

Effect of Different Dietary Calorie-Protein Ratio in Thermal on Growth Performance and Carcass Characteristics of Fatten

王百祥、陳明造博士；黃尉東博士

E-mail: 9404808@mail.dyu.edu.tw

ABSTRACT

The aims of this study were to evaluate the effects of different dietary calorie-protein ratio in thermal on growth performance, carcass characteristics and muscle quality of fattening goose. One hundred and sixty geese (80 ♂:80 ♀) were allocated according to gender into 5 treatments for this study, and each treatment had 2 replicates with 8 males and 8 females in each replicate. According to the standard dietary for goose from NRC (1994), the goose metabolizable energy (ME) was set at 3000 kcal/kg, containing A (16.50%), B (15.75%), C (15.00%), D (14.25%), and E (13.50%) crude protein (CP), respectively. Between 9?13 weeks of age when CP level was 13.5%?16.5% in thermal dietary, results indicated that body weight gain of A (CP 16.50%) treatment had significantly better than that of other groups (P

Keywords : Dietary ; White roman goose ; Crude protein

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REFERENCES

- 1.王勝德。1993。台灣土雞與白肉雞生長性能、屠體性狀與肌肉品質差異之研究。碩士論文。國立中興大學。
- 2.白秋菊。1991。日糧油脂含量對臺灣土雞腹部脂肪組織發育的影響。碩士論文。國立中興大學。
- 3.李淑娟。1993。環靜溫度與飼糧中添加抗壞血酸對臺灣種母土雞生產性能之影響。碩士論文。國立中興大學。
- 4.林正鏞、張傳煌、陳盈豪、許振忠、陳明造、劉登城。2001。不同飼糧蛋白質與能量含量對閩雞肥育期生長、血液性狀與肌肉官能品質之影響。中畜會誌。30(2):81~91。
- 5.林炳宏、白火城、許振忠。1998。環境溫度與高溫環境下飼糧中添加抗壞血酸對白肉雞生長性能血液成分及免疫反應之影響。中畜會誌。27(1):11~23。
- 6.林炳宏、盧金鎮。1998。飼糧營養分濃度對涼季下產蛋雞生產性能及免疫反應之影響。中畜會誌。27(2):165~178。
- 7.梁凱莉與高惠娟。1997。普通生物化學。Pp.248-278。合計圖書出版社，台北，中華民國。
- 8.許振忠。2000。鵝最適上市週齡之研究。行政院農業委員會89年度總結報告。
- 9.許瓊英。1989。高溫環境下飼料中添加抗壞血酸對白肉雞及台灣土雞生長及血液性狀之影響。碩士論文。國立中興大學。
- 10.陳佳靜。2001。飼料盤固草與早期禁食對白羅曼鵝生長性能及屠體品質之影響。碩士論文。國立中興大學，台中。
- 11.陳明造、劉登城、邱湧忠、陳秀卿。禽肉規格標準手冊。1992。
- 12.陳明造、葉東柏。2001。基礎生物化學。Pp.201-223。藝軒圖書出版社，台北，中華民國。
- 13.黃錫文。1991。環境溫度對台灣土雞生產性能之影響。碩士論文。國立中興大學。
- 14.連塗發、蔡榮村、盧金鎮。1991。嚴格限飼對土雞生長性能、腹脂含量及脂肪細胞之影響。中畜會誌。20(3):269~281。
- 15.張介銘。1999。高環境溫度下飼糧中添加抗壞血酸與維生素E對白肉雞生長性能、血液性狀及免疫反應之影響。碩士論文。國立中興大學。
- 16.詹士賢。2000。不同品種鴨屠體脂肪分佈及其對烤鴨風味之影響。碩士論文。國立中興大學。
- 17.蔡侑男。1993。環境溫度對台灣土雞產蛋性狀、肝臟脂質蓄積與脂質合成相關酵素活性之影響。碩士論文。國立中興大學。
- 18.賴元亮。1994。日糧中不同熱能蛋白比對台灣土雞生長性能及腹部脂肪組織發育之影響。碩士論文。國立中興大學。
- 19.賴銘葵、陳添福、胡見龍。1994。不同品種鵝脂質合成有關酵素活性的研究。畜產研究。27(1):81-86。
- 20.盧金鎮、徐阿里。1989。飼糧型態與加工方式對鵝生長性能及屠體性狀的影響。畜產研究2(1):9-19。
- 21.Akiba, Y., T. Aoki, M. Toymizu, and M. Horiguchi. 1989. Effect of dietary protein, carbohydrate and fat on hepatic lipid accumulation in estrogenized, starved-refed chicks. *Jpn. Poult. Sci.* 26: 1-9.
- 22.Ali, L. H., G. Angyal, C. M. Weaver and J. I. Rader. 1996. Comparison of capillary column gas chromatographic and AOAC gravimetric procedures for total and distribution of fatty acids in foods. *Food Chem.* 58:149-160.
- 23.AOAC.1990. Official Methods of analysis. 15th ed. Association of official Analytical Chemist. Virginia, U. S. A.
- 24.Atteh, J. O., and S. Leeson. 1983. Effect of dietary fatty acid and calcium levels on performance and mineral metabolism of broiler chicken. *Poultry Sci.* 62:2412 - 2419.
- 25.Balnave, D.1972. The influence of environmental temperature on liver and carcass lipid content and hepatic lipogenic enzyme activity in the immature male chick. *Comp. Biochem. Physiol.* 43B:109.
- 26.Bannister, D. W., I. E. O'Neill and C. C. Whitehead. 1983. The effect of biotin deficiency and dietary protein content on lipogenesis, gluconeogenesis and related enzyme activities in chick liver. *Br. J. Nutr.* 50:291.
- 27.Bartov, I., S. Bornstein and B. Lipstein. 1974. Effect of calorie to protein ratio on the degree of fatness in broiler fed on practical diets. *Br. Poult. Sci.* 15: 107-117.
- 28.Bartov, I., L. S. Jensen, and J. R. Jr. Veltmann. 1980. Effect of dietary protein and fat levels on fattening of corticosterone injected broiler chicks. *Poult. Sci.*59:1864.
- 29.Bartov, I. 1985. Effects of dietary protein concentration and corticosterone injection on energy and nitrogen balances and fat deposition in broiler chicks. *Br. Poult. Sci.* 26: 311-324.
- 30.Bartov, I. and Plavnik I. 1998. Moderate excess of dietary protein increases breast meat yield of broiler chicks. *Poultry Sci.* 77(5): 680-8.
- 31.Bedford, M. R. and J. D. Summers. 1985. Influence of the ratio of essential to nonessential amino acids on performance and carcass composition of the broiler chick. *Br. Poult. Sci.* 26:483- 491.
- 32.Belury, M. A., S. Y. Moya-Camarena, K.L. Liu and J. P. Vanden Heuvel. 1997. Dietary conjugated linoleic acid induces peroxisome-specific enzyme accumulation and ornithine decarboxylase activity in mouse liver. *J.Nutr. Biochem.* 8:579-584.
- 33.Beson, J. D. and A. Bensadonou, 1977. Response of adipose tissue lipoprotein lipase to fasting in the chicken and the rat: A species difference. *J. Nutr.* 107:90.
- 34.Bogin, E., Y. Avidar, M. Merom, B. A. Israeli, M. Malkinson, S. Soback, and Y. Kudler. 1984. Biochemical changes associated with fatty liver in gessé. *Avian Pathol.* 13:683-701.
- 35.Bonnet S, Geraert PA, Lessire M, Carre B, Guillaumin S. 1997. Effect of high ambient temperature on feed digestibility in broilers. *Poultry Sci.*76(6): 857-63.
- 36.Cabel, M. C. and P. W. Waldroup, 1991. Effect of dietary protein level and length of feeding on performance and abdominal fat content of broiler chickens. 1991. *Poult. Sci.* 70:1550-1558.
- 37.Cameron, N. D., and M. B. Enser. 1991. Fatty acid composition of lipid in Longissimus Dorsi muscle of Dorset and British Landrace pig and its relationship with eating quality. *Meat Sci.*29:295-307.
- 38.Cameron, N. D., M. B. Enser, G. R. Nute, F. M. Whittington, J. C. Penman, A. C. Fiske, A. M. Perry and J. D. Wood. 2000. Genotype with nutrition interaction on fatty acid composition of intramuscular fat and the relationship with flavour of pig meat. *Meat Sci.*55:187-195.
- 39.Campbell, M. K. 1995. Biochemistry. 2nd ed. pp.242-273. Saunders College Publishing, Orlando, Florida, U.S.A.
- 40.Chin, S. F., J. M. Storkson, K. J. Albright, M. E. Cook and M. W. Pariza. 1994. Conjugated linoleic acid is a growth factor for rats as shown by enhanced weight gain and improved feed efficiency. *J. Nutr.* 124:2344-2349.
- 41.Cleland, L. G. and M. J. James. 1997. Rheumatoid arthritis and the balance of dietary n-6 and n-3 essential fatty acids. *Br. J. Rheumatol.* 35:513-514.
- 42.Collado, C. M. and I. Tasaki. 1981a. The regulatory influences of insulin administration on hepatic lipogenesis of fasted-refed growing chicks. *Jpn.Poult. Sci.* 18: 342—348.
- 43.Combs, G. F., Jr. 1982. Influences of diet on chick body composition. *Feedstuffs* 54(22):20-28.
- 44.Cook, M. E. and M. Pariza. 1998. The role of conjugated linoleic acid (CLA) in health. *Int. Dairy. Journal.* 8:459-462.
- 45.Coon, C. N. W. A. Becker and J. V. Spencer. 1981. The effect of feeding high energy diets containing supplemental fat on broiler weight gain, feed efficiency, and carcass composition. *Poult. Sci.* 60:1264.
- 46.Cravener, T. L., W. R. Roush and M. M. Mashaly. 1992. Broiler production under varying population densities. *Poultry Sci.* 71:427-433.

47. Dale, N. M. and H. L. Fuller. 1980. Effect of diet composition on feed intake and growth of chicks under heat stress. . Constant vs. cycling temperatures. *Poultry Sci.* 59 : 1434 —1442 . 48. Decuypere, E., J. Buyse, C. G. Scanes, L. Huybrechts, and E. R. Kuhn. 1987. Effect of hyper- and hypothyroid status on growth, adiposity and levels of growth hormone, somatomedin C and thyroid metabolism in broiler chicken. *Reprod. Nutr. Dev.* 27 (2B) : 555 -565. 49. Deaton, J. W., F. N. Reece and B. D. Lott. 1984. Effect of differing temperature cycles on broiler performance. *Poultry Sci.* 63 : 612— 615. 50. Deaton, J. W. and B. D. Lott, 1985. Age and dietary energy effect on broiler abdominal fat deposition. *Poult. Sci.* 64:2161-2164. 51. Donaldson , W. E. , G. F. Combs and G. L. Romser, 1956. Studies on energy levels in poultry rations. I. The effect of calorie-protein ration of the ration on growth, nutrient utilization and body composition of chicks. *Poult. Sci.* 35:1100-1105. 52. Donaldson , W. E. , 1985. Lipogenesis and body fat in chicks: effect of calorie-protein ratio and dietary fat. *Poult. Sci.* 64:1199-1204. 53. Donaldson , W. E. 1990. Lipid metabolism in liver of chick: response to feeding. *Poultry Sci.* 69 : 1183—1187. 54. Du, M., D. U. Ahn, K. C. Nam and J. L. Sell. 2000. Influence of dietary conjugated linoleic acid on volatile profiles, color and lipid oxidation of irradiated raw chicken meat. *Meat Sci.* 56:387-395. 55. Edward, H. M. Jr. , F. Denman. A. Abou-Ashour, and D. Nugara, 1973. Carcass composition studies. 1. Influences of age, sex and fatty acid composition. *Poult. Sci.* 52:934. 56. Fisher, C. 1984. Fat deposition in broilers. P.437-470 in: *Fats in Animal Nutrition.* J. Wiseman, ed. Butter-Worths, London, England, U. K. 57. Fisher, A. V., M. Enser, R. I. Richardson, J. D. Wood, G. R. Nute, E. Kurt, L. A. Sinclair and R. G. Wilkinson. 2000. Fatty acid composition and eating quality of lamb types derived from four diverse breed production systems. *Meat Sci.* 55:141-147. 58. Goodridge, A. G., 1973. Regulation of fatty acid synthesis in isolated hepatocyte : Evidence for a physiological role for long chain fatty acyl coenzyme A. *J. Biol. Chem.* 248:4318. 59. Goodridge, A. G., A. Garay, and P. Silpananta. 1974. Regulation of lipogenesis and the total activities of lipogenic enzymes in the primary culture of hepatocytes from prenatal and early postnatal chicks. *J. Biol. Chem.* 249:1469. 60. Googridge, A. G., A. Garay, and P. Silpananta. 1974. Regulation of lipogenesis and the total activities of lipogenic enzymes in the primary culture of hepatocytes from prenatal and early postnatal chicks. *J. Biol. Chem.* 249:1469. 61. Griffith, M., A. J. Olinde, R. Schexnailder, R. F. Davenport, and W. F. Mcknight, 1969. Effect of choline, methionine and vitamin B12 on liver fat, egg production and egg weight in hens. *Poultry Sci.* 48 : 2160 — 2172 . 62. Grunder , A. A. , J. R. Chamers and A. Fortin, 1987. Plasma very low density lipoprotein, abdominal fat lipase, and fatness during rearing in two strain of broiler chickens. *Poult. Sci.* 66:471. 63. Hayashi, K., S. Kukita, M. Mukai, M. Toyomizu and Y. Tomi-ta. 1990 . Effect of dietary thyroxine on muscle protein metab-olism and abdominal fat content in broiler chicken in hot and moderate environments. *Jpn. J. Zootech . Sci .* 61:1107- 1112 . 64. Harvey, S., C. G. Scanes, and T. Howe. 1977. Growth hormone effects on in vitro metabolism of avian adipose and liver tissue. *Gen. Comp. Endocrinol.* 33 : 322 —328. 65. Hasegawa, S. 1982. Regulation metabolism of fat deposition in chickens. *Jpn. J. Zootech. Sci.* 58 : 91-100. 66. Hikami, Y., T. Sugita, S. Hasegawa and T. Mizuno. 1980 . The relationship between hepatic lipogenesis and the hepatic concentration of some metabolites in chicks fed the diets containing various levels of protein and fat . *Jpn . J. Zootech. Sci .* 51: 664-672 . 67. Hubbard, N. E., D. Lim, L. Summers and K. L. Erickson. 2000. Reduction of murine mammary tumor metastasis by conjugated linoleic acid. *Cancer Lett.* 150:93-100. 68. Hurwitz, S., M. Weiselberg, U. Eisenr, I. Bartov, G. Riesenfeld, M. Sharvit, A. Niv and S. Bornstein. 1980. The energy requirements and preformance of growing chicken and turkeys as affected by environmental temperature. *Poultry Sci .* 59 : 2290 — 2299 . 69. Igarashi, M. and T. Miyazawa. 2000. Newly recognized cytotoxic effect of conjugated trienoic fatty acids on cultured human tumor cells. *Cancer Lett.* 148:173-179. 70. Jackson, S., J. D. Summers and S. Leeson. 1982a . Effect of dietary protein and energy on broiler carcass composition and efficiency of nutrient utilization. *Poultry Sci.* 61 : 2224 — 2231 . 71. Jackson, S., J. D. Summers and S. Leeson. 1982b . The response of male broilers to varying levels of dietary protein and energy. *Nutr. Rep. Int.* 25:601-612. 72. Jones, R. L., and J. Wiseman. 1985 . Effect of nutrition on broiler carcass composition : influence of dietary energy content in the starter and finisher phase. *Br. Poult . Sci .* 26 : 381-388. 73. Keshavarz, K. and H. L. Fuller. 1980. The influence of widely fluctuating temperatures on heat production and energetic efficiency of broilers. *Poultry Sci.* 59 : 2121 — 2128 . 74. Leclercq, B. 1980. The influence of dietary protein content on the performance of genetically lean or fat growing chickens. *Br. Poult . Sci .* 24 : 581-587. 75. Lesson, S., L. J. Caston and J. D. Summers. 1988 . Response of male and female broilers to diet protein . *Can. J. Anim . Sci .* 68 : 881- 889. 76. Leveille, G. A. , D. R. Romsos, Y. Y. Yeh , and E. K. O'Hea. 1975. Lipid biosynthesis in the chick . A consideration of site of synthesis, influence of diet and possible regulatory mechanisms . *Poult . Sci.* 54 : 1075 -1093. 77. Ma, D. W., A. A. Wierzbicki, C. J. Field and M. T. Clandinin. 1999. conjugated linoleic acid in Canadian dairy and beef products. *J. Agric. Food Chem.* 47:1956-1960. 78. Mabry, C. J. and P. W. Waldroup. 1981. The influence of dietary energy and amino acid levels on abdominal fat pad development of the broiler chicken. *Poultry Sci.* 60:151-159. 79. Maltin, C. A., C. C. Warkup, K. R. Matthews, C. M. Gant, A. D. Porter and M. I. Delday . 1997. Pig muscle fibre characteristics as a source of variation in eating quality. *Meat Sic.* 47:237-248. 80. May, J. D. and B. D. Lott. 1992. Effect of periodic feeding and photoperiod on anticipation of feed withdrawal. *Poultry Sci.* 71 : 951—958 . 81. Marks, H. L., and G. M. Pesti. 1984. The roles of protein level and diet from in water consumption and abdominal fat pad deposition of broilers. *Poultry Sci.* 63 : 1617—1625 . 82. Mathews, C. K. and K. E. van Holde . 1996. *Biochemistry.* 2nd ed. pp316-352 , 659-697. The Benjamin/Cummings Publishing Company, Menlo Park, California. 83. Merkly, J. W. 1973. Abdominal fat, skin and subcutaneous fat from six broiler strains raised on the floor and in coops. *Poultry Sci.* 52 : 2064 . (Abs .) 84. Mir, Z., M. L. Rushfeldt, P. S. Mir, L. J. Paterson and R. J. Weselake. 2000. Effect of dietary supplementation with either conjugated linoleic acid (CLA) or linoleic acid rich oil on the CLA content of lamb tissues. *Small Rum. Res.* 36:25-31. 85. Mitchell, B. W., and H. S. Siegel, 1973. Physiological response of chickens to heat stress measure by ratio telemetry. *Poultry Sci.* 52:1111-1119. 86. Moran, E. T. and S. F. Bilgili. 1990. Processing losses, carcass quality, and meat yields of broiler chickens receiving diets marginally deficient to adequate in lysine prior to marketing. *Poultry Sci.* 69:702-710. 87. O , Keefe, S. F., F. G. Proudfoot and R. G. Aclman. 1995. Lipid oxidation in meats of omega-3 fatty acid-enriched broiler chickens. *Food res. Int.* 28:417-424.

88. Ostrowska, E., M. Muralitharan, R. F. Cross, D. E. Bauman and F.R. Dunshea. 1999. Dietary conjugated linoleic acid increase lean tissue and decrease fat deposition in growing pigs. *J. Nutr.* 129:2037-2042. 89. Pearce, J., N. Jackson and M. H. Stevenson. 1983. The effects of dietary intake and of dietary concentration of copper sulphate on the laying domestic fowl : effect on some aspects on lipid, carbohydrate and amino acid metabolism. *Br. Poul. Sci.* 24:337. 90. Pesti, G. H., and D. L. Fletcher. 1983. The response of male broiler chickens to diets with various protein and energy contents during the growth phase. *Br. Poul. Sci.* 24 : 91- 99. 91. Pesti, G. H., and D. L. Fletcher. 1984. The response of male broiler chickens to diets with various protein contents during the grower and finisher phase. *Br. Poul. Sci.* 25:415-423. 92. Plavnik, I. and S. Hurwitz. 1982. Organ weights and body composition in chicken as related to the energy and amino acid requirements: Effects of strain, sex, and age. *Poultry Sci.* 62 : 152 — 163. 93. Ponnappan, U., D. H. Holley and D. A. Lipschitz. 1996. Effect of age on the fatty acid composition of phospholipids in human lymphocytes. *Exp. Gerontol.* 31:125-133. 94. Reece, F., B. D. Lott and J. W. Deaton. 1984. The effects of feed form, protein profile, energy level, and gender on broiler performance in warm (26.7 °C) environments. *Poultry Sci.* 63: 1906 -1911. 95. Reiner, E. 1996. CLA: dose fat have a silver lining? *Prior. Long Life Good Health.* 8:4. 96. Robbin, K. R., 1981. Effects of sex, breed, dietary energy level, energy source, and calorie:protein ration on performance and energy utilization by broiler chicks. *Poult. Sci.* 60:2306-2315. 97. Rosebrough RW, McMurtry JP, Vasilatos-Younken R. 1999. Dietary fat and protein interactions in the broiler. *Poultry Sci.* 78 (7) : 992-8. 98. Salmon, R. E., H. L. Classen and R. K. McMillan. 1983. Effect of starter and finisher protein on performance, carcass grade, and meat yield of broilers. *Poultry Sci.* 62 : 837 - 845. 99. Sanz, M., A. Flores and C. J. Lopez-Bote. 1999. Effect of fatty acid saturation in broiler diets on abdominal fat and breast muscle fatty acid composition and susceptibility to lipid oxidation. *Poultry Sci.* 78:378-382. 100. Scheele, C. W., E. Decuyper, P. F. G. Vereijken, and F. J. G. Schreurs. 1992. Ascites in broiler. 2. Disturbances in the hormonal regulation of metabolic rate and fat metabolism. *Poultry Sci.* 71 : 1971 —1984. 101. Sonaiya, E. B. 1988. Fatty acid composition of broiler abdominal fat as influenced by temperature, diet, age and sex. *Br. Poul. Sci.* 29:589-595. 102. Suthama, N., K. Hayashi, M. Toyomizu, and Y. Tomita. 1991. Interactions of exogenous thyroxine and dietary protein levels on growth and muscle protein metabolism in broiler chickens. *Jpn. Poul. Sci.* 28 : 1-10. 103. Tanaka, K., S. Ohtani, and K. Shigeno. 1983a. Effect of increasing dietary energy on hepatic lipogenesis in growing chicks. . Increasing energy by carbohydrate supplementation. *Poult. Sci.* 62 : 445-451. 104. Tanaka, K., S. Ohtani, and K. Shigeno. 1983b. Effect of increasing dietary energy on hepatic lipogenesis in growing chicks. . Increasing energy by fat or protein supplementation. *Poult. Sci.* 62 : 452-458. 105. Temim, S, Chagneau AM, Guillaumin S, Michel J, Peresson R, Tesseraud S. 2000. Dose excess dietary protein improve growth performance and carcass characteristics in heat-exposed chickens? *Poultry Sci.* 79 (3) : 312-319. 106. Turek, J. J., Y. Li, I. A. Schoenlein, K. G. D. Allen and B. A. Watkins. 1998. Modulation of macrophage cytokine production by conjugated linoleic acids is influenced by the dietary n-6:n-3 fatty acid ratio. *J. Nutr. Biochem.* 9:258-266. 107. Whitehead, C. C. 1990. Response of body composition, growth and food efficiency to dietary protein in genetically lean and fat broilers up to seven weeks of age. 日糧 ; 白羅曼鵝 ; 粗蛋白質