

植物性飼糧對土雞生長性狀之影響⁽¹⁾

陳添福^{(2) (4)} 劉曉龍⁽³⁾ 洪哲明⁽³⁾

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摘要

本試驗之目的在探討以植物性飼料原料不添加藥物與生長促進劑之飼糧對土雞生長性狀之影響，試驗處理分為(1)高營養濃度動物性飼糧(HA)，(2)高營養濃度植物性飼糧(HV)，(3)低營養濃度動物性飼糧(LA)，(4)低營養濃度植物性飼糧(LV)。四個處理組，每處理組三重複，每重複30隻，採公母分飼，試驗雞隻共計720隻，試驗期間為20週。試驗結果顯示，公、母土雞0~4、5~8及9~12週之體增重、飼料利用效率及飼料採食量均以LV處理組顯著低於其餘處理組，13~20週之體增重則以LA及LV處理組有較高之趨勢。0~20週之總增重或每公斤增重飼料成本以高營養濃度植物性飼糧最低。以植物性飼料原料不添加藥物與生長促進劑之飼糧飼養土雞，可作為優質土雞之飼養模式。

關鍵詞：臺灣土雞、植物性飼糧、生長性狀。

緒言

面對加入世界貿易組織對國內肉雞產業所帶來的衝擊，產官學界所提出因應之道，均是以土雞對抗洋雞，以區隔市場。然觀諸國內目前土雞市場所存在之種種問題，包括土雞品種紛雜、品質良莠不齊、藥物殘留等，使消費者對土雞認同與信心不足。因此，生產健康安全、高品質、無藥物殘留並具品牌特色之土雞，應是土洋大戰前自我武裝的第一步。觀之當今，在有色雞種品牌的建立方面，首推以法國的紅牌雞 (Label Rouge) 最為成功，其飼養過程中，飼糧完全以植物性飼料原料組成，不添加動物性產品與藥物或生長促進劑，強調生產衛生安全，肉質與風味俱佳的雞肉，以獲得消費者的信心與肯定(陳，1998)。國產土雞欲獲消費者之信賴，亟需建立生產健康安全無藥物殘留並具品牌特色之土雞的飼養模式。利用土雞特有之抗病力強的特性，以不添加藥物、生長促進劑之植物性飼料原料組成之飼糧餵飼土雞，建立生產健康、衛生、安全並具品牌特色之土雞飼養模式，

(1) 行政院農業委員會畜產試驗所研究報告第1445號。

(2) 行政院農業委員會畜產試驗所技術服務組。

(3) 行政院農業委員會畜產試驗所產業組。

(4) 通訊作者，E-mail: tianfwu@mail.tlri.gov.tw。

提供業界作為生產優質土雞品牌之飼養參考模式。長期以來，台灣土雞營養飼養試驗研究已建立一些試驗成果，在營養試驗研究方面，包括蛋白質與能量 (李及黃，1985；于及徐，1989)，鈣與有效磷 (于等，1990)，含硫胺基酸需要量 (徐及林，1989；1992)、離胺酸 (Hsu and Lin, 1990) 及色胺酸 (林及徐，1994；徐等1994) 等。由于及徐 (1989) 之試驗結果顯示，0-4週齡小體型有色肉雞達最佳飼料利用效率所需之粗蛋白質含量為23%，代謝能為3200 kcal/kg，熱能蛋白比為139；5-8週齡之粗蛋白質、代謝能與熱能蛋白比依序為17%、2800 kcal/kg、165，9-14週齡則依序為17%、3000 kcal/kg、176。李及黃 (1985) 試驗研究指出，5-14週齡之土雞於任飼條件下，給飼高營養濃度之飼糧 (粗蛋白質20%，代謝能 3100 kcal/kg) 較低營養濃度飼糧 (粗蛋白質16%，代謝能 2500 kcal/kg) 有較佳之飼料利用效率。上述之試驗研究均是以含動物性飼料原料組成之飼糧，至於以植物性飼料組成之飼糧其營養需求為何，目前為止尚無試驗成果可供參考。因此，本試驗即在探討以植物性飼料原料不添加藥物與生長促進劑之飼糧對土雞生長性狀之影響，以建立生產高品質、無藥物殘留並具品牌特色之優質土雞。

材料與方法

I. 試驗動物與試驗設計

本試驗採用行政院農業委員會畜產試驗所育成之畜試土雞台畜肉十三號720隻，於1日齡依公母性別分至四個處理組，分別為(1) 高營養濃度動物性飼糧 (HA)，(2) 高營養濃度植物性飼糧 (HV)，(3) 低營養濃度動物性飼糧 (LA)，(4) 低營養濃度植物性飼糧 (LV)。每處理組為三重複，每重複為30隻，試驗為期20週，於0-4與5-8週齡時餵飼含二種不同代謝能與粗蛋白質飼糧，9-20週齡餵飼等熱能與等蛋白之植物性與動物性飼糧，試驗飼糧中均不添加藥物及任何生長促進劑。試驗處理如表1，0-4、5-8及9-20週之試驗飼糧組成如表2、3、4。

表 1. 試驗處理

Table 1. Experimental treatments

Treatments	Nutrient	0~4 wks-old	5~8 wks-old	9~20 wks-old
(1) High nutrient density diet containing animal feedstuff (HA)	ME, kcal/kg	3200	3000	3000
	CP, %	23	20	17
	ME/CP	139	150	176
(2) High nutrient density diet containing vegetable feedstuff (HV)	Ca, %	0.95	0.90	0.85
	Avail. P, %	0.46	0.36	0.30
	Sulphur amino acid, %	0.94	0.82	0.70
(3) Low nutrient density diet containing animal feedstuff (LA)	ME, kcal/kg	3000	2800	3000
	CP, %	20	17	17
	ME/CP	150	165	176
(4) Low nutrient density diet containing vegetable feedstuff (LV)	Ca, %	0.90	0.85	0.85
	Avail. P, %	0.42	0.32	0.30
	Sulphur amino acid, %	0.82	0.70	0.70

表 2. 試驗飼糧組成 (0~4週齡)

Table 2. The composition of the experimental diets (0~4 weeks of age)

Ingredients (%)	Treatments ⁺			
	HA	HV	LA	LV
Corn, yellow	47.00	42.00	58.30	55.30
Soybean meal, 44%	37.25	45.50	31.60	36.66
Fish meal, 65%	5.00	—	3.00	—
Soybean oil	7.70	8.80	4.00	4.50
Limestone, pulverized	0.85	0.87	0.80	0.82
Dicalcium phosphate	1.10	1.70	1.20	1.60
Vitamin premix ^a	0.30	0.30	0.30	0.30
Mineral premix ^b	0.20	0.20	0.20	0.20
DL-Methionine	0.20	0.23	0.20	0.22
Choline chloride, 50%	0.10	0.10	0.10	0.10
Iodized salt	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00
Calculated value				
Cost, NT\$/kg	9.65	9.14	8.54	8.21
Crude protein, %	23.04	23.01	20.15	20.15
ME, kcal/kg	3200.00	3199.00	3017.00	3005.00
Calcium, %	0.95	0.95	0.90	0.90
Avail. phosphorus, %	0.46	0.46	0.42	0.42
Sulfur amino acid, %	0.95	0.95	0.86	0.86
Analyzed value				
Crude protein, %	23.77	23.64	20.91	20.79
Calcium, %	0.92	0.94	0.87	0.86
Total phosphorus, %	0.76	0.75	0.67	0.64

^a. Vitamins supplementation per kg of diet

vitamin A, 10,000 IU; vitamin D₃, 1,000 IU; vitamin E, 25 IU; vitamin K, 3mg; thiamin, 3 mg; riboflavin, 5 mg; pyridoxine, 3 mg; vitamin B₁₂, 0.03 mg; Ca-pantothenate, 10 mg; niacin, 50 mg; biotin (1.0%), 0.1 mg; folic acid, 3 mg.

^b. Minerals supplementation per kg of diet

Mn, 60 mg (MnSO₄·H₂O); Zn, 60 mg (ZnO); Cu, 5 mg (CuSO₄·5H₂O); Fe, 70 mg (FeSO₄·7H₂O); Se, 0.1 mg (Na₂SeO₃).

⁺. HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

表 3. 試驗飼糧組成 (5~8週齡)

Table 3. The composition of the experimental diets (5~8 weeks of age)

Ingredients (%)	Treatments ⁺			
	HA	HV	LA	LV
Corn, yellow	58.35	56.80	66.00	64.90
Soybean meal, 44%	32.00	36.00	23.07	26.00
Fish meal, 65%	3.00	—	2.00	—
Wheat bran	—	—	5.00	5.00
Soybean oil	3.80	4.00	1.00	1.00
Limestone, pulverized	1.00	1.06	0.90	0.95
Dicalcium phosphate	0.80	1.06	1.00	1.10
Vitamin premix ^a	0.30	0.30	0.30	0.30
Mineral premix ^b	0.20	0.20	0.20	0.20
DL-Methionine	0.15	0.18	0.13	0.15
Choline chloride, 50%	0.10	0.10	0.10	0.10
Iodized salt	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00
Calculated value				
Cost, NT\$/kg	8.44	8.04	7.50	7.20
Crude protein, %	20.13	20.03	17.15	17.06
ME, kcal/kg	3016.00	2997.00	2813.00	2799.00
Calcium, %	0.90	0.90	0.85	0.85
Avail. phosphorus, %	0.36	0.36	0.32	0.32
Sulfur amino acid, %	0.82	0.82	0.70	0.70
Analyzed value				
Crude protein, %	20.02	20.17	17.34	17.22
Calcium, %	0.87	0.92	0.83	0.87
Total phosphorus, %	0.57	0.56	0.50	0.47

^a. Vitamins supplementation per kg of diet

vitamin A, 10,000 IU; vitamin D₃, 1,000 IU; vitamin E, 25 IU; vitamin K, 3mg; thiamin, 3 mg; riboflavin, 5 mg; pyridoxine, 3 mg; vitamin B₁₂, 0.03 mg; Ca-pantothenate, 10 mg; niacin, 50 mg; biotin (1.0%), 0.1 mg; folic acid, 3 mg.

^b. Minerals supplementation per kg of diet

Mn, 60 mg (MnSO₄·H₂O); Zn, 60 mg (ZnO); Cu, 5 mg (CuSO₄·5H₂O); Fe, 70 mg (FeSO₄·7H₂O); Se, 0.1 mg (Na₂SeO₃).

⁺. HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

表 4. 試驗飼糧組成 (9~20週齡)

Table 4. The composition of the experimental diets (9~20 weeks of age)

Ingredients (%)	Treatments ⁺			
	HA	HV	LA	LV
Corn, yellow	58.00	57.50	58.00	57.50
Soybean meal, 44%	22.30	25.50	22.30	25.50
Fish meal, 65%	2.00	—	2.00	—
Wheat bran	5.00	4.00	5.00	4.00
Alfalfa meal	5.00	5.00	5.00	5.00
Soybean oil	5.00	5.00	5.00	5.00
Limestone, pulverized	1.00	1.05	1.00	1.05
Dicalcium phosphate	0.65	0.88	0.65	0.88
Vitamin premix ^a	0.30	0.30	0.30	0.30
Mineral premix ^b	0.20	0.20	0.20	0.20
DL-Methionine	0.15	0.17	0.15	0.17
Choline chloride, 50%	0.10	0.10	0.10	0.10
Iodized salt	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00
Calculated value				
Cost, NT\$/kg	7.82	7.57	7.82	7.57
Crude protein, %	17.09	17.01	17.09	17.01
ME, kcal/kg	3017.00	3008.00	3017.00	3008.00
Calcium, %	0.85	0.85	0.85	0.85
Avail. phosphorus, %	0.30	0.30	0.30	0.30
Sulfur amino acid, %	0.70	0.70	0.70	0.70
Analyzed value				
Crude protein, %	17.20	16.98	17.24	17.01
Calcium, %	0.87	0.79	0.89	0.81
Total phosphorus, %	0.54	0.51	0.57	0.55

^a. Vitamins supplementation per kg of diet

vitamin A, 10,000 IU; vitamin D₃, 1,000 IU; vitamin E, 25 IU; vitamin K, 3mg; thiamin, 3 mg; riboflavin, 5 mg; pyridoxine, 3 mg; vitamin B₁₂, 0.03 mg; Ca-pantothenate, 10 mg; niacin, 50 mg; biotin (1.0%), 0.1 mg; folic acid, 3 mg.

^b. Minerals supplementation per kg of diet

Mn, 60 mg (MnSO₄·H₂O); Zn, 60 mg (ZnO); Cu, 5 mg (CuSO₄·5H₂O); Fe, 70 mg (FeSO₄·7H₂O); Se, 0.1 mg (Na₂SeO₃).

⁺. HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

II. 測定項目與方法

- (i) 體增重與飼料利用效率：於第4、8、12、16、18及20週齡測定體增重，飼料利用效率。
- (ii) 飼料成本分析：以各階段之飼料成本換算各階段之增重成本，並據以算出0-20週之每公斤體增重所需之飼料成本。

III. 統計分析

試驗所收集之資料，均以SAS統計分析系統 (statistical analysis system; SAS, 1988) 統計分析，先經一般線性模式 (general linear model procedure; GLM) 進行變方分析後，再以最小平方均值 (Least Square Means ; LSmeans) 測定法，比較各處理組間之顯著性差異。

結果與討論

I. 生長性狀

由表5顯示，公、母土雞0~4週之體增重、飼料利用效率及飼料採食量均以LV處理組顯著低於其餘處理組，5~8週齡公土雞之體增重及飼料利用效率(表6)，以LV處理組顯著低於其餘處理組，母土雞之體增重以HA處理組顯著高於其餘處理組，飼料利用效率以HA處理組顯著高於LA與LV處理組，公、母土雞之飼料採食量各處理組間均無顯著差異。9~12週齡之體增重(表7)，公土雞以HA處理組顯著高於LA與LV處理組，母土雞各處理組間無顯著差異，公母土雞之平均以HA處理組顯著高於LV處理組，公土雞之飼料利用效率各處理組間無顯著差異，母土雞之飼料利用效率以LV處理組顯著較差，公母土雞之飼料採食量以LV處理組顯著較低。13~16週齡之生長性狀方面(表8)，公土雞之體增重與飼料利用效率各處理組間無顯著差異，飼料採食量則以LV處理組顯著較HA處理組高，母土雞以HV與LA處理組有較佳之增重，LV處理組之飼料利用效率最差，飼料採食量以HA處理組顯著較低。17~18週齡，公土雞之體增重及飼料採食量以HA處理組顯著低於其餘處理組，母土雞之

表 5. 植物性飼料原料飼糧對0~4週齡土雞生長性狀之影響

Table 5. Effect of vegetable diet on the growth performance of Taiwan native chicken at 0 ~ 4 weeks of age

Items	Treatments				S.E.
	HA	HV	LA	LV	
Body weight gain, g					
Male	296.10 ^a	279.81 ^b	274.48 ^b	198.43 ^c	4.40
Female	264.63 ^a	257.33 ^a	261.04 ^a	183.07 ^b	3.98
Mean	280.36 ^a	268.57 ^b	267.76 ^b	190.75 ^c	1.82
Feed conversion, feed/gain					
Male	1.86 ^c	1.97 ^{bc}	2.09 ^b	2.44 ^a	0.04
Female	1.83 ^c	1.86 ^c	1.99 ^b	2.45 ^a	0.02
Mean	1.85 ^c	1.92 ^c	2.04 ^b	2.45 ^a	0.03
Feed intake, g/bird/day					
Male	19.69 ^a	19.71 ^a	20.45 ^a	17.30 ^b	0.04
Female	17.35 ^b	17.14 ^b	18.51 ^a	16.05 ^c	0.17
Mean	18.52 ^a	18.42 ^a	19.48 ^a	16.67 ^b	0.51

^{a, b, c} Means within the same row with different superscripts differ significantly ($P < 0.05$).

HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

體增重、飼料利用效率及飼料採食量均以HA處理組顯著地較其他處理組為低(表9)。19~20週齡之生長性狀(表10)，公土雞以LA處理組之體增重及飼料採食量明顯地高於其餘處理組，母土雞之體增重則以LV處理組顯著高於其餘處理組，飼料採食量以LV處理組顯著地高於HA與HV處理組。

表 6. 植物性飼料原料飼糧對5~8週齡土雞生長性狀之影響

Table 6. Effect of vegetable diet on the growth performance of Taiwan native chicken at 5 ~ 8 weeks of age

Items	Treatments				S.E.
	HA	HV	LA	LV	
Body weight gain, g					
Male	394.47 ^a	389.20 ^a	375.46 ^a	345.60 ^b	9.68
Female	320.36 ^a	291.79 ^b	282.24 ^b	281.36 ^b	7.14
Mean	357.41 ^a	340.49 ^{ab}	328.85 ^{bc}	313.48 ^c	6.76
Feed conversion, feed/gain					
Male	2.92 ^c	3.17 ^{bc}	3.27 ^b	3.09 ^a	0.04
Female	3.08 ^b	3.20 ^b	3.46 ^a	3.38 ^a	0.05
Mean	3.00 ^b	3.19 ^{ab}	3.37 ^a	3.23 ^{ab}	0.09
Feed intake, g/bird/day					
Male	41.17	44.12	43.97	38.11	1.86
Female	35.26	33.35	34.88	33.93	0.57
Mean	38.26	38.73	39.73	36.02	1.97

^{a, b, c} Means within the same row with different superscripts differ significantly ($P < 0.05$).

HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

表 7. 植物性飼料原料飼糧對9~12週齡土雞生長性狀之影響

Table 7. Effect of vegetable diet on the growth performance of Taiwan native chicken at 9 ~ 12 weeks of age

Items	Treatments				S.E.
	HA	HV	LA	LV	
Body weight gain, g					
Male	444.50 ^a	426.91 ^{ab}	411.78 ^{bc}	387.33 ^c	9.59
Female	308.85	304.85	302.21	296.27	5.30
Mean	376.48 ^a	364.24 ^{ab}	355.17 ^{ab}	342.41 ^b	10.30
Feed conversion, feed/gain					
Male	4.29	4.24	4.41	4.62	0.16
Female	4.38 ^b	4.44 ^b	4.21 ^b	5.14 ^a	0.21
Mean	4.33	4.34	4.31	4.88	0.18
Feed intake, g/bird/day					
Male	66.68 ^a	64.65 ^{ab}	64.56 ^{ab}	63.08 ^b	0.89
Female	69.53 ^a	67.69 ^a	61.91 ^b	54.39 ^c	0.69
Mean	68.10 ^a	66.17 ^a	63.24 ^b	58.74 ^c	0.81

^{a, b, c} Means within the same row with different superscripts differ significantly ($P < 0.05$).

HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

表 8. 植物性飼料原料飼糧對13~16週齡土雞生長性狀之影響

Table 8. Effect of vegetable diet on the growth performance of Taiwan native chicken at 13 ~ 16 weeks of age

Items	Treatments				S.E.
	HA	HV	LA	LV	
Body weight gain, g					
Male	556.00	570.21	569.42	559.20	12.24
Female	364.61 ^b	389.69 ^a	391.94 ^a	370.21 ^b	3.08
Mean	462.09	476.10	478.52	460.65	11.86
Feed conversion, feed/gain					
Male	4.67	4.46	4.49	4.72	0.19
Female	5.35 ^b	5.42 ^b	5.12 ^b	5.79 ^a	0.11
Mean	4.84	4.98	4.86	5.26	0.25
Feed intake, g/bird/day					
Male	89.95 ^b	90.92 ^{ab}	90.90 ^{ab}	93.87 ^a	1.13
Female	69.40 ^c	75.29 ^a	71.53 ^b	76.29 ^a	0.69
Mean	79.68	83.09	81.21	85.08	3.49

^{a, b, c} Means within the same row with different superscripts differ significantly ($P < 0.05$).

HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

表 9. 植物性飼料原料飼糧對17~18週齡土雞生長性狀之影響

Table 9. Effect of vegetable diet on the growth performance of Taiwan native chicken at 17 ~ 18 weeks of age

Items	Treatments				S.E.
	HA	HV	LA	LV	
Body weight gain, g					
Male	98.68 ^c	143.20 ^b	155.15 ^b	217.35 ^a	5.01
Female	143.06 ^c	168.09 ^a	169.29 ^a	158.46 ^b	1.83
Mean	123.74 ^b	159.04 ^a	161.17 ^a	182.04 ^a	7.87
Feed conversion, feed/gain					
Male	6.84	6.46	6.08	5.15	0.37
Female	6.62 ^b	6.15 ^c	6.07 ^c	7.02 ^a	0.14
Mean	6.71	6.26	6.11	6.08	0.41
Feed intake, g/bird/day					
Male	45.74 ^c	64.13 ^b	66.60 ^b	79.33 ^a	1.45
Female	67.54 ^c	73.84 ^b	72.67 ^b	78.55 ^a	0.70
Mean	56.64 ^c	68.98 ^b	69.37 ^b	79.94 ^a	2.75

^{a, b, c} Means within the same row with different superscripts differ significantly ($P < 0.05$).

HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

表 10. 植物性飼料原料飼糧對19~20週齡土雞生長性狀之影響

Table 10. Effect of vegetable diet on the growth performance of Taiwan native chicken at 19 ~ 20 weeks of age

Items	Treatments				S.E.
	HA	HV	LA	LV	
Body weight gain, g					
Male	151.29 ^b	157.92 ^b	215.95 ^a	137.69 ^b	15.83
Female	127.84 ^c	110.65 ^c	167.96 ^b	202.60 ^a	8.09
Mean	136.81 ^c	139.25 ^{bc}	191.74 ^a	172.92 ^{ab}	12.21
Feed conversion, feed/gain					
Male	6.28	6.34	7.57	7.02	0.47
Female	6.79	7.36	6.76	6.24	0.43
Mean	6.52	6.81	7.16	6.68	0.76
Feed intake, g/bird/day					
Male	67.11 ^c	71.28 ^b	88.08 ^a	67.57 ^c	0.78
Female	61.82 ^b	54.61 ^c	72.39 ^a	79.16 ^a	1.64
Mean	64.46 ^b	62.89 ^b	80.69 ^a	73.36 ^a	2.86

^{a, b, c} Means within the same row with different superscripts differ significantly ($P < 0.05$).

HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

綜合0~8週飼餵不同代謝能與蛋白質含量之植物性與動物性飼糧顯示，公母土雞無論飼餵含植物性與動物性之高營養濃度飼糧有較佳之體增重與飼料利用效率，0~4週之土雞，無論以植物性或動物性飼糧其代謝能與蛋白質含量以不低於3200 kcal/kg 與23%，5~8週則為3000 kcal/kg 與20%。李等 (1988) 之土雞試驗指出，0~8週齡土雞之增重與飼料利用效率隨飼糧蛋白質與代謝能含量之提高而改善，在童子雞 (Hurwitz *et al.*, 1980 ; Pesti and Fletcher, 1984) 與土雞 (于及徐, 1989 ; 李及黃, 1985) 之試驗亦顯示相同之結果，此與本試驗之結果一致。于及徐 (1989) 推薦小體型有色肉雞0~4及5~8週齡之蛋白質與代謝能量含量分別為23%、3200 kcal/kg及17%、2800 kcal/kg。本試驗0~4週之結果與其相符合，5~8週之使用量則較其推薦量為高，但與本所家禽營養分需要量手冊 (1999) 之推薦用量相同。

0~8週給飼含植物性與動物性之低營養濃度飼糧，即使在9~12週齡飼餵等蛋白質等熱能飼糧，其體增重與飼料利用效率仍較0~8週飼餵植物性與動物性之高營養濃度飼糧為差，顯然地，後期之體增重與飼料利用效率受前期之飼糧營養濃度影響。0~8週給飼含植物性與動物性之低營養濃度飼糧處理組，於13~20週齡之體增重與飼料採食量有較高之現象，由此顯示，土雞於13~20週有代償性生長能力。李等 (1988) 之試驗顯示，土雞於0~8週給飼低營養濃度飼糧，9~16週齡再飼餵等蛋白質等熱能飼糧時，具有代償性生長作用，此與本試驗結果類似。就生長性狀而言，0~4，5~8及9~20週之飼糧蛋白質與代謝能含量，無論以動物性或植物性飼糧其不宜低於23%、3200 kcal/kg，20%、3000 kcal/kg 及17%、3000 kcal/kg。

II. 飼料成本分析

各處理組之飼料成本分析如表11，以各階段之體增重及飼料利用效率換算各階段之飼料成本，並據以算出0-20週之每公斤體增重所需之飼料成本。0~20週，公、母土雞HA、HV、LA與LV處理組之總增重飼料成本分別為62.96、62.49、68.46、60.98與53.03、52.11、54.32、56.27元。每公斤體增重之飼料成本公母土雞分別為26.39、26.10、28.36、27.31與34.67、34.23、34.49、37.72元。由上述之飼料成本顯示，公母土雞之總增重或每公斤體增重飼料成本以高營養濃度植物性飼糧處理組最低，此可由其生長性狀及飼料成本反映出，與高營養濃度動物性飼糧處理組比較也發現，兩者之最終體增重相近，因此，飼料成本較低之高營養濃度植物性飼糧其增重之飼料成本自然也較低。

表 11. 體增重成本分析

Table 11. The cost analysis of body weight gain

	HA	HV	LA	LV
0-20 wk	Body weight gain cost	Body weight gain cost	Body weight gain cost	Body weight gain cost
Total body weight gain, ♂	2385.54	2394.16	2414.02	2232.93
Total body weight gain, ♀	1529.35	1522.4	1574.68	1491.97
Total cost, ♂, NT\$	62.96	62.49	68.46	60.98
Total cost, ♀, NT\$	53.03	52.11	54.32	56.27
Feed cost/kg weight gain, NT\$, ♂	26.39	26.10	28.36	27.31
Feed cost/kg weight gain, NT\$, ♀	34.67	34.23	34.49	37.72

HA : High nutrient density diet containing animal feedstuff ; HV : High nutrient density diet containing vegetable feedstuff ; LA : Low nutrient density diet containing animal feedstuff ; LV : Low nutrient density diet containing vegetable feedstuff.

結論與建議

綜合生長性狀及體增重與飼料成本顯示，依目前本所之土雞營養推薦用量，餵飼植物性飼料原料不添加藥物與生長促進劑之飼糧，公雞宜飼養至18週齡，母雞則宜飼養至18-20週齡，此可供為優質土雞之飼養模式。

參考文獻

- 于灣華、林瑞蓬、徐阿里。1990。小體型有色肉雞對鈣、磷需要量(0-4週齡)。中畜會誌 19 (1-2):107-116。
- 于灣華、徐阿里。1989。小體型有色肉雞對蛋白質及能量需要量之測定。中畜會誌 18 (1-2):1-11。
- 李淵百、黃暉煌。1985。物理環境、飼糧營養濃度與限食對臺灣三種主要肉雞生產成績影響。中畜會誌 14 (1-2):1-15。
- 李德南、邱文石、范揚廣。1988。日糧蛋白質與能量含量對0至八週齡土雞生長性狀與上市毛雞品質之影響。中畜會誌 17 (1-2):1-16。
- 林義福、徐阿里。1994。有色肉雞之色胺酸需要量。中畜會誌 23 (2):121-126。
- 徐阿里、林瑞蓬、林義福。1994。台灣土雞之含硫胺基酸、離胺酸及色胺酸的需要量(0-4週齡)。第三屆優質肉雞的改良及發展研討會論文集 142-146頁。台中，台灣。
- 徐阿里、林瑞蓬。1989。雞小體型有色肉雞之含硫胺基酸需要量。中畜會誌 18 (1-2):13-20。
- 徐阿里、林瑞蓬。1992。小體型有色肉雞之含硫胺基酸需要量(5週~13週齡)。中畜會誌 21 (1):1-6。
- 家禽營養分需要量手冊。1999。行政院農業委員會畜產試驗所 pp. 3。台南，臺灣。
- 陳添福。1998。法國的養雞聯盟。世界家禽學會中華民國分會季訊 38:23-24。
- Hsu, A. L. and R. P. Lin. 1990. Lysine requirement of small type country chicken in Taiwan. Proceeding of 4th conference of WPSA. Far East and South Pacific Federation. pp. 37. Taipei, Taiwan, R. O. C.
- Hurwitz, S. M., Weiselberg U. Eisner, I. Bartov, G. Riesen-feld, M. Shart, A. N. Niv and S. Bornstein. 1980. The energy requirements and performance of growing chickens and turkeys as affected by environmental temperature. Poultry Sci. 59:2290-2299.
- Pesti, G. M. and D. L. Flecther. 1984. The response of male broiler chickens to diets with various protein contents during the grower and finisher phase. Br. Poult. Sci. 25:415-423.
- SAS. 1988. SAS User's Guide: Statistics, SAS Inst. Inc., Cary, NC.

Effect of vegetable diet on growth performance of Taiwan native chicken ⁽¹⁾

Tian-Fwu Chen ⁽²⁾⁽⁴⁾ Hsiao-Lung Liu ⁽³⁾ and Che-Ming Hung ⁽³⁾

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Abstract

The purpose of this experiment was to determine the effect of vegetable diet without addition of antibiotic or growth factors on growth performance of Taiwan native chickens. The experimental treatments were as follows: 1. high nutrient density diet containing animal feedstuff (HA), 2. high nutrient density diet containing vegetable feedstuff (HV), 3. low nutrient density diet containing animal feedstuff (LA), 4. low nutrient density diet containing vegetable feedstuff diet (LV). A total of 720 Taiwan native chickens were allotted into 4 treatment with 3 replicates of 4 treatments with two sexes and fed one of the four experimental diets for 20 weeks. Split-sex feeding was used in this experiment. The results indicated that body weight gain, feed efficiency and feed intake were lower in LV treatment than in other treatments both in male chicken and female chickens at 0-4, 5-8 and 9-12 weeks of age. There was a trend that body weight gains in LA and LV treatments were larger during 13-20 weeks of age. The feeding cost of per kg body weight gain or total weight gain from 0 to 20 weeks was lowest in HV treatment. We suggest that the vegetable diet without addition of antibiotic or growth factors could be used as a model for feeding native chickens.

Key words: Taiwan native chicken, Vegetable diet, Growth performance.

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(2) Technical Service Division, COA-LRI, Hsinhua, Tainan 712, Taiwan, R.O.C.

(3) Animal Industry Division, COA-LRI, Hsinhua, Tainan 712, Taiwan, R.O.C.

(4) Corresponding author, E-mail: tinafwu@mail.tlri.gov.tw