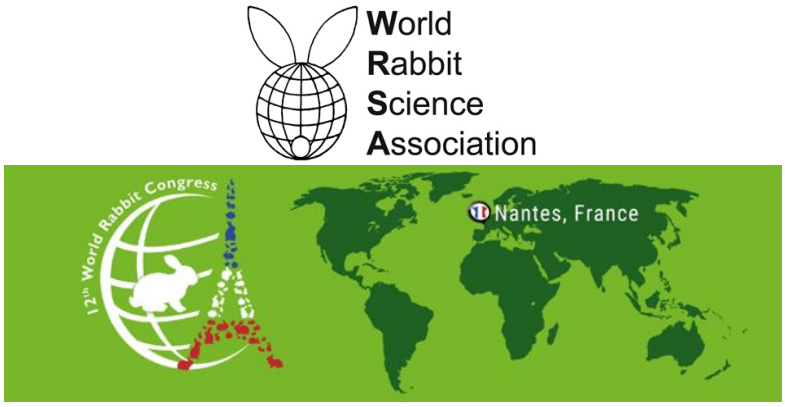

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NUTRITION & FEEDING

Kouadio K.S., Yapi Y.M., Kimse M., Alla K.J.B., Sangare S., Gidenne T., Wandan E.N.

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Full text of the communication

+

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EFFECTS OF SUN-DRIED STYLO HAY (*STYLOSANTHES GUIANENSIS* cv CIAT 184) ON RABBITS GROWTH AND SLAUGHTER PERFORMANCES

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ABSTRACT

The effect of sun-dried Stylo hay (*Stylosanthes guianensis* cv CIAT 184) level in complete pellet diet was studied on growth and slaughter performances of local hybrid rabbits in Côte d'Ivoire. Four diets containing 0% (control: Sg0), 10% (Sg10), 20% (Sg20) and 30% (Sg30) of Stylo respectively were produced and distributed *ad libitum* to 4 batches of 12 rabbits from weaning (35 d, mean weight: 613 ± 29 g) to 91 days old. Rabbits receiving the Sg30 diet had the best daily weight gain of 30.4 g / d (+ 16%, P <0.001) and the highest feed intake (+ 7%, P <0.001) compared to the control Sg0. Feed conversion rate was better with the Sg20 and Sg30 diets (-0.45, P <0.001) compared to the control diet. Animals' health was not affected by Stylo incorporation rate in the diet. In addition, the cold carcass weight was better with the Sg20 and Sg30 diets compared to the control (+12%, P <0.001). It was concluded that sun-dried Stylo hay could be incorporated in rabbits complete pelleted feed up to 30%, as source of fibres.

Key words: Rabbit, *Stylosanthes guianensis*, growth performance, carcass.

INTRODUCTION

The lack of balanced pellet feeds available at an acceptable price is one of the major problems in rabbit farming in Côte d'Ivoire. Research on rabbit feed has therefore been directed towards local fodder resources and agro-industrial by-products enhancement in order to limit dependence on imported raw materials sources of fibres. (Yao *et al.*, 2016; Kimsé *et al.*, 2017). Indeed, fibres play an important role in rabbits digestive functioning by ensuring the balance of the caeco-colic microbiota. They thus contribute to reducing digestive disorders risk, causes of high mortality in rabbit farms (Gidenne, 2015).

In West Africa, several plants rich in fibre and crude protein could be used in rabbit feed (Lebas, 2004). Among these, *Stylosanthes guianensis* is a forage legume which is adapted to a wide range of environmental conditions. This forage grows naturally in tropical, subtropical and temperate regions of America, Africa and Southeast Asia (Li *et al.*, 2014). It is a high nutritional quality fodder for most herbivorous animals, including rabbits (Omole *et al.*, 2007). Its chemical composition is characterized by a high fiber (54-60% NDF) and protein (14-20%) contents (Kambashi *et al.*, 2016). The cultivar CIAT 184 of this forage is cultivated in Côte d'Ivoire for livestock feed.

Therefore, the objective of this study was to determine the effects of sun-dried Stylo hay (*Stylosanthes guianensis* cv ciat 184) on growth and slaughter performances of rabbits.

MATERIALS AND METHODS

Animals and experimental design

The study was carried out at the Graduate School of Agronomy at Yamoussoukro (Côte d'Ivoire). A total of 48 local hybrid rabbits at weaning (35 days old, mean weight: 613 ± 29 g) were used for this study. They were divided into 4 groups of 12 animals each. The rabbits were housed in individual cages (70 x 60 x 55 cm), in an open barn fenced with chicken wire, exposed to the ambient air.
Stylosanthes guianensis cv CIAT 184 (Stylo) was harvested at the vegetative stage after 5 months of culture, then sun dried. Four experimental diets containing 17.5% PB and 19% ADF, with increasing levels of Stylo incorporation (0, 10, 20 and 30%, Table 1) were formulated to get balanced diets (De Blas & Mateos, 2020). Foods were pelleted (diameter: 4 mm, length: 9 mm). Rabbits were fed the diets *ad libitum* from weaning until 91 days of age. No drug substance was used in this study. The animals were weighed once a week and feed intake was measured daily. At the end of the experiment, 8 rabbits per batch were euthanized for carcass study (Blasco & Ouhayoun, 1996).

Chemical Analyses

The chemical analyses were performed using European procedures (EGRAN, 2001), they concerned dry matter, crude ash, and crude protein. Fibres (NDF, ADF and ADL) were determined according to the sequential procedure of Van Soest *et al.* (1991).

Statistical Analysis

Statistical analyzes were performed with R software version 4.0.0 (R Development Core Team). The measured variables were subjected to an analysis of variance with the diet as the main source of variation. Comparisons of the means were performed using the Tukey test (5%).

Table 1: Ingredients and chemical composition of the experimental diets

Ingredients (g / kg DM)	***Sg*0**	***Sg*10**	***Sg*20**	***Sg*30**
Stylo	0.00	100	200	290
Pennisetum purpureum	290	190.0	90.0	0.00
Bran	240	244	242	237
Soybean meal	105	106	108	114
Cotton cake	125	120	117	116
Corn grains	194	194	196	197
Cane molasses	20.0	20.0	20.0	20.0
Salt (NaCl)	10.0	5.00	5.00	5.00
Shell	10.0	10.0	10.0	10.0
Coccidiostats & Histomonostats[1]	2.00	2.00	2.00	2.00
Vitamin/mineral mixture[2]	4.00	4.00	4.00	4.00
Chemical composition (% as fed)				
Dry matter	88.8	88.8	88.9	89.0
crude ash	8.70	8.30	7.90	7.50
Crude protein	17.5	17.5	17.5	17.6
NDF	37.5	35.8	34.0	32.3
ADF	19.1	19.1	19.1	19.1
ADL	3.50	3.90	4.20	4.60

[1]Coccidiostats & Histomonostats: Diclazuril® (Carrier: calcium carbonate); [2]Mineral and vitamin mixture: A: 2,500,000 IU/kg; D3: 250,000 IU/kg; E: 12,500 mg/kg; K3: 375 mg/kg, B1: 500 mg / kg; B2: 500 mg/kg ; B5: 1000 mg/kg; B6: 200 mg/kg; B12: 1.14 mg/kg; PP: 2,500 mg / kg; Choline Chloride: 45,000 mg/kg, Biotin: 5 mg/kg, Folic Acid: 200 mg/kg ,: Calcium: 187 g/kg, NaCl (Salt): 400 g/kg, Sodium (Na): 154 g/kg, Magnesium (Mg): 21,198 mg/kg, Copper (Cu): 2,000 mg/kg, Iron (Fe): 12,500 mg kg, Zinc (Zn): 12,500 mg/ g, Manganese (Mn): 5000 mg/kg, Iodine (I): 75 mg/kg, Selenium: 25 mg/kg, Cobalt (Co): 25 mg/kg; citric acid; propyl gallate: (Carrier: calcium carbonate, magnesium oxide).

RESULTS AND DISCUSSION

Growth performance

Rabbits given the Sg30 feed grew faster than rabbits on other diets, leading to 18% higher body weight gain (25.6 *vs* 30.4 g/d, P <0.001) compared to the control group Sg0 (Table 2). The feed intake of rabbits on the Sg30 diet was on average 7% higher than that of rabbits on the other diets. The control

batch presented the worst feed conversion ratio (+ 0.45, P <0.001) compared to the Sg30 batch. The results of this study are better than those commonly obtained in tropical areas (Oloruntola *et al*., 2015; Kimsé *et al.*, 2017), but however similar to those of Yao *et al.* (2016).

Table 2: Effect of Stylo inclusion level on the performance of rabbits

	Experimental diets				*SEM*	*P-value*
	***Sg*0**	***Sg*10**	***Sg*20**	***Sg*30**		
No.[1]	12	12	12	12		
Period 35-63						
Body weight at 35 d (g)	613	614	613	615	8.5	0.99
Body weight at 63 d (g)	1405 [b]	1317 [c]	1487 [a]	1528 [a]	14.8	< 0.001
Daily weight gain (g/d)	28.3 [b]	25.1 [c]	31.2 [a]	32.6 [a]	0.74	< 0.001
Daily feed intake (g/d)	108 [b]	102 [c]	108 [b]	115 [a]	1.4	< 0.001
Feed conversion rate	3.93 [a]	4.22 [a]	3.46 [b]	3.59 [b]	0.078	< 0.001
Period 63-91						
Body weight at 91 d (g)	2048 [b]	1923 [c]	2253 [a]	2318 [a]	20.1	< 0.001
Daily weight gain (g/d)	23.0 [b]	21.7 [c]	27.4 [a]	28.3 [a]	0.65	< 0.001
Daily feed intake (g/d)	120 [b]	120 [b]	128 [a]	130 [a]	1.73	< 0.001
Feed conversion rate	5.26 [a]	5.58 [a]	4.69 [b]	4.62 [b]	0.090	< 0.001
Period 35-91						
Daily weight gain (g/d)	25.6 [b]	23.4 [c]	29.3 [a]	30.4 [a]	0.39	< 0.001
Daily feed intake (g)	113 [b]	111 [b]	118 [a]	121 [a]	1.21	< 0.001
Feed conversion rate	4.51 [a]	4.84 [b]	4.03 [c]	4.06 [c]	0.066	< 0.001

[1] No: Number of rabbits at the end of the experiment.
[a, b, c]: Mean values in the same row with a different superscript differ, P<0.05.

Slaughter performances

Rabbits fed the Sg20 and Sg30 diets had a higher slaughter weight (+ 290 g, P <0.001) compared to those fed the Sg0 and Sg10 diets. The same orders of magnitude were observed for cold carcass weight, confirming the observation that the cuts weights are a function of rabbits final body weight (Ojebiyi *et al.*, 2013). However, carcass yields remained similar between batches, on average around 59%.

Table 3: Effect of Stylo inclusion level on rabbits' carcass characteristics

	Experimental diets				SEM	*P-Value*
	***Sg*0**	***Sg*10**	***Sg*20**	***Sg*30**		
No.[1]	8	8	8	8		
Body weight, BW g	2076 [b]	1974 [b]	2294 [a]	2337 [a]	28.1	< 0.001
Full digestive tract, % BW	17.1	17.7	17.6	16.1	0.55	0.233
Cold carcass, CC g	1235 [b]	1176 [b]	1373 [a]	1414 [a]	21.1	< 0.001
Perirenal fat, % CC	2.9	3.0	3.1	3.2	0.38	0.938
Dressing out percentage, %	59.5	59.6	59.8	60.5	0.67	0.728

[1] No: Number of rabbits at the end of the experiment.
[a, b, c]: Mean values in the same row with a different superscript differ, P<0.05.

CONCLUSIONS

Stylosanthes guianensis is a very palatable forage for rabbits. The incorporation of the cultivar CIAT 184 in the feed improves the growth rate and carcass weight without affecting animals' health. It was concluded that Stylo could be incorporated in rabbits complete pelleted feed up to 30%, as source of fibres.

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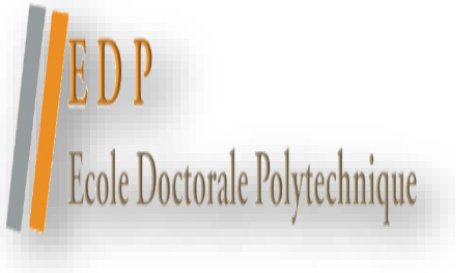


Session : NUTRITION & FEEDING

Kouadio K. S., Yapi Y. M., Kimsé M., Alla K. J. B., Sangaré S., Gidenne T., Wandan E. N.

Effects of sun-dried stylo hay (*Stylosanthes guianensis* cv CIAT 184) on rabbits growth and slaughter performances

Presentation

KOUADIO Kouakou Serge

Problematic

Imported fibrous raw Materials such as dehydrated alfalfa (*Medicago sativa*) **(Kadi *et al.*, 2012 ; Kadi *et al.*, 2018)**

Incorporation

Balanced feed in fiber

Increase in the cost of feed
(Oseni & Lukefahr 2014)

Non-incorporation
Limited incorporation

Unbalanced feed in fiber
(< 16 % ADF)

High mortality due to digestive disorders in young rabbits **(Kimsé *et al.*, 2013)**

Objectif

Determine the effects of *Stylosanthes guianensis* (*Stylo*) hay on rabbit growth and carcass caracteristics

***Stylosanthes guianensis* (CIAT 184)**

- Native to the tropical regions of Central and South America (Chandra, 2013)
- Adapted to various agro-ecological zones (tropical zone of Africa) (Edo, 1982 ; Heuzé *et al.*, 2015)
- Yield : **7.76-20 t MS.ha^{-1}** (Husson *et al.*, 2008)
- *Cv* CIAT 184, resistant to anthracnose (Jia *et al.*, 2017)

Chemical composition of *S. guianensis* (Ladeira *et al.*, 2002 ; Akpensuen *et al.*, 2018, 2019)

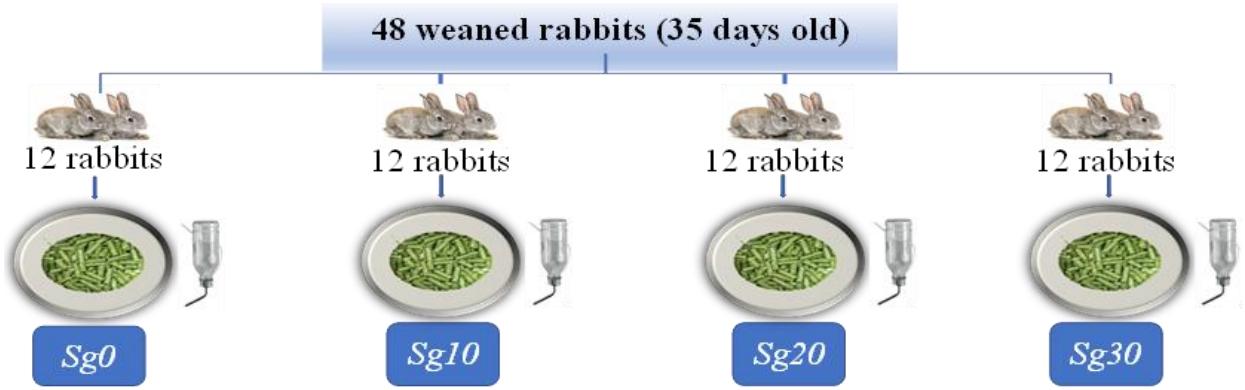
DM (% brut)	OM (% MS)	CP (% MS)	NDF (% MS)	ADF (% MS)	ADL (% MS)	Hem (% MS)	TDN (% MS)	ME (MJ/kg MS)
81.6-91.6	95.6	9.8-16.2	46.9-63.7	36.1-50.1	7.7-11.8	13.6	53.7	7.7

❑ Experimental diets

(CP : 17.5%, ADF : 19%)

Ingredients	*Sg*0	*Sg*10	*Sg*20	*Sg*30
Stylo	0	10	20	30
Basic mixture	98	88	78	68
Mineral & premix	2	2	2	2
Total	100	100	100	100

❑ Experimental design



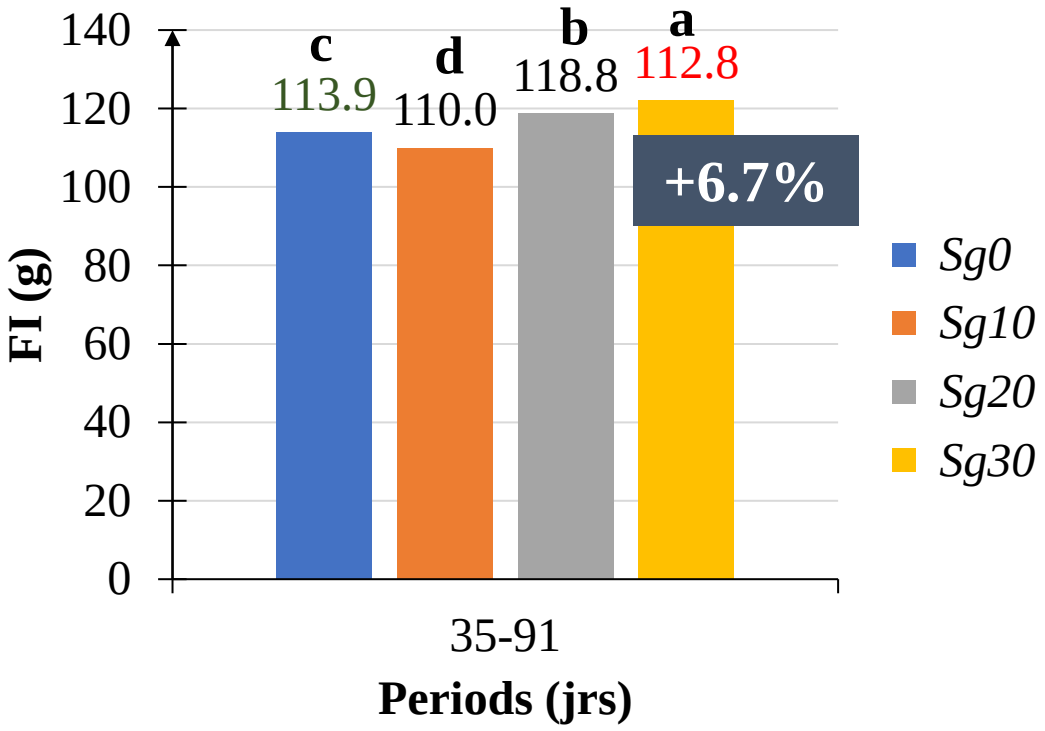
Slaughter at 91 days, and carcass measurement (Blasco & Ouhayoun, 1996)

- ❖ Hot and cold carcass,
- ❖ Dissectable fat,
- ❖ Organs (kidney, liver, etc.)

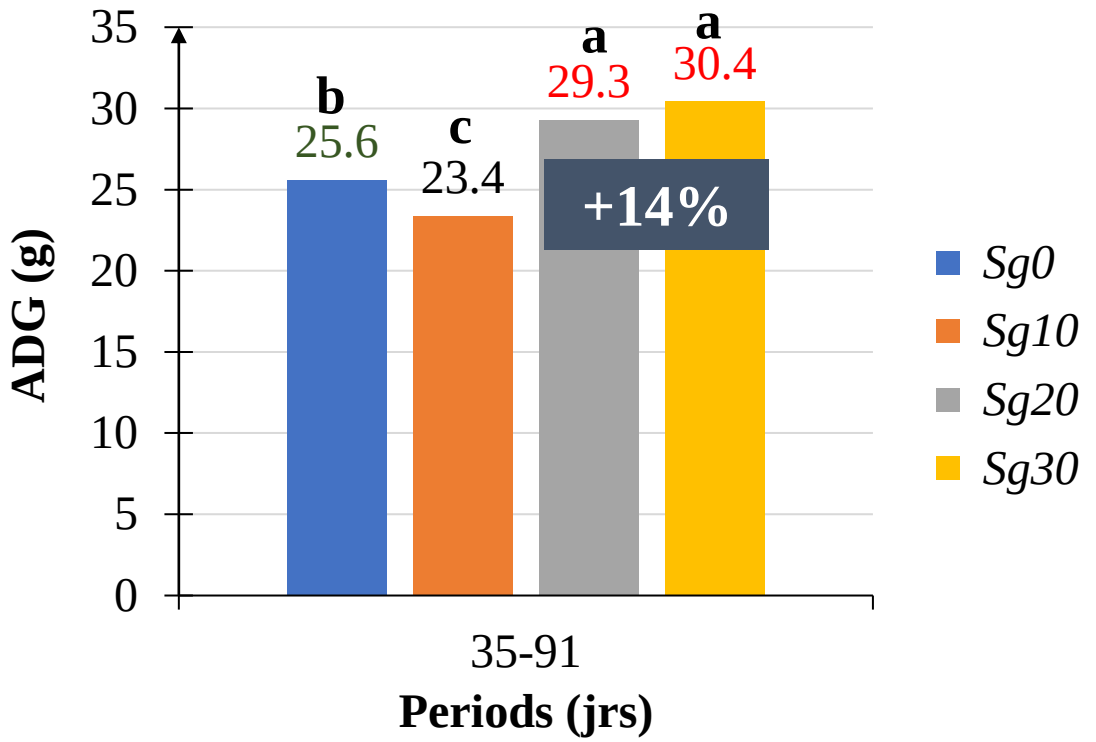
❖ **Measurements (35-91 days): Ingestion and growth**

Results & discussion

❑ Feed intake



❑ Growth



- FI avg.: 115 g/d MS > 80 g/d MS in tropical areas **(Adejoh *et al.*, 2019)**
- FI with *Stylo* level → Stimulation of the appetite **(Bureenok *et al.*, 2007 ; Okpeza *et al.*, 2007)**
- **30.4 g/d** > 23 g/d **(Kimsé *et al.*, 2014)** and 28 g/d **(Yao *et al.*, 2016)** with local commercial feed
- **ADG : 27g/d** > 20 g/d on avg. in tropical areas **(Kouakou *et al.*, 2016 ; Kimsé *et al.*, 2017)**

❑ Carcass characteristics

	Experimental feed				SEM	*P*-value
	*Sg*0	*Sg*10	*Sg*20	*Sg*30		
No.	**8**	**8**	**8**	**8**		
Slaughter weight (SW, g)	2 076 [a]	1 974 [a]	2 294 [b]	**2 337** [b]	28.12	< 0.001
Chilled carcass weight;(CCW, g)	1 235 [a]	1 176 [a]	1 373 [b]	**1 414** [b]	21.13	< 0.001
Dressing out (%)	59.48	59.60	59.83	60.47	0.67	0.728
Liver (g)	69.05	66.05	67.74	72.34	4.37	0.774
Kidney (g)	14.72	13.01	13.91	15.78	0.76	0.099
Dissectable fat (DF, g)	35.01	35.10	42.36	44.60	4.92	0.408

+200 g

❑ ↗ **SW and CCW with *Stylo* levels** → **Ability of *Stylo*-based diet to promote carcass development** (Jiwuba & Ogbuewu, 2019)

❑ Similar organ weights → **Absence of toxin in the feed** that could alter animals health (Sese *et al.*, 2013 ; Oloruntola *et al.*, 2019)

❑Conclusion

***Stylo* incorporation up to 30%**

- **Improvement of rabbits growth,**
- **Improvement of rabbits carcass weight.**

***Stylo* hay could thus be considered as a good and balanced fiber source for the growing rabbit in tropical areas**

❑Prospects

- Develop the production of *Stylosanthes guianensis* to replace alfalfa in rabbit feed,
- Thoroughly characterize the nutritional value of rabbit meat from *Stylo* hay-based diet.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