

## EFFECT OF FEEDING MEXICAN SUNFLOWER LEAF (*Tithonia diversifolia*, Hemsley, A. Gray) ON PERFORMANCE OF BROILER CHICKS

## UTJECAJ HRANIDBE LIŠĆEM MEKSIČKOG SUNCOKRETA (*Tithonia diversifolia*, Hemsley, A. Gray) NA PROIZVODNE REZULTATE BROJLERSKIH PILIĆA

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### ABSTRACT

One hundred and fifty (150) white one-day old Arbor Acres broiler chicks were randomly allocated to five experimental diets of thirty birds each. The first diet was the standard (basal) starter and finisher diet and served as control. The other rations contained 2.5%, 5.0%, 7.5% and 10.0% Mexican sunflower leaf (MSL) as graded replacement (w/w) for maize and soya meal. The study investigated the performance and haematological responses of the birds to the diets. Mexican sunflower leaf meal supplementation did not improve performance characteristics over basal diets and significantly ( $p < 0.05$ ) retarded feed intake, growth rate, feed conversion except for its inclusion at 5.0%, while haematological parameters were significantly ( $p < 0.05$ ) enhanced except for eosinophil and lymphocytes concentration. Mexican sunflower leaf is therefore a promising feed ingredient that could be cheaply incorporated into poultry rations at 5.0% level when conventional feeds are inadequate.

Key word: lesser known sunflower, feed intake, weight gain, broiler chicks

### INTRODUCTION

Poultry, particularly chicken, appear more frequently than any other animal as a source of meat in the diet of people throughout the world with the exception of vegetarians. Chicken is a delicacy cherished by young and old, especially in Africa where it suffers no social or religious inhibition. However, due to its wide spread cost, poultry products such as eggs and meat are gradually fading out in most meals in Africa. In an effort to increase productivity of poultry, non conventional feeds such as Mexican sunflower leaf are incorporated into the diets of broilers. The purpose of this study therefore is to investigate the effect of Mexican sunflower leaf on the growth of broiler chicks. Specific objective is to determine the optimal level of inclusion of Mexican sunflower leaf.

### MATERIALS AND METHODS

Experimental site: The experiment was carried out in a deep litter house at Ologuneru village for a period of eight (8) weeks.

Experimental Materials: One hundred and fifty one-day old Arbor Acres broiler chicks, drugs (antibiotics, anticoccidials and vitamins), brooms, plastic bucket, vaccines, feeding and drinking troughs etc. were purchased. The building had already been partitioned into various pens.

Plant material: Mexican sunflower "*Tithonia diversifolia*" leaf obtained at the Teaching and research farm, University of Ibadan was harvested at approximately 6 weeks by slashing and carrying after the onset of rains. The stems were cut 50cm above the ground and sorted into leaves (Tarawali *et al*; 1995). The stems were sun-dried on a clean

**Table 1: Ingredient Composition of the Starter Diet**

**Tablica 1. Sirovinski sastav početnih krmnih smjesa**

Ingredients - Sastojci	A	B	C	D	E
Maize - Kukuruz	52.50	51.00	49.50	48.00	46.50
Soya meal – Sojina sačma	23.00	22.50	22.00	21.50	21.00
GNC - Pogača od kikirikija	17.00	16.50	16.00	15.50	15.00
MSLM <sup>1</sup> – Brašno lista meks. suncokreta	0.00	2.50	5.00	7.50	10.00
Fish meal (72%) - Riblje brašno	2.50	2.50	2.50	2.50	2.50
Bone meal – Koštano brašno	2.50	2.50	2.50	2.50	2.50
Oyster shell – Ljuska školjki	1.50	1.50	1.50	1.50	1.50
Vitamin premix – Vitaminski premiks	0.25	0.25	0.25	0.25	0.25
Salt - Sol	0.25	0.25	0.25	0.25	0.25
Methionine - Metionin	0.25	0.25	0.25	0.25	0.25
Lysine - Lizin	0.25	0.25	0.25	0.25	0.25
Total - Ukupno	100.00	100.00	100.00	100.00	100.00
CP – Sirove bjelančevine	24.36	24.18	24.01	23.83	23.65
Energy kcal/kg – Energija kcal/kg	2944.2	2913.2	2882.2	2851.3	2820.3

**Table 2: Ingredient Composition of the Finisher Diet**

**Tablica 2. Sirovinski sastav završnih krmnih smjesa**

Ingredients - Sirovine	A	B	C	D	E
Maize - Kukuruz	59.50	58.00	56.50	55.00	53.50
Soya meal – Sojina sačma	20.00	19.50	19.00	18.50	18.00
GNC - Pogača od kikirikija	14.00	13.50	13.00	12.50	12.00
MSLM <sup>1</sup> – Brašno lista meks. suncokreta	0.00	2.50	5.00	7.50	10.00
Fish meal (72%) - Riblje brašno	1.50	1.50	1.50	1.50	1.50
Bone meal – Koštano brašno	2.50	2.50	2.50	2.50	2.50
Oyster shell – Ljuska školjki	1.50	1.50	1.50	1.50	1.50
Vitamin premix – Vitaminski premiks	0.25	0.25	0.25	0.25	0.25
Salt - Sol	0.25	0.25	0.25	0.25	0.25
Methionine - Metionin	0.25	0.25	0.25	0.25	0.25
Lysine - Lizin	0.25	0.25	0.25	0.25	0.25
Total - Ukupno	100.00	100.00	100.00	100.00	100.00
CP – Sirove bjelančevine	21.73	21.55	21.38	21.20	21.02
Energy kcal/kg – Energija kcal/kg	2995.7	2964.8	2933.8	2902.9	2871.9

**Table 3: Anti-nutritional factors in MSLM**

**Tablica 3. Anti-nutritivni faktori u MSLM**

Component – Sastojak	Quantity – Količina (mg/100g)
Total Alkaloid – Ukupni alkaloidi	6.32
Saponin - Saponin	1.05
Oxalate - Oksalat	5.25
Phytate - Fitat	8.81
Tannin - Tanin	5.19
Glycosides - Glikozidi	0.42
Phenol - Fenol	0.53

Source - Izvor: Ekeocha, A.H. (2009)

cemented platform until crisp. The leaves were partially ground and packed into sacks, weighed and stored in a silo. The samples were bulked together and manually mixed to obtain as uniform a product as possible. A representative sample was collected from it for proximate analysis. The MSL sample was oven dried at 105 c for 24 hours (to constant weight), milled and stored in air tight, sealed polythene bags prior to chemical analysis.

**Experimental procedures:** The one hundred and fifty one-day old Arbor Acres broiler chicks were purchased from CHL farms Ltd., Ajanla, Ibadan. The birds were randomly assigned to the five (5) treatments A, B, C, D and E. Feed and fresh water were supplied *ad libitum* on daily basis through out the experimental standard procedures. The daily left-over in the feeding troughs was carefully weighed and deducted from the known weight of feed served at the initial stage to know the actual feed intake. Actual water intake was also determined. The experiment was terminated at the end of the eight weeks. Blood samples were collected through the veins in the neck and under their wings into clean sterilized test tubes. Twelve (12) pairs of blood samples were randomly collected in each treatment for serum and haematological analysis.

**Data collection:** Data were collected on the following parameters on weekly basis. Feed intake, body weight gain, feed conversion ratio, blood samples. Blood samples were collected through the veins in the neck and under the wings of the six (6) birds randomly selected from each treatment into two (2) different bottles one with EDTA (Ethylene diamine tetra acetic acid) to avoid coagulation and the

other without EDTA so as to allow coagulation and then the collection of serum samples. In all sixty (60) birds were used and there were one hundred and twenty (120) bottles containing the blood samples.

**Blood analysis:** Haematological analyses of the blood samples were carried out at the Faculty of Veterinary Medicine of the University of Ibadan. Parameters analyzed included haemoglobin content using cyanomethamioglobin method, packed cell volume (PCV) was determined using a haemocytometer. Other parameters analyzed were lymphocytes, neutrophils, monocytes and eosinophils.

**Statistical analysis:** The data collected were subjected to the analysis of variance procedure of SAS (2000). Significant means were separated using the Duncan Multiple Range Test of the same package.

**Experimental design:** Completely randomized design (CRD) was adopted for the experiment. 150 one-day old broiler chicks were randomly assigned to five (5) treatments, with 30 broilers in each treatment. (i.e A, B, C, D and E – A being the control).

**Ration formulation:** The starter and finishers diets contained graded levels of Mexican sunflower leaf with the exception of the control diet as shown in Tables 1 and 2. Anti-nutritional factors in MSLM are shown in Table 3.

## RESULTS

Tables 1 and 2 show the details of ingredient composition of the starter and finisher diets. The crude protein and energy were adequate for birds

**Table 4: General Performance of Broilers given Mexican Sunflower Leaf Meal**

**Tablica 4. Proizvodni rezultati pilića hranjenih brašnom lišća meksičkog suncokreta**

Parameters - Pokazatelji	A	B	C	D	E	SEM
Initial weight, g/bird – Početna masa, g/pile	31.0	31.0	31.0	31.0	31.0	0.00
Weight gain at 4 weeks, g/bird – Dnevni prirast do 4 tjedna, g/pile	680.30 <sup>a</sup>	668.00 <sup>b</sup>	651.61 <sup>c</sup>	627.26 <sup>d</sup>	582.12 <sup>e</sup>	15.12
Weight gain at 5-8 weeks, g/bird - D. prirast 5. - 8. tjedan, g/pile	1961.0 <sup>a</sup>	1894.75 <sup>b</sup>	1762.37 <sup>c</sup>	1525.98 <sup>d</sup>	1172.01 <sup>e</sup>	21.13
Live weight (g/bird) - Živa masa (g/pile)	2641.30 <sup>a</sup>	2562.75 <sup>b</sup>	2413.98 <sup>c</sup>	2153.24 <sup>d</sup>	1754.13 <sup>e</sup>	41.26
Weekly water consu. (ml/bird) – Tjedna konz. vode (ml/pile)	1981.08 <sup>a</sup>	1899.12 <sup>b</sup>	1798.88 <sup>c</sup>	1732.72 <sup>d</sup>	1677.84 <sup>e</sup>	59.18
Feed intake 1-4 wks (g/bird) – Konz. hrane 1.-4. tj. (g/pile)	442.04 <sup>a</sup>	440.96 <sup>a</sup>	424.73 <sup>b</sup>	409.46 <sup>c</sup>	356.04 <sup>d</sup>	13.37
Feed Intake at 5-8 wks (g/bird) - Konz. hrane od 5.-8. tj. (g/pile)	2912.40 <sup>a</sup>	2916.54 <sup>a</sup>	2603.69 <sup>b</sup>	2517.74 <sup>c</sup>	2195.71 <sup>e</sup>	40.48
Feed conversion ratio - Konverzija hrane	1.62 <sup>d</sup>	1.67 <sup>c</sup>	1.63 <sup>d</sup>	1.77 <sup>b</sup>	1.90 <sup>a</sup>	0.03

Means in the same row with different superscript are significantly different ( $p < 0.05$ )

Vrijednosti u istim redovima označeni različitim slovima značajno se razlikuju ( $p < 0.05$ )

**Table 5: Average haematological parameters of broilers fed Mexican sunflower leaf meal**

**Tablica 5. Prosječni hematološki parametri pilića hranjenih brašnom lišća meksičkog suncokreta**

Parameters - Pokazatelji	A	B	C	D	E	SEM
PCV, %	32.56 <sup>c</sup>	32.95 <sup>b</sup>	33.16 <sup>a</sup>	33.12 <sup>a</sup>	33.21 <sup>a</sup>	0.22
RBC, $10^6/\text{mm}^3$	3.27 <sup>c</sup>	3.31 <sup>bc</sup>	3.34 <sup>ab</sup>	3.37 <sup>a</sup>	3.32 <sup>abc</sup>	0.10
HB, g/dl	9.21 <sup>d</sup>	9.44 <sup>c</sup>	9.52 <sup>b</sup>	9.57 <sup>b</sup>	9.68 <sup>a</sup>	0.10
WBC, $10^6/\text{mm}^3$	15.67 <sup>e</sup>	16.03 <sup>d</sup>	16.28 <sup>c</sup>	16.53 <sup>b</sup>	16.91 <sup>a</sup>	0.08
Lymphocyte, %	33.67 <sup>a</sup>	33.30 <sup>b</sup>	32.95 <sup>c</sup>	32.87 <sup>d</sup>	32.81 <sup>e</sup>	0.08
Neutrophil (%)	60.52 <sup>c</sup>	61.07 <sup>d</sup>	61.57 <sup>c</sup>	62.01 <sup>b</sup>	62.18 <sup>a</sup>	0.12
Monocyte (%)	1.70 <sup>bc</sup>	1.68 <sup>c</sup>	1.71 <sup>ab</sup>	1.73 <sup>a</sup>	1.72 <sup>ab</sup>	0.04
Eosinophil (%)	1.90 <sup>a</sup>	1.86 <sup>b</sup>	1.84 <sup>b</sup>	1.79 <sup>c</sup>	1.76 <sup>c</sup>	0.07

Means on the same row with different superscript are significantly different ( $p < 0.05$ )

Vrijednosti u istim redovima označeni različitim slovima značajno se razlikuju ( $p < 0.05$ )

at both stages of growth. Table 4 summarizes the results of the performance of the birds on the various diets. The results further show that birds on control diet had the highest growth rate ( $p < 0.05$ ), and this decreases with increasing level of Mexican sunflower inclusion. Following the same trend, rate of gain, water consumption and feed conversion of the birds on control diet (0% Mexican sunflower leaf meal) were significantly ( $p < 0.05$ ) superior to the other diets. Feed intake and dry matter intake of the bird on both starter and finisher diets for control and 2.5 % Mexican sunflower leaf meal supplementation were significantly heavier than birds on the other diets. Most of the haematological parameters investigated were affected by Mexican sunflower leaf meal supplementation except in the eosinophil concentration where the 0% Mexican sunflower leaf meal supplementation yielded higher eosinophil counts ( $p < 0.05$ ) than the other rations. Mexican sunflower leaf meal supplementation at all levels also significantly elevated white blood cell count and PCV in the broilers on the diets than in the birds on the control diet.

## DISCUSSION

All the rations had adequate CP and energy as recommended by earlier researches (Faniyi, 2002, Babatunde and Oluyemi, 2000). Although literature on the utilization of Mexican sunflower leaf meal (MSLM) is scanty, the results of this study justify its incorporation into livestock feeds as the performance of the birds does not reveal any decline in due to MSLM supplementation at levels below 5.0%. The live weights obtained for broilers in this study were higher than the values ( $2480.39 \pm 9.75\text{g}$ ) reported for broilers by Omojola and Fagbuaro (2005). However, live weights of broilers on treatments C, D and E ( $1754.13 - 2413.98\text{g}$ ) were significantly lower. The significant decrease in live weight observed in broilers across treatments with increasing level of MSLM could be attributed to the presence of anti-nutritional factors like tannin and saponnin in MSLM that makes it bitter as it increased across treatments. These could decrease the feed intake and consequently the live weight. Prince *et al*, (1980) had observed depression of growth rates of chicks when fed diet containing high tannin sorghum.

The haematological values recorded for the birds on all the rations though statistically different in PCV, haemoglobin, white blood cell count, red blood cell count, eosinophil, monocyte, and neutrophil were within normal range recorded for poultry (Gupta and Paul, 1972; Jain, 1986; Adejumo, 2005). The higher haemoglobin concentrations in the Mexican sunflower supplemented meals may suggest improved iron or mineral profile in those rations but this and the high white blood cell count in the Mexican sunflower diets would need further investigation to determine mineral levels and possibly microbial counts in the sun-dried meal before incorporation into the diets.

Invariably, this study suggests that Mexican sunflower leaf meal could be safely incorporated into poultry rations up to 7.5% inclusion level without adverse effects. However, from the data presented here, an inclusion level of 5.0% seems to be adequate.

## REFERENCES

1. Adejumo, D.O. (2005): Haematology, growth and performance of broiler finishers fed rations supplemented with Indian almond (*Terminalia catappa*) husk and kernel meal. *Ibadan Journal of Agricultural Research, Vol 1: 1-6*.
2. AOAC. (1990): Association of Official Analytical Chemists. Official methods of Analysis, 15<sup>th</sup> Edn., Washington D. C. USA. pp.69-88.
3. Babatunde, B.B. and Oluyemi, J.A. (2000): Comparative digestibility of three commonly used fibrous ingredients in maize-soyabean meal fish diet by broiler chicks. *Trop. J. Anim. Sci. 3(1): 33-43*.
4. Ekeocha, A.H. (2009): Utilization of Mexican Sunflower (*Tithonia diversifolia*, Hemsley A. Gray) By the West African Dwarf Sheep. Ph.D Thesis, University of Ibadan, Ibadan, Nigeria, 224pp.
5. Faniyi, G.F. (2002): Replacement of wheat offal with untreated citrus pulp in broiler chick diets. *Trop. Anim. Prod. Invest. 5: 95-100*.
6. Gupta, P.K. and Paul, B.S. (1972): Influence of dietary intake of malathion on the haematology and plasma electrolyte in chicken. *Journal of Poultry Sci. 51: 157-174*.
7. Jain, W.C. (1986): Schalm's Veterinary haematology. 4<sup>th</sup> Edition. Lea and Febiger. Philadelphia. Pp:149-162.

8. Omojola, A. B., And Fagbuaro, S. S. (2005): Carcass Characteristics of Broilers Spent Layers and Local Fowls. in: Proceedings of the 10<sup>th</sup> Annual Conference of Animal Science Association of Nigeria. Held on 12 – 15<sup>th</sup> September, 2005, Ado-Ekiti; Nigeria Pg. 176 – 178.
9. Prince, M. L., Butler, L. G., Roger, J. G. and Featherstone, W. R., (1980): Overcoming the Nutritional Harmful Effects of Tannin in Sorghum Grain by Treatment with Inexpensive Chemicals. *J. Agric. Food Chem.* 27: 441 – 445. SAS, (1999). SAS/STAT Guide for personal computers, version 6, S.A.S Int. Cary. New York, USA.
10. Tarawali, S. A., Tarawali, G., Lorbi, A. and Harrison, J. (1995): Methods for the evaluation of forage-legume grasses and fodder trees for use as livestock feed. ILRI Nairobi Kenya. Pg. 7 – 15.

### SAŽETAK

150 jednodnevnih Arbor Acres brojlerskih pilića nasumce je podijeljeno u pet pokusnih hranidbenih tretmana s po 30 pilića u svakom. Prvi hranidbeni tretman činile su standardne (osnovne) početna i završna krmna smjesa koje su predstavljale kontrolu. Ostali hranidbeni tretmani sadržavali su 2.5, 5.0, 7.5 i 10% lišća meksičkog suncokreta kao zamjenu za kukuruz i sojinu sačmu. U radu je ispitivan utjecaj hranidbenih tretmana na proizvodne rezultate i hematološke promjene kod pilića. Dodatak brašna lišća meksičkog suncokreta u obroku više od 5% nije poboljšalo rezultate u odnosu na kontrolnu skupinu i značajno je ( $p < 0.05$ ) smanjilo konzumaciju hrane, stopu rasta i konverziju hrane, dok su hematološki pokazatelji bili značajno poboljšani ( $p < 0.05$ ) osim koncentracije eozinofila i limfocita. List meksičkog suncokreta je stoga obećavajući sastojak koji se može jeftino umiješati u obroke peradi na razini od 5% kada su uobičajena krmiva nedostatna.

Ključne riječi: manje poznati suncokret, unos hrane, porast težine, brojleri