休產期禁食對白色中國鵝生殖性能之影響(1)

王勝德(2) 吳國欽(2) 葉力子(3)

收件日期：89 年 9 月 16 日；接受日期：90 年 1 月 8 日

摘 要

鵝之生殖具有季節性，為探討休產期禁食以調節種鵝產蛋期之可行性，選用剛結束第二產蛋期之白色中國鵝分成三組：對照組、14%及 28%失重組。對照組於試驗開始時，先經限飼處理（連續 7 日 100 g／隻／日休產期飼糧，再加上連續 7 日 150 g／隻／日休產期飼糧），再給予休產期飼糧任食；14%或 28% 失重組則以禁食方式處理至活體失重達 14%或 28%後，再進行如對照組之餵飼流程。直至各組有鵝隻開產後，方改以產蛋期飼糧任食。結果顯示，14%及 28%失重組之開產日期較對照組延遲 21 天，28%失重組之每隻母鵝平均產蛋數顯著（$P<0.05$）低於對照組與 14%失重組。飼料採食量、受精率、對受精蛋之孵化率、每隻母鵝平均出雛數三組間均無顯著（$P>0.05$）差異。血液生化性狀方面，於結束禁食處理時，28%失重組之公鵝血清鈣、三酸甘油酯濃度均顯著（$P<0.05$）低於 14%失重組。整體而言，繁殖性能以對照組較佳、14%失重組次之、28%失重組較差。依本試驗結果認為，於休產期施行不同程度（14%或 28%失重）禁食處理，並無法調節白色中國鵝產蛋期，28%失重組對繁殖性能且具負面影響。

關鍵詞：鵝、禁食、休產期、生殖性能。

緒 言

本省養鵝之目的向以肉用為主。種鵝業者生產雛鵝俾供肉鵝飼養戶飼養為肉鵝，再經屠宰後供應鵝肉上市而少有其他產品。在兩大種鵝品種中，中國鵝之種鵝數量所佔極微（2.4%）、平均飼養規模小（673 隻／場）、且飼養地區明顯集中於桃園與彰化兩地（合計 65%）；然因中國鵝鵝肉之皮下脂肪薄、肉質鮮美，在雛鵝與肉鵝市場之價格遠高於白羅曼鵝。在台灣，中國鵝之產蛋期約自每年 9 月至翌年 4 月（王等，1999；王，2000），此季節性生殖之結果，導致產銷失衡至鉅。除以保存其固有形質而進行之保種計畫外，研究提高繁殖效率（王等，1999；王，2000）或調節種鵝所具有之季節性生殖特性（Gillette, 1976；Sauveur, 1982；Yeh and Wang, 1999）均為研究之重點。

---

(1) 行政院農業委員會畜產試驗所研究報告第1034號。
(2) 行政院農業委員會畜產試驗所彰化種畜繁殖場。
(3) 財團法人中央畜產會。

為提高換羽後產蛋性能（Alodan *et al.*, 1999；Hurwitz *et al.*, 1998）、改善蛋殼品質（Rolon *et al.*, 1993；Zimmermann *et al.*, 1987）及調節生產等目的，以禁食誘發產蛋雞換羽，為目前認為容易且效果較佳之處理方式（Buhr and Cunningham, 1994；Hurwitz *et al.*, 1995；Ruszler, 1998）；而以產蛋鵝所作之研究（Buhr and Cunningham, 1994；Hussein, 1996; Ruszler, 1998；Zimmermann *et al.*, 1987）顯示，25 至 30%之換羽期活體失重百分比，可獲致最佳之換羽後產蛋性能。但在種鵝方面，國內外之相關文獻尚付闕如。本試驗之目的，即嘗試於休產期施行不同程度之禁食處理，比較其對白色中國鵝繁殖性能之影響；俾探討休產期禁食之必要性，及對調節種鵝次一產蛋期之可能性。

材料與方法

Ⅰ. 試驗動物與管理

選取行政院農委會畜產試驗所彰化種畜繁殖場育成、剛結束第二產蛋期之白色中國鵝 96 隻為供試動物，分配至三處理組、每處理組 2 欄，每欄 3♂、13♀，使各欄平均體重相近。自民國 87 年 5 月 20 日開始進行試驗，試驗處理分述如下：(1)對照組：試驗開始（第 1 天）時，先進行限飼處理【連續 7 日 100 g／隻／日休產期飼糧（CP 13%, ME 2,350 kcal／kg）與連續 7 日 150 g／隻／日休產期飼糧】後，方給予休產期飼糧任食。(2) 14%失重組：試驗開始時，經禁食致平均活體失重達 14%後，再進行限飼處理（限飼處理如對照組），之後方給予休產期飼糧任食。(3) 28 %失重組：除以禁食致平均活體失重達 28%外，其餘過程皆與 14%失重組相同。各處理組有鵝隻開產後，即改以產蛋期飼糧（CP 18%，ME 2,650 kcal／kg）任食。試驗採水泥地面之平飼【長 7.8m×寬 2.7m，含水池（長 2.0 m×寬 2.7 m，水深約 35 cm）】飼養方式，每週清洗 2 次，試驗全期之飲水皆採任食，飼糧組成列於表 1。

Ⅱ. 調查項目與分析方法

調查飼料採食量及體重變化，產蛋數、受精率、對受精蛋之孵化率與測定血液性狀。血液樣品之採集，係在試驗開始前、禁食處理結束時與高峰產蛋（約第 35 週）時，自所有公鵝腳脛靜脈採血 5 ml 後，離心取得血清儲於－20℃以供白蛋白（albumin）、鈣（calcium）、三酸甘油酯（triglycerides）、三碘甲狀腺素（triiodothyronine）及睪固酮（testosterone）濃度分析之用。血清白蛋白、鈣及三酸甘油酯濃度方面，採用 Hitachi Automatic Analyzer 911 全自動血液生化分析儀，輔以 Biocon® 相關套組（kits）測定之。血清三碘甲狀腺素及睪固酮濃度，則以競爭性化學冷光免疫分析法（Competitive Chemiluminescent Immunoassay）分析之；其分析步驟概述如下：取定量試樣置入比色管中，依序加入 Releasing Agent、Lite Reagent 與 Solid Phase，於 37℃培養 7.5 分鐘（三碘甲狀腺素）或 5 分鐘（睪固酮）。經分離並以 Reagent water 清洗後，再加入 Reagent 1 及 Reagent 2 啟始化學冷光反應；後依 relative light units 量代入標準曲線求得其含量。係利用 ACS：180™ 全自動化學冷光免疫分析儀（Ciba Corning Diagnostics）輔以商用套組（ACS：180™ T_3 +A, 藥品代號：672205；ACS：180™ testosterone +E，藥品代號：672324；Chiron Diagnostics Co., Ltd.）測定之。

Ⅲ. 統計分析

試驗所得資料依統計分析系統 SAS 6.12 版進行統計分析，使用一般線性模式程序（General Linear Model Procedure）進行變方分析，並以鄧肯氏新多次變域測定法（Duncan's New Multiple Range Test）比較各組間之差異顯著性。

表 1.　試驗飼糧組成

Table 1.　The composition of experimental diets

Ingredient	Resting diet	Laying diet
	%	
Yellow corn	51.87	57.01
Soybean meal, 43.5 %	13.30	25.50
Rice hull	12.00	—
Alfalfa meal	6.00	3.00
Wheat bran	10.00	—
Fish meal, 65 %	—	2.50
Molasses	3.00	3.00
Dicalcium phosphate	1.80	1.60
Limestone, pulverized	1.30	3.10
Oystershell, ground	—	3.50
Salt	0.30	0.30
Choline chloride, 50 %	0.10	0.10
DL-Methionine	0.10	0.15
Vitamin premix[a]	0.03	0.04
Mineral premix[b]	0.20	0.20
Calculated value		
Crude protein, %	13.04	18.02
Crude fiber, %	8.47	3.83
ME, kcal/kg	2,346	2,657
Calcium, %	1.08	3.13
Available phosphorus, %	0.42	0.45

[a] Supplied per kilogram of diet : Vitamin A, 10,000 IU ; Vitamin D_3, 2,000 ICU ; Vitamin E, 15 mg ; Vitamin K_3, 4 mg ; Vitamin B_1, 2 mg ; Vitamin B_2, 6 mg ; Vitamin B_6, 4 mg ; Vitamin B_{12}, 0.02 mg ; Niacin, 40 mg ; Pantothenic acid, 12 mg ; Folic acid, 0.25 mg.

[b] Supplied per kilogram of diet : Fe, 80 mg ; Cu, 10 mg ; Mn, 55 mg ; Zn, 45 mg ; I, 0.3 mg ; Co, 50 mg ; Se, 0.05 mg.

結果與討論

表 2 為休產期禁食對白色中國鵝繁殖性能之影響。對照組經限飼（連續 7 日 100 g／隻／日休產期飼糧加上連續 7 日 150g／隻／日休產期飼糧）過程之最大失重為 5.3%，而 14%及 28%失重組經不同禁食程度所達之最大失重分別為 14.1%與 28.4%；當恢復休產期飼糧任食後，14%及 28%失重組之體重分別於開始試驗後之第 10 及第 71 天與對照組差異不顯著（$P>0.05$）。飼料採食量、開產日期、受精率、對受精蛋之孵化率、每隻母鵝之平均出雛數三組間均無顯著（$P>0.05$）差異，但 14%及 28%失重組之平均開產日期較對照組延遲 21 天；28%失重組之每隻母鵝平均產蛋數（23.6 枚）且顯著（$P<0.05$）低於對照組（30.9 枚）與 14%失重組（29.2 枚）。血液性狀方面（表 3），開始進行試驗時之白色中國鵝公鵝血清白蛋白、鈣、三酸甘油酯、三碘甲狀腺素及睪固酮濃度三組間均無顯著（$P>0.05$）差異；結束禁食處理時，28%失重組公鵝之血清鈣、三酸甘油酯濃度均顯著（$P<0.05$）低於 14%失重組，睪固酮濃度則低於可測值（<0.1 ng/ml）。產蛋雞於換羽期

間，其血鈣（Brake and Thaxton, 1979；Gildersleeve *et al.*, 1983）、三酸甘油酯（Attia *et al.*, 1994）濃度顯著下降。Huff *et al.*（1996）指出，在能量攝食量改變之下，血清三酸甘油酯濃度為最敏感之血液成分。本試驗雖未採集母鵝血樣俾供分析，但測得公鵝血清中之鈣、三酸甘油酯與睪固酮濃度，皆於禁食處理結束時最低（表 3）。血中三酸甘油酯主要源自肝臟合成與飼糧來源（McKee *et al.*, 1997），本試驗測得之 28% 失重組顯著低於 14%失重組之結果，主因於禁食處理所造成。當進入產蛋高峰後，睪固酮濃度明顯升高，28%失重組且顯著（$P<0.05$）高於其他兩組；此結果應與血樣採集時，28%失重組之母鵝產蛋率高於其他兩組（圖 1）有關。

表 2. 休產期禁食對白色中國鵝繁殖性能之影響

Table 2. The effects of feed withdrawal in resting period on subsequent reproduction of White Chinese geese

Variable	Treatment[1]		
	CON	14% BWL	28% BWL
Maximal body weight loss, %	-5.3	-14.1	-28.4
Returning to no significant difference ($P>0.05$) compared to the control group in body weight, day	—	10	71
Feed intake from returning to *ad libitum* until week 24, g/bird/day	191 ±2	190 ±2	194 ±2
Day from initiation of treatment until onset of lay, (mean date at onset of lay, month/day)	132 ±35 (9/29)	153 ±56 (10/20)	153 ±62 (10/20)
Number of eggs laid per goose	30.9 ±1.0[a]	29.2 ±0.5[a]	23.6 ±0.2[b]
Fertility of hatched eggs, %	39.7 ±12.2	40.2 ±10.1	33.5 ±4.2
Hatchability of fertile eggs, %	71.2 ±4.1	76.8 ±2.1	75.9 ±1.6
Number of goslings per goose	8.6 ±2.4	8.7 ±1.6	5.9 ±0.6

Mean±S.D.

[1] CON: control, 14% or 28% BWL: treatment of 14% or 28% body weight loss by feed withdrawal.

[a,b] Means within each row with different superscripts are significantly different ($P<0.05$).

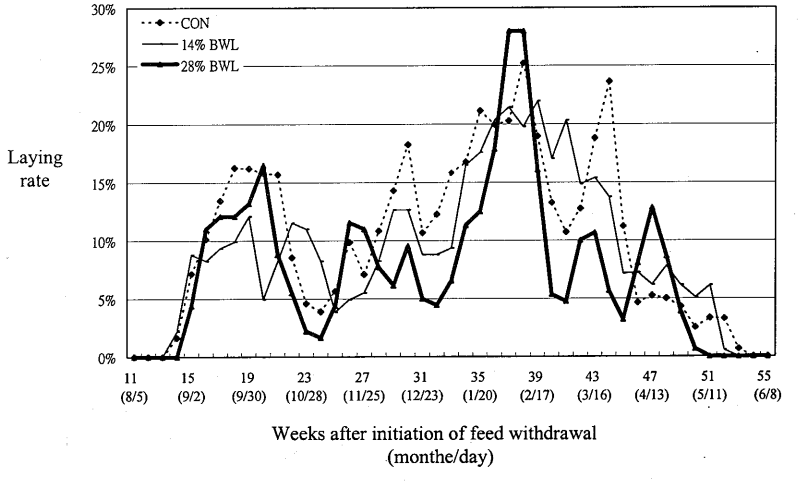

圖 1. 休產期禁食對白中國鵝產蛋率之影響。

Fig. 1. The effect of feed withdrawal in resting period on subsequent laying rate of White Chinese geese.

表 3. 休產期禁食對白色中國鵝公鵝血清生化之影響

Table 3. The effects of feed withdrawal in resting period on serum biochemicals of White Chinese ganders[1]

Variable	Treatment[2]		
	CON	14% BWL	28% BWL
Albumin, g/dl dl			
At the beginning of treatment	1.7 ± 0.2 (6)	1.7 ± 0.3 (6)	1.7 ± 0.2 (5)
At the end of feed withdrawal	–	1.5 ± 0.4 (6)	1.2 ± 0.3 (6)
At the day of laying rate up to 20%[3]	2.3 ± 0.3 (5)	2.4 ± 0.1 (4)	2.5 ± 0.2 (5)
Calcium, mg/dl			
At the beginning of treatment	12.7 ± 0.5 (6)	12.3 ± 1.2 (6)	11.8 ± 0.9 (5)
At the end of feed withdrawal	–	11.2 ± 1.0 (6)[a]	9.0 ± 1.5 (6)[b]
At the day of laying rate up to 20%	10.5 ± 0.5 (4)	10.2 ± 0.3 (4)	10.3 ± 0.8 (4)
Triglycerides, mg/dl			
At the beginning of treatment	52.5 ± 31.8 (6)	51.3 ± 13.4 (6)	46.4 ± 19.3 (5)
At the end of feed withdrawal	–	50.2 ± 18.2 (5)[a]	24.3 ± 8.5 (6)[b]
At the day of laying rate up to 20%	130.2 ± 45.4 (5)	104.5 ± 10.5 (4)	118.3 ± 41.7 (4)
Triiodothyronine[4], ng/ml			
At the beginning of treatment	0.5 ± 0.3 (4)	0.9 ± 0.2 (4)	0.6 ± 0.5 (3)
At the end of feed withdrawal	–	0.8 ± 0.4 (5)	0.5 ± 0.1 (5)
At the day of laying rate up to 20%	0.8 ± 0.3 (5)	0.7 ± 0.3 (4)	1.1 ± 0.7 (4)
Testosterone[5], ng/ml			
At the beginning of treatment	0.4 ± 0.1 (2)	0.15 ± 0.06 (2)	0.1 (1)
At the end of feed withdrawal	–	0.12 ± 0.3 (2)	ND[6]
At the day of laying rate up to 20%	2.7 ± 1.2 (5)[b]	2.1 ± 1.9 (4)[b]	6.2 ± 2.8 (4)[a]

[1] Mean±S.D. The numbers of animals are presented in parentheses.
[2] CON: control, 14% or 28% BWL: treatment of 14% or 28% body weight loss by feed withdrawal.
[3] Sampling at week 35 after initiation of treatment.
[4,5] Minimum detectable concentrations for triiodothyronine and testosterone were 0.2 ng/ml and 0.1 ng/ml, respectively.
[6] Not detectable.
[a,b] Means within each row with different superscripts are significantly different ($P<0.05$).

綜括而言，白色中國鵝之產蛋模式並不集中：分別於 18～21 週（9～10 月）及 35～40 週（1～2 月）各有一產蛋高峰，但高峰產蛋率均未超過 25 至 30%；王（2000）指出，白色中國鵝之產蛋高峰期在 2 月、月高峰產蛋率為 23.5%；本試驗所得之產蛋模式亦有相同結果。圖 1 顯示，28%失重處理之開產較遲、但休產也較早；14%失重處理組之產蛋模式則與對照組相近。

依本試驗結果顯示，28%之失重處理除顯著（$P<0.05$）降低每隻母鵝之平均產蛋數、顯著降低禁食處理後之血清鈣、三酸甘油酯及睪固酮濃度，並導致延遲開產、提前休產；而 14%之失重處理對白色中國鵝之繁殖性能亦無促進效果。故結論認為，於休產期施行禁食處理並無必要，且無法調節白色中國鵝之產蛋期，28%失重處理對繁殖性能更有負面影響，故不建議採用。

誌　謝

本試驗承行政院農業委員會經費補助【88 科技－1.5－牧－03 (4)】、東海大學畜產系楊錫坤教授提供寶貴意見、飼料作物股全體同仁鼎力協助，謹此致謝。

參考文獻

王勝德。2000。飼糧粗纖維與粗蛋白質含量對種母鵝產蛋性能與血液性狀之影響。畜產研究。33：54～62。

王勝德、吳國欽與葉力子。1999。飼糧粗纖維與粗蛋白質含量對種母鵝初產之影響。畜產研究。32：343～352。

台灣省政府農林廳。1999。台灣農業年報。pp. 170～173。

Alodan, M. A. and M. M. Mashaly. 1999. Effect of induced molting in laying hens on production and immune parameters. Poultry Sci. 78：171～177.

Attia, Y. A., W. H. Burke and K. A. Yamani. 1994. Response of broiler breeder hens to forced molting by hormonal and dietary manipulations. Poultry Sci. 73：245～258.

Brake, J. and P. Thaxton. 1979. Physiological changes in caged layers during a forced molt. 1. Body temperature and selected blood constituents. Poultry Sci. 58：699～706.

Buhr, R. J. and D. L. Cunningham. 1994. Evaluation of molt induction to body weight loss of fifteen, twenty, or twenty-five percent by feed removal, daily limited, or alternate-day feeding of a molt feed. Poultry Sci. 73：1499～1510.

Gildersleeve, R. P., D. G. Satterlee, W. A. Johnson and T. R. Scott. 1983. The effects of forced molt treatment on blood biochemicals in hens. Poultry Sci. 62:755-762.

Gillette, D. D. 1976. Laying patterns of geese in the Mid West. Poultry Sci. 55：1143～1146.

Huff, W. E., G. R. Bayyari, N. C. Roth and J. M. Balog. 1996. Effect of feed and water withdrawal on green liver discoloration, serum triglycerides, and hemoconcentration in turkeys. Poultry Sci. 75：59～61.

Hurwitz, S., E. Wax, Y. Nisenbaum and I. Plavnik. 1995. Responses of laying hens to forced molt procedures of variable length with or without light restriction. Poultry Sci. 74：1745～1753.

Hurwitz, S., E. Wax, Y. Nisenbaum, M. Ben-Moshe and I. Plavnik. 1998. The response of laying hens to induced molt as affected by strain and age. Poultry Sci. 77：22～31.

Hussein, A. S. 1996. Induced moulting procedures in laying fowl. World's Poultry Sci. J. 52：176～187.

McKee, J. S., P. C. Harrison and G. L. Riskowski. 1997. Effects of supplemental ascorbic acid on the energy conversion of broiler chicks during heat stress and feed withdrawal. Poultry Sci. 76：1278～1286.

Rolon, A., R. J. Buhr and D. L. Cunningham. 1993. Twenty-four-hour feed withdrawal and limited feeding as alternative methods for induction of molt in laying hens. Poultry Sci. 72 : 776～785.

Ruszler, P. L. 1998. Health and husbandry considerations of induced molting. Poultry Sci. 77 : 1789～1793.

SAS. 1996. SAS Proprietary Software Release 6.12. SAS Institute Inc., Carry, NC. U.S.A.

Sauveur, B. 1982. Programmes lumineux à un étalement de la période de reproduction de l'oie. Ann. Zootech. 31 : 171～186.

Yeh, L. Y. and S. D. Wang. 1999. Effects of the photoperiod on first laying performance of breeding geese. pp. 203～208. The First World Waterfowl Conference, Taichung, Taiwan, R.O.C.

Zimmermann, N. G., D. K. Andrews and J. McGinnis. 1987. Comparison of several induced molting methods on subsequent performance of Single Comb White Leghorn hens. Poultry Sci. 66 : 408～417.

Effects of Feed Withdrawal in Resting Period on Subsequent Reproductive Performance of White Chinese Geese[1]

Sheng-Der Wang[2], Gwo-Chin Wu[2]
and Lih-Tzyy Yeh[3]

Received Sep. 16, 2000 ; Accepted Jan. 8, 2001

Abstract

The goose is characterized as a seasonal breeder. To study the possibility of tuning the period, we allotted White Chinese geese that just finished the secondary laying period into three groups, including the control, 14% and 28% body weight loss (BWL). The feed restriction procedure of the control group was conducted by 7 days of 100 g resting diet/bird/day following 7 days of 150 g resting diet/bird/day from the initiation of this investigation. Thereafter, they were allowed to feed *ad libitum* until the onset of lay. The geese in 14% and 28% BWL groups were deprived of food until losing 14% and 28% of their mean body weight, respectively, and then were fed *ad libitum* the same as the control group. When the onset of laying in each group had reached, the laying diet was used. The results showed that the onset of laying was delayed nearly 21 days in 14% and 28% BWL groups as comparing to that of the control one. Number of eggs per goose were less ($P < 0.05$) for 28% BWL group than that both for control or 14% BWL groups. Concentrations of serum calcium and triglycerides were lower in 28% BWL group than those in 14% BWL group at the end of feed withdrawal. Although there was no significant difference ($P > 0.05$) in feed consumption, fertility, hatchability of fertile eggs, or number of goslings per goose, these reproduction traits for the control group had more satisfactory results than those of 14% and 28% BWL ones. We concluded that 14% or 28% body weight loss caused by feed withdrawal in resting period could not adjust the laying season of White Chinese geese, and 28% body weight loss had adverse effects on reproductive performance.

Key words : Goose, Feed withdrawal, Resting Period, Reproductive performance.

---

(1) Contribution No. 1034 from Taiwan Livestock Research Institute, Council of Agriculture.
(2) Changhua Animal Propagation Station, COA-TLRI, Peitou, Changhua, Taiwan, R.O.C.
(3) National Animal Industry Foundation, Taipei, Taiwan, R.O.C.