement and the recovery of *Chromolaena odorata*	-0,414	0,001	Significant

Table 2. Pearson Correlation (Previous and cultural recovery of *Chromolaena odrata*).

Paramètres corrélés	Pearson correlation (P)	Level	Nature of the correlation
Previous crop and recovery of *Chromolaena odorata*	-0,349	0,001	Significant

Appendix 1. Coding system variables.

previous cropping	
qualitative variable	code
Cofea	1
Cocoa	2
Yam	3
Mays	4

Environment of the vegetation	
Qualitative variable	code
Near the village	5
Fallow	6
Industrial culture	7
Secondary forest	8
Primary forest	9
Agro-forest	10
piece of modern culture	11

Cultural previous and Chromolaena odorata recovery

Recovery of *C. odorata* and previous crop plot that houses are highly correlated (Table 2). Plots with previous cropping cycle short and undemanding nutrient (maize, rice and cowpea) have high recovery rates (50-60%) as those with yam and cassava as previous crops include average recoveries of the order of 20 to 40%. Low rates of recovery (10, 20%) were obtained in plots that housed the crops.

Discussion

Evolution of Chromolaena odorata recovery depending on the environment surrounding the plot with C. odorata

The evolution of the recovery of *C. odorata* is positively influenced by closed environments and less degraded because it protects the environment because this land that houses against certain types of damage (rain erosion, wind erosion, depletion of soil nutrient, etc).

These types of closed environment often have many wood that constitute "windbreaks". In addition, primary forests and secondary formations include tree species that contribute significantly to mitigating the impact of ruisselements rainwater on the ground. Also, the training they have a wealth of flora which is an asset to the maintenance of moisture and mineral soils that contain *C. odorata*.

Evolution of Chromolaena odorata recovery based on previous cropping of the field with this taxon.

Plots with maize, cowpea and rice as previous crops are subject to recurring development. This shortening of fallow promotes the development of *C. odorata* as we said Gautier (1992, 1993) and Slaats *et al.* (1996). Moreover, compared to cassava and yams, these short-cycle crops are less demanding of soil nutrients. The low recovery rate of *C. odorata* in the plots as the previous cropping Cocoa and Coffee Tree is inherent in the architecture of these cultures. In fact, the leaves of these two cultures become dense and sometimes joined shortly before production. The canopy created and hinders the development of *C. odorata*. The fallow period evoked by Slaats et al. (1996) and Gautier (1992) as a factor influencing the recovery of *C. odorata* is certainly crucial, but this influence is conditioned by the reconstitution floral fallow, which deprives reconstitution medium or long term *C. odorata* light.

Conclusion

The medium surrounding the plot with *Chromolaena odorata* and the previous crop are two ecological parameters that influence the development of C. *odorata* in rebuilding post-harvest.

This development is favored by closed environments (primary forests and secondary forests) as opposed to degraded vegetation (fallow and cultivated fields) that slow and sometimes hinder the development of this taxon. The previous cropping plots also play a role in the development of *C. odorata*. Plots that housed constantly cereal crops such as maize, upland rice and cowpea promote the development of *C. odorata* tandisque those who sheltered crops such as coffee tree shaded and Cocoa are less favorable to its growth. However, the sensitivity of *C. odorata* vis-à-vis ecological parameters is sometimes slightly offset by its great capacity for regeneration (seed, stump sprouts and cuttings). Therefore its integrated management must now consider the ecological parameters studied.

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