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Valorization of *Leucaena Leucocephala (L)* leaves in the broilers feed (strain Cobb500) in Lubumbashi: Effect on growth and economic yield

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Abstract: The present study was focused on *Leucaena leucocephala* leaves valorization in the broiler meat feed (strainCobb500) in the Lubumbashi. One hundred and twenty unsexed chicks were used in this study. Four treatments based on different foods were setfor this experiment i.e.the control: 100% of soya flour (T0), mere *Leucaena* leaves (MLL), Sulphated *Leucaena*leaves (SLL) and soaked *Leucaena* leaves (SoLL). These leaves were incorporated at a rate of 0%, 5%, 10% and 15% respectively in replacement of soya flower. The obtained results reveal a significant difference on zootechnical parameters i.e. the daily feed consumption (DFC), daily mean increase and the consumption index (CI) with the low cost of production observed on *Leucaena* leaves treatment soaked in water and L*eucaena leucocephala* leaves chemically treated with ferric sulphate.

Key words: food, broiler meat, *Leucaena leucocephala*, growth, consumption, economic yield

1. Introduction

The aviculture is one means by which Africa is engaged in order to increase its production of animal proteins. Compared to other productions, aviculture offers the best yields of plant calorie conversion to animal calorie and protein transformation. (Acamovic et *al.;*1980). Beyond the excellent yield of chickens, chicken meats possesshigh nutritional and dietetic quality such as low concentration of fat and high concentration of polyunsaturated fatty acids(Anonyme,2005). Producing, consumption and sell of poultry meat can allow producers to improve their diet and earn incomes (Ossebi,2010) . The modern poultry breeding is more and more under a rapid expansion and the feed only represents 60 to 80% of the operating charges(Issa et *al*.;2002). And constitutes the main development limiting factor in this area.The raw materials are more and more expensive and rare because of the human competition and their diversion to biofuel. The broiler production in Lubumbashi would be the object of the better economic expectations, the market being favorable and the demand very permanent. Moreover, the over chilled chicken legs are the source of disastrous socio-economic consequences, and could be replaced by a local production which is the better way of decreasing the capital outflow. However, it necessary to note that although all these predispositions, the local production is still very insignificant and the area is largely underexploited. The chicken producers face several challenges and the economic results are often negative or low. Most of imported products seem to cheaper than those coming from the local production (Ghatnekar et al.;1983). The use of Leucaena leucocephala leaves appear to be favorable for feeding chicken in Lubumbashi. According to (LeHoebinh et al.;1990), the growth of this plant is good on tropical soil, and can produce 40.2 to 45.5 tons of green fodder it being 11 to 12 tons of dry matter or 2.15 to 3.25 tons of crude proteins ha-1 year-1.Moreover, the Leucaenaleucocephalaleaves are not consumed by humans; showing a reduced competition between man and livestock especially in developing countries in general and DR Congo in particular where access to feedis one of big challenges.Leucaenaleucocephalaleaves contain also some anti-nutritional substances which can hinder their use to animals, mostly the monogastrics, and more to broiler meat such as: tannin, antitrypsine, saponine, flavone and particularly the mimosina which is very toxic. But several detoxifying methods have been proved by researchers ensuring their use. The use of

Leucaena leucocephala leaves in diet of broiler meats in Lubumbashi can contribute to maintain their growth performance and assure the acceptable production cost. The present study aimed to contribute to knowledge of non-conventional feed resource efficiency in modern aviculture; case of Leucaena leucocephala leaves. As objectives: to determine the efficiency of this substitution on the growth (effect on feed consumption, Daily Mean Increase and Consumption index) and on the economic yield (effect on the production of a kilo of feed, gross feed margin kg-1 of LW; gross benefit).

2. Study area, material and methods

2.1. Study area

The experiment was conducted in a building situated in Misepe camp area, annex commune, Lubumbashi city, DR Congo. The suburban area is located at 1.224m mean altitude, and 11°40' south latitude and 27°8' east longitude; its annual mean temperature is 20°C. The pluviometric regime of the city is characterized by a rainy season (from November to March), a dry season (from May to September) and two transitional months (AprilandOctober)[26].Overall, Lubumbashi city comprises various economic activities. Aside the large exploitation units, there are some small and medium-sized businesses upon which, elsewhere many world's country based their hope for development.The city encompasses some commercial activities and businesses of all kinds. Then the markets are tightly organized according to the industrial activity without counting some semi-industrial workshops which are scattered [27]. The broiler meat market is very favorable in the city; however the quasi-totality of products is imported.

2.2. Material and methods

One hundred and twenty unsexed chicks belonging to the Cobb 500starin, of one day old was the biologic material for this study. The *Leucaena leucocephala* leaves were collected in different areas of Lubumbashi, which are: Lubumbashi university area, Agronomic science faculty area and Kabulamenshi area. The dry leaves were pounded to powder in a harmmer mill of Matshipisha market found in Katuba commune. Three different treatments were applied to detoxify the mimosina which is the antinutritional factor of *Leucaena leucocephala.*The leaves were macerated during 48 hours followed by the sun drying during 72 hours, and then chemically treat the leaves adding ferric sulphate, according to a ratio of 5g sulphate in 1kg of leaf powder, firstly dried to sun during 72 hours and a mere sun drying of leaves during 72 hours.

2.3. Experimental trials

Three experimental rations of the kind growing-finishingallowed assessing the effect of soya flour substitution by the*Leucaenaleucocephala*leaves on the broiler meat growth in Lubumbashi. The rations were based on local ingredients such as: maize bran, fish powder, caterpillar powder, cassava flour; purchased in the local market of Lubumbashi and the *Leucaenaleucocephala*leaves treated in three ways described above.

2.3.1. The breeding design

From the reception, chicks passed under a general checkup. A vaccination calendar proposed by strain selector allowed preventing New castle and Gumboro diseases.

2.3.2. Feeding design

This study was realized at the period going from midst of August to the midst of September and during 28 days. A commercial feed called "demarrage" in French meaning starting was given to chicks in a period of 6 days. From the 7^{th} to the 9^{th} day, the livestock was put under feed transition with a ration based on *Leucaena leucocephala* leaves at 5%. At the 10^{th} day, the period corresponding with the beginning of the livestock growth according to the strain selector recommendation coincided with the beginning of experimental rations going up to 28^{th} day old. After installation in lot according to the factorial experimental designof 3 treatments with 36 chicks each, and the doses of D_0 (Control), D_1 (5%), D_2 (10%) and D_3 (15%) of soya flour substitution rate by the*Leucaena leucocephala* leaves; each treatment was subdivided in three replicates of 12 chicks each. At these substitution rates, each one was related to different detoxification treatments of the antinutritional factor i.e. the mimosina. Then these doses and treatments become LLD1, LLD_2, andLLD_3 referring to different *Leucaena leucocephala* leaf treatments such as: dried leaves, socked and then dried leaves and the dried leaves and then treated in ferric sulphate. And each lot was then subdivided in four sub-experimental lotsof $1m^2$area, having 3 chicks each (figure 1).

Figure 1. Experimental design

2.3.3. Ingredient and experimental ration formulation

The feedrations used in this experiment are found in the table 1 below.

Table 1. Ingredient and experimental ration formulation

Ingredients	**Experimental ration(kg)**			
	T0	**T1**	**T2**	**T3**
Caterpilar'spowder	12	12	13	13
Fish powder	5.4	5.4	5.5	5.5
Maize bran	61	61	60	61
Soya flour	15	10	5	0
Salt	0.2	0.2	0.2	0.2
*Leucaena's*leaves	0	5	10	15
Cassave flour	6	6	6	4,9
Vitamin E	0.2	0.2	0.2	0.2
Syntheticvitamin	0.2	0.2	0.1	0.2
Total	100	100	100	100
Bromatologic composition from experimental ration calculations				
Dry matter (DM)	83.91	83.91	83.91	83.91
Brut protein (BP)	20.16	20.16	19.73	19.96
Fat matter (FM)	7.10	7.10	7.10	7.10
Brut cellulose (BC)	2.89	2.89	2.89	2.89
MetabolisableEnergy (ME)	3269.84	3206.97	3139.99	3074.39
Ratio EM/PB	162.15	159.27	159.14	154.01
Calcium (Ca)	3.80	3.80	3.80	3.80
Phosphorous(P)	3.92	3.92	3.92	3.92
Sodium (S)	40.42	40.42	40.42	40.42
Potassium (K)	3.08	3.08	3.08	3.08

2.4. Growth performance evaluation

For determining the effect of soya flour substitution by the *Leucaena leucocephala* leaves in the ration of the broiler meat, growth parameters such as, the individual feed consumption (IFC), daily mean increase (DMI) and the consumption index (CI) were determined.

2.4.1. Individual feed consumption (IFC)

According to Sanson (2009), the individual feed consumption (IFC) is calculated using the following formula:

$$\mathbf{IFC} = \frac{(\mathbf{FQD} - \mathbf{FQR})}{\mathbf{Number}}$$

FQD = Daily feed quantity distributed
FQR = Daily feed quantity rejected

2.4.2. Daily mean increase (DMI)

The weekly weight measures allowed determiningthe DMI through a ratio of weight during a period by the time (in days) of the period.

$$\mathbf{DMI(g)} = \frac{\mathbf{weight\ (in\ g) during\ a\ period}}{\mathbf{Period\ of\ time\ (day)}}$$

2.4.3. Consumption index (IC)

It's a ratio of feed quantity consumed during a given time by the weight increase period during the same time. It's without a unit and is determined according to the below formula.

$$\mathbf{CI} = \frac{\mathbf{Food\ quantity\ consumed\ (g)}}{\mathbf{Weight\ increase\ during\ a\ period\ (g)}}$$

2.5. Economic evaluation

The economic evaluation was done through basic feed production. This was calculated from ingredient price collected in the local market. The production cost of a kilogram of live weight was obtained by multiplying the consumption index (CI) by the cost of a kilo of a feed according to [4].

2.6. Statistical analysis

Data were captured on the Excel sheet and then statistically treated with Minitab 16. Anova two ways (dose and treatment) allowed to show to show the dose effects, the treatment effects and the eventual interaction; and the Turkey test was used for comparing averages.

3. Results

3.1. Effect of soya flour substitution by the *Leucaena Leucocephala* leaves on the animal live weight

The table 2 shows that during 28 days, the doses D_1 and D_3 induced significant effects compared to D_0 and D_2 on a period of 29 to 35 days. Considering the 3 treatments, significant differences were observed from the 15th day up to the end of the observation. When considering eventual interactions, the combination of treatment and dose induced the significant effects on the animal live weight from the 15th day up to the end the experiment period, while no significant effect was observed from the 7th to the 14th day.

Table 2. Effect of soya flour substitution by the *Leucaena Leucocephala* leaves on the live weight

Experimental ration		**Live weight in g/ days**				
		7 to 14	**15 to 21**	**22 to 28**	**29 to 35**	**7 to 35**
Doses	**D_0**	123.80±11.03^{a}	198.80±11.69^{a}	322.60±11.70^{a}	631.82 ± 30.41^{a}	1124.0 ± 90.1^{a}
	D_1	121.52±13.24^{a}	191.82±18.44^{a}	313.34±20.59^{a}	604.59 ± 51.02^{a}	1070.8 ± 127.6^{a}
	D_2	121.79±12.8^{a}	195.88±30.13^{a}	317.68 ± 30.15a	611.93 ± 55.94^{ab}	1076.2 ± 112.3^{a}
	D_3	125.65±7.48^{a}	186.92±19.06^{a}	312.60 ±22.23a	580.43 ± 45.31b	1027.4 ± 89.6^{a}
Dose effect		**p= 0.789**	**p= 0.540**	**p= 0.021**	**p=0.385**	**p=0.188**
Treatments	**LS**	122.38±11.96^{a}	179.01±24.05^{b}	301.39±23.31^{b}	572.55 ± 48.50^{b}	992.3±100.2^{b}
	LT	124.52 ± 9.79^{a}	199.81 ±13.25^{a}	324.33±17.03^{a}	618.18 ± 26.97^{a}	1101,7±60.7^{a}
	LS	122.69 ±12.08^{a}	201.26±16.15^{a}	323.94±17.02^{a}	630.83 ± 48.82^{a}	1129.8±106^{a}

	S					
Treatment effects		**p=0.847**	**p=0.002**	**p=0.008**	**p=0.000**	**p=0.000**
Treatment X doses		**p=0.953**	**p=0.038**	**p=0.017**	**p=0.032**	**p=0.001**

a,b,c: values bearing different letters at the same row are significant different to the threshold of 5%. LS, LT, LSS.

3.2. Effect of soya flour substitution by the *Leucaena Leucocephala* leaves on the Daily Mean Increase (DMI)

During 28 days of observation (table 3) the doses D_0, D_1 and D_3induced significant effects compared to D_2 during a period of 22 to 28 days. The significant differences were observed from the 15th day up to the end of the observation. The combination of treatment and dose exerted the significant effect on the daily mean increase of broilers from the 15th up to the end of the observation.

Table 3.Effect of soya flour substitution by the *Leucaena Leucocephala* leaves on the Daily Mean Increase (DMI)

Experimental ration		**Daily Mean Increase**				
		7 to 14	**15 to 21**	**22 to 28**	**29 to 35**	**7 to 35**
Doses	**D_0**	17.686 ± 1.576a	28.400 ± 1.670a	44.175 ± 3.247^{a}	70.314 ±8.786^{a}	40.144 ± 3.217^{a}
	D_1	17.360±1.892a	27.404±2.635a	41.602±5.386^{ab}	66.599±11.240^{a}	38.241±4.55^{a}
	D_2	17.399±1.826a	27.983±4.304a	42.036±5.090^{ab}	66.323±9.064^{a}	38.435±4.010^{a}
	D_3	17.954±1.069a	26.704±2.723 a	38.262±3.853^{b}	63.849±6.55^{a}	36.692±3.199^{a}
Dose effect		**P=0.789**	**p=0.540**	**p=0.021**	**p=0.385**	**p=0.188**
Treatements	**LS**	17.483 ±1.709^{a}	25.572 ± 3.436^{b}	38.738 ±4.781^{b}	59.967±8.528^{b}	35.440±3.66^{5b}
	LT	17.788 ± 1.99^{a}	28.545 ± 1.893^{a}	41.978±2.869^{ab}	69.072±5.598^{a}	39.346 ±2,169^{a}
	LSS	17.527 ±1.726^{a}	28.751 ± 2.308^{a}	43.841±5.284^{a}	71.275±8.792^{a}	40.348 ±3.796^{a}
Treatmenteffect		**p=0.847**	**p=0.002**	**p=0.008**	**p=0.000**	**p=0.000**
TeatementsX Doses		**p=0.953**	**p=0.038**	**p=0.017**	**p=0.008**	**p=0.001**

a,b,c: values bearing different letters at the same row are significant different to the threshold of 5%. LS, LT, LSS.

3.3. Effect of soya flour substitution by the *Leucaena Leucocephala* leaves on the individual feed consumption (IFC)

From the table 4 it is observed that the doses induced significant effects from the 7th to the 35th day; and the combination of treatment and dose exerted significant effects on the feed consumption in the time of experiment.

Table 4. Effect of soya flour substitution by the *Leucaena Leucocephala* leaves on feed consumption (g day^{-1})

Experimental ration		**Individual feed consumption (g day^{-1})**				
		7 to 14	**15 to 21**	**22 to 28**	**29 to 35**	**7 to 35**
Doses	**D_0**	53.25 ±9.85^{b}	90.17±4.78^{c}	118.25±6.24^{b}	169.75 ±4.45^{b}	107.85± 5.21^{b}
	D_1	104.93±8.91^{a}	164.64±9.59^{a}	161.09±55.78^{a}	215.09±56.35^{a}	161.44±31.44^{a}
	D_2	98.88±8.059^{a}	155.65±8.27^{b}	160.08±16.74^{a}	206.45 ± 11.06^{a}	155.26±7.16^{a}
	D_3	97.53±18.78^{a}	167.75 ±1.39^{a}	157.63±13.94^{a}	207.10±6.32^{a}	157.50±8.46^{a}
Dose effect		**p=0.000**	**p=0.000**	**p=0.002**	**p=0.002**	**p=0.000**
Treatments	**LS**	80.04±21.27^{b}	141.56±31.72^{a}	129.43±30.60^{b}	181.95±30.58^{b}	133.25±22.13^{a}
	LT	84.98±19.97^{ab}	150.22±36.45^{a}	154.05±34.24^{ab}	206.63±34.61^{ab}	148.97±29.36^{a}
	LSS	100.93±26.95^{a}	141.87±31.12^{a}	164.31±29.92^{a}	210.22 ±28.48^{a}	154.33±27.49a
TreatmentsEffet		**p=0.035**	**p=0.706**	**p=0.010**	**p=0.028**	**p=0.076**

TreatmentsX Doses	**p=0.000**	**p=0.000**	**p=0.000**	**p=0.000**	**p=0.000**

a,b,c: values bearing different letters at the same row are significant different to the threshold of 5%. LS, LT, LSS.

3.4. Effect of soya flour substitution by the *Leucaena Leucocephala* leaves on the consumption index (IC)

The different doses (table 5) exerted significant effects on the consumption indexduring the experiment. But, considering the 3 treatments no significant difference was observed; and for interactions, the combination of treatment and dose induced significant on the consumption index.

Table 5.Effect of soya flour substitution by the *Leucaena Leucocephala* leaves on the consumption index

Experimental rations		**Consumption index on the period of observation**				
		7 to 14	**15 to 21**	**22 to 28**	**29 to 35**	**7 to 35**
Doses	**D_0**	3.06 ± 0.43^b	3.18 ± 27.7^b	2.69 ± 0.29^b	2.45 ± 0.3^b	2.7 ± 0.2^b
	D_1	6.1 ± 0.81^a	6.05 ± 0.64^a	3.82 ± 1.17^a	3.3 ± 0.6^a	4.2 ± 0.6^a
	D_2	5.74 ± 0.87^a	5.73 ± 1.23^a	3.83 ± 0.56^a	3.2 ± 0.5^a	4.0 ± 0.4^a
	D_3	5.46 ± 1.17^a	6.34 ± 66.12^a	4.17 ± 0.61^a	3.3 ± 0.4^a	4.3 ± 0.5^a
Dose effect		**p=0.000**	**p=0.000**	**p=0.000**	**p=0.000**	**p=0.000**
Treatments	**LS**	4.632 ± 1.372^a	5.729 ± 1.794^a	3.4 ± 0.96^a	3.08 ± 0.6^a	3.8 ± 0.8^a
	LT	4.802 ± 1.240^a	5.287 ± 1.352^a	3.7 ± 0.9^a	3.01 ± 0.6^a	3.8 ± 0.8^a
	LSS	5.805 ± 1.637^a	4.972 ± 1.226^a	3.8 ± 0.8^a	2.9 ± 0.5^a	3.8 ± 0.7^a
Treatment effect		**p=0.052**	**p= 0.355**	**p=0.436**	**p=0.876**	**p=0.985**
Treatments X Doses		**p=0.002**	**p=0.023**	**p=0.000**	**p=0.000**	**p=0.000**

a,b,c: values bearing different letters at the same row are significant different to the threshold of 5%. LS, LT, LSS.

3.5. Effect on economic parameters

The table 6 presents the economic parameters related to the cost of production of a kilo of food,the cost of a kilo of live weight and gross benefit.

Table 6. Effect of soya flour substitution by the *Leucaena Leucocephala* leaves on the feed production cost of broiler meat

Ingrédient	**Quantity (kg)**	**U.P (FC per kg)**	**Control**	**Rations based on *Leucaena* leaves**		
			T0	T1	T2	T3
Maize bran	61	212.5	12962.5	12962.5	12962.5	12962.5
Cassavaflour	6	760	4560	4560	4560	4560
Fish powder	5.4	466.7	2520.18	2520.18	2520.18	2520.18
Soya flour	15	875	13125	8750	4375	0
*Leucaena*leavesp owder	15	150	0	750	1500	2250
Caterpillar powder	12	700	8400	8400	8400	8400
vitaminopfsynthe sis	0.2	35000	7000	7000	7000	7000
Vitamin E	0.2	56666.6	11.333	11.333	11.333	11.333
Table salt	0.2	1000	200	200	200	200
Cost of 100kg			60100.14	56.474	52850.14	49225.14
$CostKg^{-1}$food			601.001	564.74	528.50	492.25

CI			2.7	4.2	4.00	4.00
Cost Kg (LW)			1622.70	2371.908	2114.00	1969.00
Sale price of one kg of (LW)			5000	5000	5000	5000
Gross margincompared to the control			0	749.2	491.3	346.3

4. Discussions

4.1. Effect of soya flour substitution by *Leucaena leucocephala* leaves on the live weight

The *Leucaena leucocephala* leaf powder incorporation in the ration exerted significant influence on the live weight of chicken from the 7th to the 14th day. But the interaction of treatment and dose on the live weight exerted significant difference from the 15th to 35th day. These results go in the same line with those obtained by (Ayssiwede et *al.;* 2010;Ayssiwede et *al.;* 2011a)on the local chicken in Senegal, whereby the best results were registered on chicken receiving diet which encompassed 7% of *Leucaena leucocephala* leaves. The same results corroborate that obtained by (Ter Meulen et *al.;* 1989)who, when he incorporated 10% of *Leucaena* leaves powder in the rations of broiler meat and obtained the best performance in weight compared to the control.(Mutayola et *al.*;2003)likewise observed when incorporating the low rate (5-10%) of *Leucaena leucocephala* leaf powder in the diet of good layers a live weight improvement in comparison of the control (Bello,2010;Ossebi,2010)didn't observe any negative effect on the live weight of local chicken when feeding them with 5 to 8% of *Moringao leifera* leaf powder. These results prove that the *Leucaena* leaves are rich in protein(Gupta et al.;1986) and there is a reduction of toxicity via drying of leaves [Acamovic et al.;1980)] and the use of ferricsulphate which inhibit the mimosina. On the contrary (Scott et *al*.;1971) and (Bastarrachea et *al.;*1980) observed a decrease of the live weight and the production of eggs with diet encompassing 3 to 5% *L. leucocephala* leaves. The same applied to (Ter Meulen et *al*.;1989)and (Mutayola et *al.;* 2003)who recorded a deterioration of the live weight when incorporating *L. leucocephala* leaves at different rates (among them 5%) in the ration of broilers and chicks. The similar results were observed by (Soedayo and Bortharkar,1996) on the broiler meat fed with 3 to 6% *Leucaena* leaf powder. The wear and tear of the live weight observed by these authors would be due in one hand to the fact that the leaves were not dried to the sun and ferricsulphate not added to reduce or inhibit the mimosina and the other hand to the lack of differentiation of seeds and leaves in the formulated rations.

4.2. Effect of soya flour substitution by *Leucaena leucocephala* leaves on the daily feedconsumption

The effect on the interaction of treatment and dose on the consumption was significant by the fact that the consumption index increased with the substitution rate. The feed consumptions recorded in the course of the experience corroborate the result of (Riise et *al.* ;2004).Such feedconsumption increases were observed on the subjects treated with *Leucaena* leaf powder (Mutayola et *al.;*2003) on young chickens. Contrary to this result, (Bello,2010) obtained a consumption decrease by incorporating the *M.oleifera* leaves at 16 to 24% in the ration the broilers in Senegal. The similar results were also obtained by (Ter Meulen et *al.;*1989) on the broiler meat receiving *Leucaena* leaf powder at 20 and 30% of inclusion and the seeds at the incorporation rate of 3, 6, 9, and 12%. This may be explained by the effects of the antinutritional factors such as the mimosina which seems to inhibit the appetite of animals; this is contrary to the present result for (Bello,2010) and (Ter Meulen et *al* .;1989) didn't include in their ration the ferricsulphate.

4.3. Effect on the mean daily increase

The interaction of treatment and dose effect didn't show a significant difference on chickens during the period going from 7th to 14th day, but from 17th to 35th day a significant effect on the mean daily increase was observed. These results are in the same line with that of (Natam and Chandrasekaran, 1996), who found significant differences when they used different levels of feedincorporation of FFL with 0.5 and 10% on broilers which were 0 to 5 weeks old. But they go in the opposite sense with the results of (Hussain et *al.*; 1991) who didn't indicate any significant effect for the interaction of the treatment and dose on the mean daily increase of broilers having 1 to 35 days old when the dose of *Leucaena leucocephala* leaves soaked in the ration went from

0 to 15%. Similar results were reported by (Guiral et al, 1991); (Bastarrachea et al.;1980)and (Acamovic et al.;1980)**,** with levels of FFLhaving 12 and 15% of chickens' ration. These differences between studies could have been related to the antinutritional substance tolerance, to the nutritional need of the chicken's race and to the concentration of mimosina in the *Leucaena* leaf powder used.

4.4. Effect on the consumption index

The *Leucaena* leaf powder input in feed of broiler meat had significantly improved the consuption index in comparison of the control ration. These results corroborate that of (Ossebi,2010)and **(**Ayssiwede et *al*.;2010**)** who obtained on the lot of the control subjects and those treated with the diet containing 7% of *Leucaena*leaf powder. The similar results were obtained by (Bello,2010)on the local chickens in Senegal fed with the diet containing 8,16, 24% of Moringa leaf powder; and by (Ayssiwede et al.;2010) and (Ossebi,2010)after the incorporation of *Cassia tora* leaf powder at the rates of 10 and 15%. The results of this study are contrary to that of (Reddy et al,1987) who by incorporating *Leucaena Leucocephala* leaf powder in the ratio of broilers at 3, 6, 9, and 12% recorded an increase of the consumption index;(Ter Meulenetet *al.;*1989) likewise demonstrate some trends opposite to that observed in this study. These latter authors recorded a deterioration of zootechnic growth parameters (LW, MDI, FC and CI) to broilersunder diet containing 10, 20, and 30% of *Leucaena leucocephala* leaf powder incorporation.

4.5. Effect on economic parameters

Results obtained on the economic yield of the present study show that the production cost decreases with the increase of the substitution rate of *Leucaena leucocephala* leaves replacing soya flour. This reality is justified by the fact that soya occupies the first place in the worldwide trade of protein crops and oleaginousand in consequence by its processing incrab which is so expensive(Tendokeng et al.;2008).That is why its price is always too high compared to the byproducts. These results are similar to that of (Mahamat,2013)who observed a significant decrease of the production cost when they incorporated the *Leucaena leucocephala* in the ration of broilers. On the contrary (Bello,2010) observed a rising of the feedproduction cost with the growing inputs of *Moringaoleifera*powder in the ration local chickens. He justifies this increase of the feedproduction cost by the increase the consumption index. However, the results of this study become similar to that of [Bello,2010] who found more profitable with *Moringaoleifera* leaf powder incorporation rate of 16% in the ration of local broilers compared to the control.

5. Conclusion

Four different feed treatments were experimented i.e. T0 (the control: 100% soya flour), a treatment based on mere *L. leucocephala* leaves, a treatment of sulphated *L. leucocephala* leaves and a treatment of soaked *L. leucocephala* leaves and incorporated respectively at a rate of 0%, 5%, 10% and 15% of soya flour substitution by the *L. leucocephala*leaves in the experimental diet. The resultsshow that the treatment of *L. leucocephala*by soaking and by chemical treatment at 5% and 10% of substitutionof substitution rateexerted good performances on weight increase and causing a high decrease of the production cost. Therefore, the valorization of *L. leucocephala*leaves in the feedof broilers can allow avoidingfeedcompetition between man and animal. Thus, the cultivation of *L. leucocephala*as legume on the great areas in association with other crops is very essential not only for atmospheric nitrogen fixation, but also its incorporation in the diet of domestic animals while mastering different techniques of fighting against the mimosina an antinutritional factor in *L. leucocephala*leaves.

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