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Preliminary study of the digestive effects of *Chenopodium ambrosioides* Linn. (Chenopodiaceae) leaves extracts in goats

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ABSTRACT

The effects of the crude aqueous extract of *Chenopodium ambrosioides* leaves on food intake and digestibility were evaluated with twelve Sahelian goats weighing about 25 kg. Three experimental groups, each consisting of three animals, were treated respectively with the dose of 1ml, 2ml and 4ml/kg of body weight. Treatment was daily and lasted three days. One control group, receiving the same diet as the experimental groups, was involved. The experiment revealed that the herbal extract induced a highly significant variation ($p < 0.01$) in voluntary feed intake expressed in grams of dry matter (DM) from 366.67 g ± 86 (control group) to 631.67 g ± 106.37 (4ml/kg/BW treated group). Concerning digestibility, the results indicated an increase in the absorption of ash and fibre (39.65 % ± 2.65 to 51.38 % ± 4.91). But the digestibility of protein was only slightly influenced by the herbal extract. Animals treated with 4ml/kg/BW dosage had soft and pasty faeces. The aqueous extract of *C. ambrosioides* leaves would own interesting digestive effects in small ruminants in the fattening stage or those suffering from indigestion due to rumen stuffing. Further specialized studies may clarify those effects.

1. Introduction

In sub-Saharan lands, ruminant's production is an activity of great social and economic importance [1]. It's widely practiced for milk and meat but also represent the main hoarding way. There are some constraints to this activity by the most important is feeding [2] indeed forage availability is in constant decreasing. Unlike cattle breeding which is prone to transhumance, the small advocated in this dynamic. Inspired by the interest and the effects of teas, spices and flavourings in human nutrition, it aims to highlight the digestive effects of *Chenopodium ambrosioides* (Chenopodiacae) a cosmopolitan and renowned plant for its medicinal properties [6-10]. This aromatic herb is used in Mexican cuisine [11]. In small ruminants, particularly in the Sahelian goat, anthelmintic efficacy of the aqueous extract of its ruminant production is practiced mainly in housing or wandering around human habitats and then feeding problems are often greater. Breeders used to fill their need with crop wastes but scientific researches aim at improve some digestibility factors like feed efficiency and consumption index, since digestibility is the main productivity factor [3-5]. The present study has been leaves has been proven by *Salifou et al*.[12] and in this respect it is also relevant opportunist to check the impact on the digestive physiology of the animal in the prospect of a double interest (pharmacological and food).

2. Materials and methods

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2.1 Study design

The study was conducted in January 2012 in farm resort in southern Benin, precisely in the village of Kpoguètomê, district of Allada. The animal material consists of 12 Sahelian goats. These animals were purchased at livestock market of Zongo, district of Cotonou. Their exact origin is not known. The average weight of animals is 25 kg. The diet attributed to animals is a commercial Feed - small ruminants (VETO SERVICE ®) whose composition is given in Table 1. An acclimatization time of 15 days was observed. The drug sample is represented by the aqueous extract of leaves of *Chenopodium ambrosioides*. The science analyzes to determine indicators of digestibility were conducted in the laboratory of the National Institute of Agronomic Research (INRA).

Table 1: Diet composition

Components	Rate (%)
Corn	24,99
Corn bran	9,99
Palm kernel cake	2,49
Wheat bran	2,49
Roasted soybeans	9,99
Salt	0,00019
Milling	49,99

2.2 Preparation of extract drug

Chenopodium ambrosioides leaves picked in the lateritic and waterlogged zones, southern Benin (district of Abomey-Calavi) were dried without sunshine then powdered. The total extract was obtained by infusion of 50 g of *C. ambrosioides* powder in 1000 ml of deionised distilled and heated (50°C) water for 30 min. The infusion was filtered and the filtrate collected in a non-transparent container.

2.3 Animal's treatment

Four groups of three animals of which one control group (C) and three experimental (E1, E2 and E3) were constituted. Each group was placed in an experimental box and animals wearied a panty for waste recovering (Figure 1). Treatment design is shown in Table 2.

Table 2: Treatment design

Groups	Treatment	
	Dose of herbal drug per kg body weight (ml)	**Duration**
C	0	-
E1	1	Daily and during 3 days
E2	2	
E3	4	

Figure 1: Goats with panty for faecal recovery

2.4 Monitoring of the post- treatment sign

The general health condition of the treated animals was watched carefully. Posture, breathing rate and the state of ocular and nasal mucosa were classified as normal or abnormal every half hour after administration during eight hours, in order to detect any signs of clinical toxicity. The hindquarters of animals and texture of their droppings are reviewed every morning before feeding. This was designed to detect diarrhoea in animals.

2.5 Measurement of food intake

The daily food was served in individual fixed and deep troughs that do not allow waste. The total voluntary intake (VI) is measured by the difference between the distributed food (DF=1000 g) and remained or refusal food (RF). All data are reported as a percentage of dry matter (DM). The determining of the DM followed the methodology described by [13]. Six food samples of 5g were dried in oven at 60°C until constant weight. The dry matter (% DM) is calculated by the following formula:

$$\%\,DM = \frac{1}{6}\sum_{6}^{i=6}\left(100\frac{FDMi}{5}\right)$$

DM = % Dry matter, FDMi = final dry matterof sample "i".

2.6 Measurement of digestibility

The apparent digestive utilisation coefficient (CUDa) of each nutrient was determined after chemical analysis of the food and faeces. The assessment included dry matter, total ash and protein. The rates calculation used the following formula indicative of the overall trend of digestibility.

$$CUDa\ (x) = \frac{100\ (Intake\ X - Faecal\ X)}{Intake\ X}$$

CUDa (x) = digestibility of "X", Intake X = "X" intake and Faecal X = faecal output of "X" intake.

3. Results and discussion

3.1 Post- treatment signs and clinic

No clinical dysfunction was observed during the study. All clinical physiological signs were normal unless that the faeces were pasty in animals with 4ml/Kg BW (E4 group). So there is no proof of clinical toxicity with the current experiment conditions.

3.2 Food intake and digestibility

Table 3 shows the average voluntary intake (VI) measured for each experimental group. There was a dose dependent increase in food intake. Some significant variations ($p < 0.01$) were recorded except with regard to the group E2 compared to E1.

Table 3: Diet intake following treatment with the herbal drug

Groups	Voluntary Intake (g.DM / animal)	Standard deviation (SD)
C	366.67	86.12
E1	461.17	65.16
E2	527.5	82.99
E3	631.67	106.37

This result indicates an improvement in dietary intake. This is similar to the result reported by Yadav et *al.*[11] with a species of goosefoot, *Chenopodium album*. These authors have shown this plant stimulates appetite in humans. Observations are also consistent with the forecasts in dry matter intake of 11-32 g / kg body weight indicated by Jarrige et *al.*[14]. In terms of digestibility, the table 4 presents the calculated coefficients after tests.

Table 4: Digestibility variation following treatment with the herbal drug

Groups	CUDa (%)		
	Dry Matter	Total Ash	Protein
C	39.65 ± 2.65 [a]	09.45 ± 1.14 [a]	09.41 ± 0.62 [a]
E1	42.46 ± 8.68 [a]	09.50 ± 1.58 [a]	10.25 ± 2.01 [a]
E2	49.71 ± 5.86 [b]	10.60 ± 0.95 [a]	10.02 ± 2.15 [a]
E3	51.38 ± 4.91 [b]	12.52 ± 0.67 [b]	12.56 ± 1.01 [a]

Overall, the plant extract induced digestion increasing resulting in better degradability of dry matter in animals of groups E2 and E3 whom experienced a digestive utilisation coefficient of almost 50%. This result is consistent in terms of trends with those reported by Smeti et *al.*[15] which reported a 60% digestibility of dry matter using the tannin of acacia in sheep in Tunisia. No significant change was detected in the digestion of protein and ash. Only animals in E3 showed slight increase of absorption of minerals and proteins.

4. Conclusion

The aqueous extract of leaves of *Chenopodium ambrosioides* has laxative properties and seems to aid digestion. It increases the digestibility of dry matter without degrading the assimilation of nitrogenous matter. Given these other pharmacological properties, including anthelmintic reported in small ruminants, it seems appropriate and timely to make a functional food in these species. Digestive effects of this plant must be clarified by specialized studies for a wider use in animal production.

Conflict of interest statement

We declare that we have no conflict of interest.

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