中國畜牧學會會誌 37（增刊），2008
J. Chin. Soc. Anim. Sci. 37（Suppl.）

# 38. 飼糧添加不同型式銅化物對肥育豬生長、屠體與糞中銅排泄量之影響

蘇天明[1] 劉士銘[1] 蕭庭訓[1] 李恒夫[1] 陳國隆[2] 廖宗文[1]
[1]行政院農業委員會畜產試驗所 [2]國立嘉義大學

本試驗旨在探討在肥育期肉豬飼糧中添加不同型式的銅化物，對豬隻生長性能、屠體性狀及糞便中銅含量之影響。本試驗選取 LD 肥育豬 48 頭，平均分置於 T1、T2、T3 及 T4 等 4 個處理組。T1 組餵飼不額外添加銅之基礎飼糧，T2 或 T3 組分別於飼糧中添加硫酸銅型式的銅 35 或 5 mg/kg，T4 組則添加蛋白質複合銅型式的銅 5 mg/kg。每處理 12 頭、閹公豬及肉女豬各半數，從體重 70 kg 開始進行試驗至 100 kg 時結束，期間豬隻採個飼，飼料與飲用水均採任食，每週收集糞便一次。試驗結束後採集血液，並逢機擇半送往屠宰，測定屠體性狀。結果顯示，飼糧中添加不同型式的銅化物，不影響肥育期肉豬之生長性能及屠體性狀，T1 組糞便中銅含量極顯著地($P < 0.01$)較 T2、T3 及 T4 為低，T2 組豬隻之血液中銅的濃度顯著地($P < 0.05$)較 T3 組為高。

關鍵語：銅排泄量、不同型式銅化物、肥育豬

# EFFECTS OF ADDING VARIOUS FORMS OF COPPER TO DIET ON GROWTH PERFORMANCE, CARCASS CHARACTERISTICS AND FECAL COPPER CONCENTRATIONS OF FINISHING PIGS

T. M. Su[1], S. M. Liou[1], T. H. Hsiao[1], H. F. Lee[1], C. L. Chen[2] and C. W. Liao[1]
[1]Livestock Research Institute, COA [2]National Chiayi University

The purpose of this study was to investigate the effect of different copper forms in diet on growth performance, carcass characteristics and copper excretion of finishing pigs. A total of 48 LD pigs, with body weight 70 kg were randomly allocated into four treatments with 12 pigs, half barrow and half gilt in each treatment. The first group (T1 group) was provided with the basal diet without adding copper. The pigs in groups T2 and T3 were fed basal diet supplemented with inorganic copper of $CuSO_4 \cdot 5H_2O$ at 35 mg/kg and 5 mg/kg, respectively and group T4 was fed basal diet supplemented with copper proteinate at 5 mg/kg. All pigs were individually fed. Feed and water were provided *ad libitum*. The feeding trial was finished when pigs reached a body weight of 100 kg. The growth performance, carcass characteristics, fecal copper excretion, and serum copper concentration were measured. The results showed that the growth performance and carcass characteristics of pigs were not affected by different forms of copper. The pigs of T1 group which did not add copper in diet had lower ($P < 0.01$) fecal copper excretion than other groups. The T2 group which provided 35 mg/kg of copper from $CuSO_4 \cdot 5H_2O$ had higher ($P < 0.05$) serum copper concentration than T3 group.

Key Words: Copper excretion, Different copper forms, Finisher pig

# 53. 白肉雞替代性墊料堆肥試驗

劉曉龍　林義福　陳添福　洪哲明　謝昭賢　鄭裕信　蔡銘洋　蕭庭訓
蘇天明　沈韶儀　郭猛德
行政院農業委員會畜產試驗所

本試驗目的探討曬乾切短後之稻稈與分碎後椰殼之纖維介質，當粗糠墊料替代品，取代白肉雞粗糠墊料使用不足之問題，並測試白肉雞適應性與墊料堆肥化分析。試驗利用稻米收割後曬乾、切短之稻稈（稻稈組）；另以椰殼分碎機分碎後之椰殼纖維介質(椰殼組)，作為平飼雞舍墊料；並以傳統粗糠墊料為對照組（粗糠組）。採用白肉雞 1944 隻於出生日齡時分置於前述三個處理組分別為一.稻稈組 二.椰殼組 三.粗糠組，每處理組 3 重複，每重複 216 隻，舖約 5 公分厚之墊料，以平飼方式飼養於 28.5 $m^2$ 面積，並供水及供料，飼養期間為初生日齡至出售日齡為止。飼養結束後收集墊料，以箱式堆積發酵，每隔兩週以鏟裝機翻堆，進行兩個月的堆積發酵，分析堆肥後成份。試驗結果顯示：飼養結束後測試苜蓿發芽率，於堆肥前稻稈發芽率達 30.8%，顯著高於粗糠組 5.85%與椰殼組 5.82% ($P<0.05$)。經發酵堆肥兩個月，以粗糠組 67%較優於椰殼組 57.2%與稻稈組 50%，但未達顯著差異。堆肥成分，各組間無顯著性差異。綜合整體可看出白肉雞可完全適稻稈或椰殼纖維來替代粗糠當墊料使用。建議以切短並曬乾之稻稈為優先選擇粗糠之替代物，可解決粗糠供貨短缺時替代粗糠當墊料使用。若善加利用稻稈相對可減少田間焚燒稻草空氣污染之問題，亦可增加稻農種稻副產品之利用，而椰殼纖維的利用亦可減輕垃圾掩埋場處裡椰殼之負擔。

關鍵語：白肉雞、墊料、堆肥

# EFFECT OF REPLACEMENT LITTER ON THE COMPOST COMPOSITION OF BROILER CHICKEN

H. L. Liu, Y. F. Lin, T. F. Chen, C. H. Hsieh, Y. S. Cheng, C. M. Hung, T. M. Yang, T. H. Hsiao, T. M. Su, S. Y. Sheen and M. D. Koh
Livestock Research Institute, Council of Agriculture

The purpose of this experiment was to investigate the replacement of rice hull with rice straw and coconut hull as chicken litters to solve shortage problem of rice hull. The experiment also determined the adaptation of broiler chicken and analyzed litter compost composition. Rice straws were dried and cut into small pieces. Coconut hulls were smashed. The control group was rice hull. A total of 1944 day-old broiler chickens were allotted into three treatment groups. Group 1 was rice straw; group 2 was coconut hull and group 3 was rice hull. Each group had three replicates; each replicate had 216 birds. The average litter height was 5 cm and feeding area was 28.5 $m^2$ for each group. Feed and water were supplied ad libitum till the market age. After feeding experiment, litters were collected and composted for 2 months. The compost was stirred every two weeks and its composition was measured. The results indicated that germinating rate of alfalfa was 30.8% in rice straw, 5.85% in rice hull and 5.82% in coconut hull before composting ($P<0.05$). After two month's composting, germinating rate of alfalfa was 67% in rice hull, 57.2% in coconut hull and 50% in rice straw before composting ($P>0.05$)。In general, broiler chicken can totally adapt rice straw or coconut hull. Dried small pieces rice straws can be the first choice when there is a shortage of rice hull. In addition, usage of rice straw can decrease air pollution of burning rice straw and increase application of rice by-products. The usage can also decrease the processing cost of coconut hull.

Keywords: Broiler chicken, Litter, Compost

# 55. 白肉雞對替代墊料之生長適應性

劉曉龍　林義福　陳添福　洪哲明　謝昭賢　鄭裕信　蔡銘洋　蕭庭訓
蘇天明　沈韶儀　郭猛德
行政院農業委員會畜產試驗所

本試驗目的探討曬乾切短後之稻稈與分碎後椰殼之纖維介質，當粗糠墊料替代品，取代白肉雞粗糠墊料使用不足之問題，並測試白肉雞適應性與墊料堆肥化分析。試驗利用稻米收割後曬乾、切短之稻稈（稻稈組）；另以椰殼分碎機分碎後之椰殼纖維介質(椰殼組)，作為平飼雞舍墊料；並以傳統粗糠墊料為對照組（粗糠組）。採用白肉雞 1944 隻於出生日齡時分置於前述三個處理組分別為一.稻稈組 二.椰殼組 三.粗糠組，每處理組 3 重複，每重複 216 隻，舖約 5 公分厚之墊料，以平飼方式飼養於 28.5 $m^2$ 面積，並供水及供料，飼養期間為初生日齡至出售日齡為止。收集白肉雞體重、育成率，檢測墊料氨氣、硫化氫濃度。試驗結果顯示：稻稈及椰殼纖維替代粗糠使用墊料其白肉雞生長體重、飼料效率、檢測墊料硫化氫氣體濃度、飲水量及堆肥成分，各組間無顯著性差異。3 週齡檢測墊料氨氣粗糠組 4.11 ppm 顯著大於椰殼組 1.89 ppm。綜合整體可看出白肉雞可完全適稻稈或椰殼纖維來替代粗糠當墊料使用。建議以切短並曬乾之稻稈為優先選擇粗糠之替代物，可解決粗糠供貨短缺時替代粗糠當墊料使用。若善加利用稻稈相對可減少田間焚燒稻草空氣污染之問題，亦可增加稻農種稻副產品之利用。

關鍵語：白肉雞、墊料、生長性能

# EFFECT OF REPLACEMENT LITTER ON THE GROWTH ADAPTATION OF BROILER CHICKEN

H. L. Liu, Y. F. Lin, T. F. Chen, C. H. Hsieh, Y. S. Cheng, C. M. Hung, T. M. Yang, T. H. Hsiao, T. M. Su, S. Y. Sheen and M. D. Koh
Livestock Research Institute, Council of Agriculture

The purpose of this experiment was to investigate the replacement of rice hull with rice straw and coconut hull as chicken litters to solve shortage problem of rice hull. Rice straws were dried and cut into small pieces. Coconut hulls were smashed. The control group was rice hull. A total of 1944 day-old broiler chickens were allotted into three treatment groups. Group 1 was rice straw; group 2 was coconut hull and group 3 was rice hull. Each group had three replicates; each replicate had 216 birds. The average litter height was 5 cm and feeding area was 28.5 $m^2$ for each group. Feed and water were supplied ad libitum till the market age. Growth performance, litter $NH_3$ and $H_2S$ content, viability and compost composition were measured. The results indicated that replacement of rice hull with rice straw and coconut hull had no significant difference on growth performance, feed efficiency, litter $H_2S$ content, compost composition and water consumption. Rice hull $NH_3$ content (4.11 ppm) was significantly higher than coconut hull (1.89 ppm). In general, for broiler chicken, rice straw and coconut hull can replace rice hull as a litter. Dried small pieces rice straws can be the first choice when there is a shortage of rice hull. In addition, usage of rice straw can decrease air pollution of burning rice straw and increase application of rice by-products.

Keywords: Broiler chicken, Litter, Growth performance

中國畜牧學會會誌 37（增刊），2008
J. Chin. Soc. Anim. Sci. 37 (Suppl.)

# 74. 不同品種母豬哺乳期糞尿排泄量之調查

廖宗文 鄭文勝 蘇天明 李恆夫
行政院農業委員會畜產試驗所

本研究旨在調查不同品種哺乳母豬之飼料採食量、飲水量及其糞尿排泄量之相關性。試驗採用哺乳期藍瑞斯母豬及畜試黑豬共16頭，母豬置於代謝架上適應三天後，每天收集尿液1次，及上、下午各收集糞便1次，連續收集5天，糞尿收集後立即測量尿液容積及秤取糞便重量，儲存於4℃冷藏庫，至樣品全部採集完成後，將全部的糞、尿分別予以混合、取樣，並進行後續分析。結果顯示，藍瑞斯哺乳母豬每日採食量、飲水量及其糞尿排泄量分別平均為6208 g 、22.7 L、1659 g 及6.3 L，而畜試哺乳黑豬分別平均為4487 g、19.7 L、1162 g及8.04 L。藍瑞斯母豬每日飼料採食量及排糞量顯著地較畜試黑豬為多（$P < 0.05$）。每日飼料量與糞便量相關（$r = 0.65$），飲水量與排尿量之相關（$r = 0.62$），均呈正相關（$P < 0.01$）。綜合上述，藍瑞斯與畜試黑豬哺乳母豬的糞便排泄量受到飼料採食量之影響，排尿量則受到飲水量影響，飼糧採食量、飲水量、排糞量及尿液量均有品種間之差異。

關鍵語：哺乳母豬、飼糧及飲水量、糞尿排泄量

# INVESTIGATION OF THE FECES AND URINE EXCRETION FOR LANDRACE AND TBP LACTATING SOWS

C. W. Liao, W. S. Jeng, T. M. Su and H. F Lee
Livestock Research Institute, Council of Agriculture

The purpose of this study was to investigate the feed, water intake and feces and urine excretion for Landrace and Taiwan Black Pig (TBP) lactacting sow. A total of 16 lactating sow included 5 Landrace and 11TBP were fed individually in metabolism crate for adaptation from day 1 to 3. Total feces and urine were collected and recorded separately twice a day from day 4 to 9. Feces and urine samples were stored at 4℃ in refrigerator. All the feces or urine sample of individual sow were thawed, pooled and sampled for further analysis. The results showed that the Landrace sows had larger ($P < 0.05$) feed intake and fecal excretion than TBP sows. There were significant ($P < 0.01$) correlation between feed intake and wet feces excretion ($r = 0.65$) and between water and urine excretion ($r = 0.62$). In summary, the feed and water intake affected the feces and urine excretion of lactacting sows. There were breed difference on the feed、water intake and feces and urine excretion.

Key Words: Landrace and TBP sows, Feed and water intake, Feces and urine excretion

# 161. 飼糧中添加可溶性非澱粉多醣類對畜試黑豬一號離乳仔豬生長性能及十二指腸型態之影響

李恒夫 洪韻如 蔡銘洋 楊璧菁 吳淑芬 蘇天明 謝昭賢
行政院農業委員會畜產試驗所

本試驗旨在利用果膠以改善離乳豬生長性能及十二指腸型態。選取四週齡畜試黑豬一號離乳豬 72 頭，逢機分至三處理組，每處理六重複，每重複四頭，公母各半。對照組（B）飼予玉米-大豆粕為主之基礎飼糧（含 CP17.6% 及 DE 3360 kcal/kg）；另二處理組以果膠分別取代基礎飼糧中玉米，使飼糧含 3%或 6%果膠。仔豬於 28 日齡離乳，餵飼處理飼糧 3 天，第 4 天起至第 14 天，所有豬隻餵飼基礎飼糧，飼料及飲水採任食。於試驗開始、開始後第 4、7 及 14 天，秤量豬隻體重及採食量以計算生長性能。試驗開始前時犧牲 1 公 1 母仔豬取腸道樣品作為基準值；另 18 頭分為三犧牲組，分別餵飼三處理飼糧，並於試驗開始後第 4、7 及 14 天，犧牲組各犧牲 2 頭仔豬取腸道測定十二指腸絨毛型態。結果顯示，飼糧中添加果膠不影響離乳仔豬生長性能及下痢情形，但可顯著（$P < 0.05$）改善十二指腸絨毛型態。為謀求離乳仔豬最大生長及腸道發展，仍需更近一步研究可溶性非澱粉多醣類最適當添加量。

關鍵語：十二指腸型態、可溶性非澱粉多醣類、離乳豬

# EFFECTS OF DIETARY NON-STARCH POLYSACCHARIDE ON GROWTH PERFORMANCE AND MORPHOLOGY OF DUODENUM IN TBP NO. 1 WEANING PIGS

H. F. Lee, Y. J. Hung, M. Y. Tsai, T. C. Yang, S. F. Wu, T. M. Su and C. H. Hsieh
Livestock Research Institute, Council of Agriculture

The purpose of this experiment was to investigate the effect of dietary pectin on growth performance and morphology of duodenum in TBP No. 1 weaning pigs. Seventy-two pigs were randomly assigned to three treatments with six replicates per treatment and four pigs, two male and two female, each replicate. Pigs were weaned at the age of 28 days (day 0) and fed with basal diet based on corn-soybean meal consisted CP 17.6% and DE 3360 kcal/kg or basal diet supplemented with 3% or 6% of pectin for three days post weaning. Feed and water were provided *ad libitum*. All the pigs were fed with basal diet on day 4 until day 14 post weaning. Body weight and feed intake of pigs were measured on day 0, 4, 7 and 14 post weaning. One male and one female pig were sacrificed on day 0 for baseline. Another 18 pigs were assigned to the three treatments and two pigs per each treatment of the slaughter group were sacrificed on day 4, 7 and 14 post weaning for villous measurement. Results showed that pectin had little effect on growth performance and diarrhoea incidences of pigs, but pectin diets resulted in better ($P < 0.05$) villous formation of duodenum compared to basal diet. The optimal level of NSP included to weaning diet to maximise growth performance and improving gut development remains to be assessed.

Key Words: Duodenum formation, Non-starch polysaccharides, Weaning pigs