

Assessing the usefulness of *Senna obtusifolia*, an invasive plant species in West Africa rangelands

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Abstract

Senna obtusifolia is a less appreciated plant species. Its invasion has led to the disappearance of several herbaceous species of interest in West Africa rangelands. As adaptation strategy, people use it to substitute for those that have disappeared. This study aimed to assess the importance of this species for animal and local ethnic groups according to two contrast climate zones in Burkina Faso. Ethnobotanic survey mixed with direct observations on the field were conducted. Three hundred (300) people from eight (8) ethnic groups were interviewed. The survey technique was semi-structured interviews using a previously tested semi-structured questionnaire. At the early stage of the rainy season, *Senna obtusifolia* is one of the plants available in abundance. Animals graze on the leaves of the seedlings. During the dry season, animals graze on the dry pods of *Senna obtusifolia* due to lack of fodder. Grazing dry pods also reduces the high rate of tree pruning. In addition, local population uses *Senna obtusifolia* in eight (8) categories. The most important are food (100%) and construction (46%). Sahelian people use the species more than Sudanian people. This study revealed the benefit of *Senna obtusifolia* to animals and people. The use of this species could be seen as an adaptive strategy to the negative ecological invasion of the species. Furthermore, these results could guide the formulation of management policies and how to further value invasive species.

Key words: Adaptation strategy, ethnic group, invasive species, *Senna obtusifolia*, ethnobotany survey

Introduction preferred

Invasive plant species are known to be a threat for biodiversity conservation and ecosystem change (Pyšek et al., 2020) because it contributes to eradicate directly native plant communities by altering the composition and diversity (Wardle et al. 2011). It also led to the scarcity of forage resources (Ouedraogo et al 2021). This situation impact negatively husbandry. Several studies have focused on the detrimental effects of invasive plants (Shackleton et al. 2019; Archibald et al 2020). However, invasive plant species could have positive economic, social and ecological effects (Souley et al., 2020) which can be used as adaptation strategy to their negative effect. For example, some of these species provide provisioning (food, medicine) and regulatory (soil fertilization) ecosystem services to people (Shackleton and Shackleton 2018). *Senna obtusifolia* is a wild legume from regions of the African continent (Pasternak et al. 2006). It also considered as an aggressive invader of rangelands and its proliferation leads to the disappearance of many appreciated herbaceous species used as major feed resources (Tessema et al. 2011). In Burkina Faso, *Senna obtusifolia* is widespread in many habitats such as rangelands and is among the most abundant herbaceous species in the Sahelian zone of the country. Faced with biodiversity loss, local people in Burkina Faso are promoting the use of neglected species including invasive species as resilience strategy (Ouedraogo et al., 2021). Young green leaves of *Senna obtusifolia* are used as food in some African countries (Tidiani et al. 2019), indicating that this invasive species is potentially valuable. At the beginning of the rainy season, seedlings of *Senna obtusifolia* are among the most abundant in the rangelands. These seedlings constitute forage resources for livestock, but in the adult state, the species is no longer appreciated because the green leaves contain a toxic substance (Augustine et al. 2020). At current stage, the usefulness of the species remains poorly explored. Local people perceptions of invasive species and traditional valorisation forms of these species could help to design efficient and sustainable management policies. This research aimed to explore the usefulness of *S. obtusifolia* in the perspective to valorize it in rangeland ecosystems.

Material and Method

Ethnobotanical surveys were conducted in the Sahelian and Sudanian zone of Burkina Faso. Study sites were selected based on the importance and abundance of *Senna obtusifolia* in their pastoral areas conducted in these two zones. The stratified probability sampling method or proportional stratified random sampling was used. It consists of dividing the study area into different strata, represented here by the villages, and associating the same number of respondents with them. Interviews were conducted among people from ten (10) villages located near pastoral areas with five (05) villages per climate zone. Eight (8) ethnic groups were selected considering their knowledge and use of *Senna obtusifolia*. All informants were at least 18 years old. They were selected considering their voluntary membership and knowledge of *Senna obtusifolia*. The survey technique used was based on semi-structured interviews, using a previously tested semi-structured questionnaire to ensure that the questionnaire provided all the information sought. The main information collected were ethnobotanical knowledge of the species, i.e. the different uses of the species (use categories of *Senna obtusifolia* and organs used). The interviews were conducted with the help of native interpreters and samples of *Senna obtusifolia* were harvested and brought to study sites and presented to informants during interviews to ensure the presence of the species in each village. The Use Value (UV) of *Senna obtusifolia* was analysed via a generalized linear model (GLM) with a Poisson distribution in order to test its variation according to the study site and socio-demographic factors. The separation of average test of Student Newman Keuls (SNK) was performed to test difference between ethnic groups. All analyses were performed using software version 4.1.0 (RCore Team, 2021).

Results

Use category of *Senna obtusifolia*

Data analysis revealed that among use categories of *Senna obtusifolia* food was the most important (100 %) followed by construction (49 %), handicraft (26.66 %). Leaves were used in food (sauce, couscous) while stems were used in construction (roofing of houses), handicrafts (confection of seccos), woody energy, fertilization. Seeds and roots were less used. Seeds were used in both food and medicine but roots were only used as medicine (figure 1).

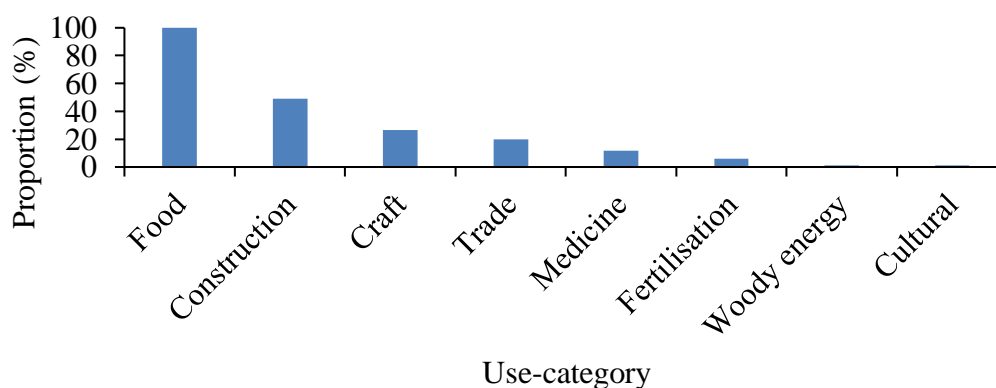


Figure 1: Frequency of use category of *Senna obtusifolia*

The use value (UV) of *Senna obtusifolia* varied significantly between climatic zones and ethnic groups given that $p < 0.001$ (Table 1). Age and gender had no influence on this ethnobotanical use value (table 1). In the Sahelian zone People used more *Senna obtusifolia* than those of Sudanian zone.

Table 1. Influences of ecological zone and socio-demographic factors on *Senna obtusifolia*

	Estimate	Std. Error	t value	Pr(> t)
Intercept	-2.764	0.246	-11.254	< 2e-16 ***

Ecological zone	0.341	0.090	3.794	0.001 ***
Ethnicity	-0.058	0.015	-3.787	0.001 ***
Age	0.004	0.046	0.090	0.928
Gender	0.005	0.075	0.073	0.941

Discussion/Implications

The utilization of *Senna obtusifolia* depends on climatic zones. In the Sahelian zone, this plant species represents a multipurpose plant for the ethnic groups. Indeed, the majority of informants were unanimous that the invasion of *Senna obtusifolia* has led to the disappearance of several herbaceous species of interest like *Andropogon gayanus* used to make seccos, hut. They then appropriated the use of the plant to substitute for those that had disappeared. In this Sahelian zone *Senna obtusifolia* has become a key food component, an essential material in the scaffolding of houses and their accessories (roofs, huts, mats, seccos and fences). Food and construction were the most use categories in this zone. Roots and seeds of *Senna obtusifolia* are often used as food and medicine. They are also used dry steam as fertilizer in the fields or as firewood or skewer wood. In addition, *Senna obtusifolia* is a recourse for animals during periods of forage shortage. Surveys showed that cattle graze on dry *Senna obtusifolia* pods instead of tree leaves. This helps to reduce the high rate of tree pruning. However, in the Sudanian zone only the leaves of *Senna obtusifolia* are used like food. The lack of knowledge about the use of other parts of *Senna obtusifolia* could be explained by the choice made by the people in the use of plants to satisfy their needs. This choice could be based on the availability and diversity of plant resources in this Sudanian zone. This study revealed the benefit of *Senna obtusifolia* to animals and people. The use of this species could be seen as an adaptive strategy to the negative ecological invasion of the species. Furthermore, these results could guide the formulation of management policies and how to further value invasive species.

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