Invasion of West Africa sahelian rangelands by the plant *Senna obtusifolia*: Ecological dynamics and local resilient strategies in Burkina Faso

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Introduction

Rangelands in Sahelian countries are continuously over-grazed decreasing forage resources and causing rapid environmental changes. *Senna obtusifolia* is a less palatable plant species that becomes increasingly invasive. This research explored drivers of its invasiveness, impacts on ecosystem services and local populations resilient strategies.

Data collection

Species composition and herbaceous aboveground biomass were assessed in 120 plots with 1 m² size in rangelands with different levels of invasion of *Senna obtusifolia*. Germination rate and an interspecific competition were tested (Photo 1). Individual interviews and focus group were addressed to investigate local population knowledge and perceptions.

Results

Invasion- Ecosystem services

The development of *Senna obtusifolia* in rangelands affected significantly forage quantity. Indeed the biomass of the others herbaceous species decreased but not the species richness (Table 1).

Drivers of *S. Obtusifolia* invasiveness

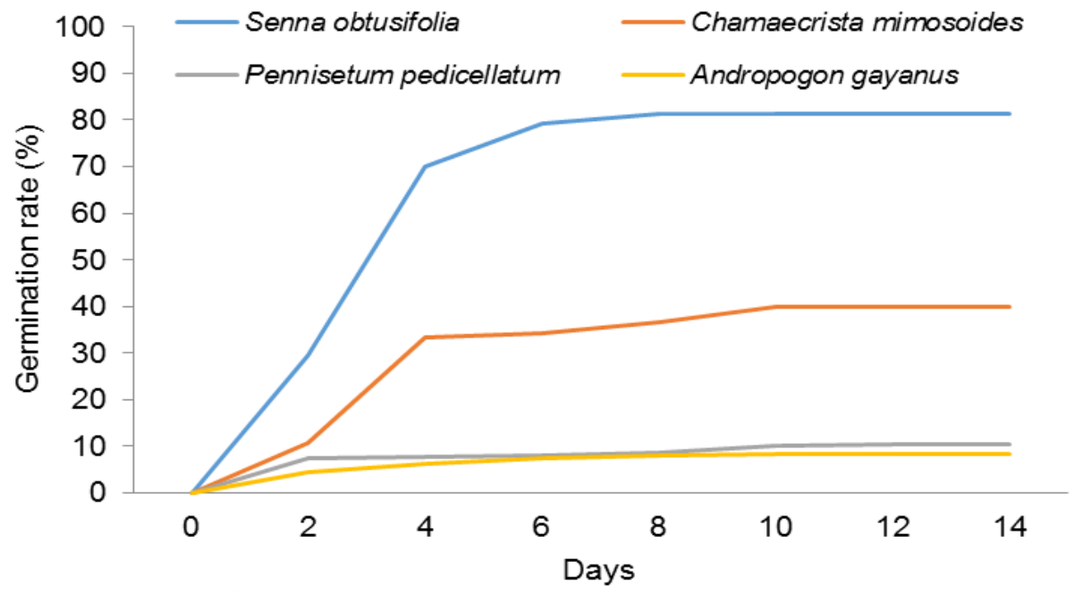
The overgrazing of Sahelian rangelands combined to the floristic selection operated by livestock reduced the abundance of fodder species and fostered the expansion of *S. obtusifolia* (Photo 2). Moreover, *S. obtusifolia* had a good germination rate (Graph 1) with a rapid growth that made it more competitive. Thus, in the interspecific competition experiment, the aboveground biomass of *S. obtusifolia* biomass was not influenced (Graph 2) when associated to the 3 herbaceous functional types (legume, annual and perenial grass).

Photo 1: Interspecific competition in a greenhouse experiment

Photo 2: *Senna obtusifolia* excluded from grazing in a rangeland

Table 1: Effect of *S. obtusifolia* abundance on herbaceous vegetation attributes (Kruskal Wallis Test)

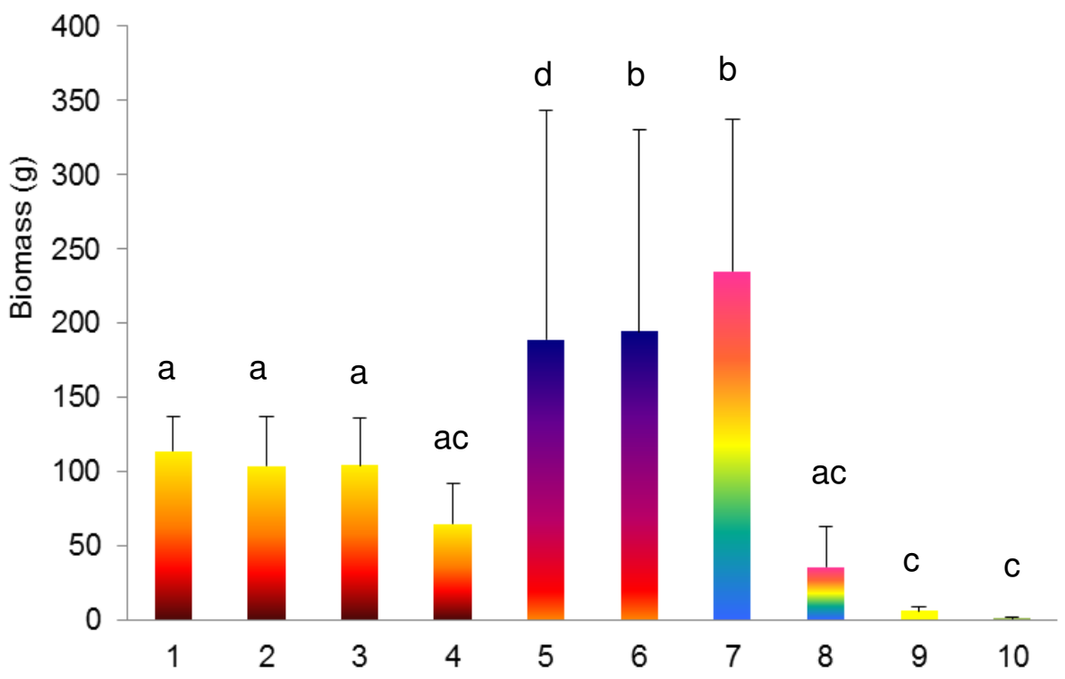
***Senna obtusifolia*'s cover (%)**	**0 - 5**	**5 - 35**	**35 - 65**	**65 - 100**	**Prob**
Senna obtusifolia biomass kg/m²	0.23 ± 0.43	0.90 ± 0.91	1.51 ± 0.78	3.76 ± 1.62	p<0.001
Other species biomass kg/m²	2.23 ± 1.25	1.91 ± 0.80	2.10 ± 0.92	1.44 ± 0.77	p=0.001
Species richness/m⁻²	16.35 ± 6.47	17.6 ± 7	17.2 ± 5.75	16.15 ± 6.04	p>0.05



Graph 1: Germination test of four herbaceous species

Local's resilient strategies

Because of the scarcity of plant resources in the Sahel, *S. obtusifolia* were used alternatively for multiple purposes as food, handicraft, as local materials for house building (Photo 3a-b) and slightly as forage when dry. Indeed local populations had in general a positive perception on *S. obtusifolia* in their environment. They hided expressively negative impacts of this species on forage production in rangelands.



Graph 2: Species biomass in interspecific competition (Anova Test)

1: *S. obtusifolia* -- 2: *S. obtusifolia* vs *Chamaecrista mimesoides*
3: *S. obtusifolia* vs *Andropogon gayanus* -- 4: *S. obtusifolia* vs *Pennisetum pedicellatum*
5: *Pennisetum pedicellatum* -- 6: *Pennisetum pedicellatum* vs *S. obtusifolia*
7: *Andropogon gayanus* -- 8: *Andropogon gayanus* vs *S. obtusifolia*
9: *Chamaecrista mimesoides* -- 10: *Chamaecrista mimesoides* vs *S. obtusifolia*

Alphabetic letters on bar graph indicate significant difference (p<0.05)

a

Photo 3: *S. obtusifolia* leaves sold as food in local market

b

***S. obtusifolia* stems used as fence and roofing**

Perspectives

The endogenous uses *S. obtusifolia* offer opportunities for the development of innovations and technologies to control its expansion for a sustainable management of sahelian rangelands and help rural populations to be more resilient from land degradation and climate change.

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