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天噸乳牛之有利繁殖基因篩選

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44.天噸乳牛之有利繁殖基因篩選

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天噸乳牛是指一頭泌乳牛在台灣濕熱氣候下，自開始測乳後的平均每一個泌乳期(305-2X-ME)就能夠生產牛奶超過10,000公斤以上的乳量，亦就是年產乳量有10公噸以上，10公噸的英文是Ten Tons，取其音取其義，我們稱這種乳牛為天噸乳牛(Ten Tons Cow)。本研究應用2001年1月至2009年10月間DHI資料庫www.angrin.tlri.gov.tw乳樣記錄，進行篩選。自2001年完檢的天噸乳牛頭數32頭(僅為該年28,381頭測乳牛之0.1%)，增加至2002年的103頭，至2003年的144頭，至2004年的248頭，至2005年的326頭(為該年37,820頭測乳牛之0.8%)，而從2006至2009年的頭數分別有327、326、552、1172頭，九年來，天噸乳牛頭數成長率達37倍(1172/32)。從2001至2009年完檢的天噸乳牛月齡平均分別為52、57、50、55、55、51、53、53、51月；飼養戶數逐年增加從25、50、66、88、93、87、90、93、116戶。再者，採取3,009頭泌乳牛乳樣DNA進行四種繁殖基因BLAD、CITL、CVM、DUMPS檢測，分別有2945、3007、2711、3007頭為正常型繁殖基因。在2009年的1172頭天噸乳牛，也檢測574頭，其中有CV雜合型的比率尚有15%之多，不利於夏季受孕。因此，天噸乳牛採乳量乳質兼顧的選拔方法外，也須應用基因選種技術來培育有利繁殖基因型台灣乳牛群。

關鍵語：乳牛、選育、基因

GENOMIC SELECTION ON FAVORABLE REPRODUCTIVE GENE OF TEN TONS COW

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Ten Tons Cow is designated as milk yield of 305-2X-ME greater than 10,000 kg for hot and humid environment in Taiwan. For breeding scheme of dairy cattle, selection on milk yield and quality associated with reproductive performance is essential to the hot and humid weather. In 2001, there were 32 test-off Ten Tons Cow (0.1% to 28,381 cows for milk test), and then number of cows up to 103 head in 2002, 144 head in 2003, 248 head in 2004, 326 head (0.8% to 37,820 cows for milk test) in 2005, and there were 327, 326, 552, 1172 head from 2006 to 2009. An increment of 37 times (1172/32) for the number of ten tons cows for the past nine years. From 2001 to 2009, age of test-off Ten Tons Cow were

52, 57, 50, 55, 55, 51, 53, 53 and 51 months old, respectively; along with number of farms of 25, 50, 66, 88, 93, 87, 90, 93 and 116. In addition, a total of 3009 cows' milk DNA was used to identify the genotype of four reproductive genes such as BLAD, CITL, CVM and DUMPS. There were 2945, 3007, 2711 and 3007 head with normal genotype of reproductive genes. In 2009, 574 of 1172 Ten tons cows were genotyped with 15% of animals having the CV genotype, which the CV genotype was unfavorable to conception of cows during summer season. Application of genomic selection combined with selection of milk yield and quality would be feasible to improve reproductive performance in Ten tons cows.

Key Words: Dairy cattle, Selection, Gene

台灣本地黑山羊微衛星遺傳標記多樣性分析

51.台灣本地黑山羊微衛星遺傳標記多樣性分析

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台灣本地黑山羊是台灣重要的本土畜產動物，自1987年起設立國家保種場於行政院農業委員會畜產試驗所恒春分所，至今台灣本地黑山羊遺傳多樣性資料仍然有限。本試驗利用FAO(2004)建議使用的山羊微衛星標記組，以其中12組山羊微衛星標記分析行政院農業委員會畜產試驗所恒春分所台灣本地黑山羊保種族群40頭山羊個體之DNA，其中除ETH10微衛星標記所檢測的基因型在所有檢測個體皆為單型外，其它11組微衛星標記皆有多態型的基因型。具多態型的微衛星標記組共檢測到42個alleles，平均每個基因座具有3.8個對偶基因(2~6個alleles)，其觀測異質度介於0.262到0.714，平均為0.483，期望異質度介於0.357到0.674，平均為0.502，而多態性訊息含量平均為0.434。在本試驗選用的12組微衛星標記組中有10組呈現非高多態性資訊(PIC
關鍵語：台灣本地黑山羊、遺傳多樣性、微衞星標記

GENETIC DIVERSITY ANALYSIS OF TAIWAN BLACK GOAT BY MICROSATELLITE MARKERS

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Taiwan Black Goat is an important indigenous farm animal in Formosa Island. The conservation population was in Hengchung Branch of LRI since 1987. However, the information of genetic diversity of Taiwan Black Goat was very limited. To study the genetic diversity, a set of 12 microsatellite markers recommended for goat in FAO's DADIS MoDAD programme were utilized. The study was carried out on 40 animals to generate genotype data. Except ETH10, all the microsatellites were polymorphic with average allelic number 3.8, ranged from 2 to 6 per locus. There were 42 alleles detected in total. The observed heterozygosity of the population ranged from 0.262 to 0.714, and the average observed heterozygosity was 0.483. The expected heterozygosity ranged from 0.357 to 0.674, and the average expected heterozygosity was 0.502. The estimated polymorphic information content (PIC) was 0.434. In 12 markers, ten markers were not highly informative with PIC less than 0.5 and one marker ETH10 had only one allele detected.

Therefore, geneticist should be aware of genetic diversity of Taiwan Black Goat.

Key Words: Taiwan Black Goat, Genetic diversity, Microsatellite marker

台灣杜洛克級進一代公豬性能之評估

52.台灣杜洛克級進一代公豬性能之評估

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杜洛克豬繁殖能力低落，國內養豬產業卻仍多以杜洛克種豬作為終端公豬，為提升養豬產業競爭 力，選育高繁殖新品種杜洛克是勢在必行的工作。我們期望能利用帶有多產基因（MM）與緊迫基 因（AA）之高畜黑公豬（KHAPS black boar）來選育具多產與產精性能優秀的終端公豬。本試驗 將杜洛克母豬分別與配第6 代（K6）與第7 代（K7）高畜黑豬公豬，產下台灣杜洛克級進一代公 豬，公豬70 日齡時每胎選留一頭最優秀者參加檢定，共44 頭。綜合檢定結果顯示，在70 日齡體 重為30.53±3.11 公斤，150 日齡完檢體重為93.36±9.8 公斤，平均檢定天數為78.91±1.8 天，平均日 增重為0.8 ±0.11 公斤，飼料效率為2.68±0.27，平均三點背脂厚度為1.95±0.21 公分。如將K6 與 K7 高畜黑豬之後代予以區隔，在70 日齡體重分別為30.68±3.29 與30.39±2.99 公斤，150 日齡完檢 體重為96.27±11.13 與90.45±7.41 公斤，平均檢定天數為78.91±2.24 與78.91±1.27 天，平均日增重為0.83±0.12 與0.76±0.08 公斤，飼料效率為2.74±0.31 與2.63±0.23，平均三點背脂厚度為2.03 ±0.28 與1.87±0.00 公分。級進第一世代的選育目標在於選留體型較大的公豬，評估檢定成績後，來自 K6 高畜公豬之後裔公豬其體型較大，將優先考慮選留以供級進配種使用。

關鍵語：台灣杜洛克、公豬、性能評估

THE PERFORMANCE EVALUTION OF F1 HYBRID BOARS OF DUROC SOWS SIREDWITH KHAPS BLACK BOARS

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Although Duroc pig is a breed with low reproductive performance, it is preferably used to be the terminal sire in pig industry. To promote the competitiveness of pig industry, the selection of new prolific breed of Duroc is the imperative work at present. We expected that the KHAPS black boars with ESR genotype (MM) and Hal-1843 genotype (AA) could be the sire to produce the terminal sire with prolific genotype and high sperm quality. Initially, the Duroc sows were sired with K6 and K7 KHAPS black boars to reproduce the F1 hybrid boars. The best one F1 hybrid boar in each litter was selected to test the growth performance, and a total of 44 F1 hybrid boars were evaluated. The results showed that BW70, BW150, average days evaluated (ADE), average daily gain (ADG), feed efficiency (FE), and average backfat thickness (BF) for F1 hybrid boars were 30.53 ± 3.11 kg, 93.36

± 9.8 kg, 78.91 ± 1.8 d, 0.8 ± 0.11 kg/d, 2.68 ± 0.27, and 1.95 ± 0.21 cm, respectively. Furthermore, the BW70, BW150, ADE, ADG, FE and BF of F1 hybrid boars derived from K6 or K7 KHAPS sire were 30.68 ± 3.29 and 30.39 ± 2.99 kg, 96.27 ± 11.13 and 90.45 ± 7.41 kg, 78.91 ± 2.24 and 78.91 ± 1.27 d, 0.83 ± 0.12 and 0.76 ± 0.08 kg/d, 2.74 ± 0.31 and 2.63 ± 0.23, 2.03 ± 0.28 and 1.87 ± 0.00 cm, respectively. One of the major selection programs in F1 progeny was to select the bigger boars, and from our results showed that the F1 hybrid boars derived from K6 KHAPS black boar had bigger body size, thus, they will be used in the next generation of upgrading programs.

Key Words: Taiwan Duroc, Boars, Performance evaluation

台灣黃牛粒線體D環區序列變異分析

53.台灣黃牛粒線體D環區序列變異分析

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本研究之目的在於探討台灣黃牛恆春品系牛隻粒線體D環區序列之變異，並建構演化類緣關係圖與BLAST分析，藉以了解族群內之差異，及與其他牛種之相關性。在30頭台灣黃牛恆春品系牛隻之粒線體DNA D-loop區域序列解析的結果，其長度介於1037~1039 bp，經過多重序列之比對分析後，可得知此30條序列可分成主要的兩個叢集，一叢集由7條序列組成，另一叢集則由23條序列組成，且在此區域中含有28個變異點。其後再分別將兩叢集中之各一條序列與GenBank資料庫進行比對分析，得知與此兩條序列相似性最高的物種同為Bos taurus strain Korean Cheongwon yellow 3，但identity則分別為99%與97%。

關鍵語：台灣黃牛、粒線體D環區、變異點

SEQUENCE VARIATION ANALYSIS OF MITOCHONDRIAL D-LOOP REGION OF TAIWAN YELLOW CATTLE HENGCHEN LINE

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Ten Tons Cow is designated as milk yield of 305-2X-ME greater than 10,000 kg for hot and humid environment in Taiwan. For breeding scheme of dairy cattle, selection on milk yield and quality associated with reproductive performance is essential to the hot and humid weather. In 2001, there were 32 test-off Ten Tons Cow (0.1% to 28,381 cows for milk test), and then number of cows up to 103 head in 2002, 144 head in 2003, 248 head in 2004, 326 head (0.8% to 37,820 cows for milk test) in 2005, and there were 327, 326, 552, 1172 head from 2006 to 2009. An increment of 37 times (1172/32) for the number of ten tons cows for the past nine years. From 2001 to 2009, age of test-off Ten Tons Cow were 52, 57, 50, 55, 55, 51, 53, 53 and 51 months old, respectively; along with number of farms of 25, 50, 66, 88, 93, 87, 90, 93 and 116. In addition, a total of 3009 cows' milk

DNA was used to identify the genotype of four reproductive genes such as BLAD, CITL, CVM and DUMPS. There were 2945, 3007, 2711 and 3007 head with normal genotype of reproductive genes. In 2009, 574 of 1172 Ten tons cows were genotyped with 15% of animals having the CV genotype, which the CV genotype was unfavorable to conception of cows during summer season. Application of genomic selection combined with selection of milk yield and quality would be feasible to improve reproductive performance in Ten tons cows.

Key Words: Dairy cattle, Selection, Gene

台灣黃牛微衛星遺傳標記多樣性分析

54.台灣黃牛微衛星遺傳標記多樣性分析

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台灣黃牛是台灣重要的本土畜產動物，自1987年起設立國家保種場於行政院農業委員會畜產試驗所恒春分所，至今台灣黃牛遺傳多樣性資料仍然有限。本試驗利用FAO(2004)建議使用的牛微衛星標記組，以其中12組牛微衛星標記分析行政院農業委員會畜產試驗所恒春分所台灣黃牛保種族群93頭台灣黃牛個體之DNA，所有12組微衛星標記皆有多態型的基因型。具多態型的微衛星標記組共檢測到106個alleles，平均每個基因座具有8.8個對偶基因(5~13個alleles)，其觀測異質度介於0.37到0.87，平均為0.57 ± 0.15，期望異質度介於0.52到0.83，平均為0.73 ± 0.09，而多態性訊息含量平均為0.69 ± 0.10。在本試驗選用的12組微衛星標記組皆有多態型的基因型，且除BM1824微衞星標記之多態性訊息含量為中多態性資訊(0.25
關鍵語：台灣黃牛、遺傳多樣性、微衞星標記

GENETIC DIVERSITY ANALYSIS OF TAIWAN YELLOW CATTLE BY MICROSATELLITE MARKERS

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Taiwan Yellow Cattle is an important indigenous farm animal in Formosa Island. The conservation population was in Hengchung Branch of LRI since 1987. However, the information of genetic diversity of Taiwan Yellow Cattle was very limited. To study the genetic diversity, a set of 12 microsatellite markers recommended for cattle in FAO’s DADIS MoDAD programme were utilized. The study was carried out on 89 animals to generate genotype data. All of the microsatellites were polymorphic with average allelic number 8.8, ranged from 5 to 13 per locus. There were 106 alleles detected in total. The observed heterozygosity of the population ranged from 0.37 to 0.87, and the average observed heterozygosity was 0.571±0.15(mean±SD). The expected heterozygosity ranged from 0.52 to 0.83, and the average expected heterozygosity was 0.73±0.09. The estimated average polymorphic information content (PIC) was 0.69± 010. Except BM1824 was reasonably informative (0.50 > PIC > 0.25), all the microsatellites were highly informative highly informative (PIC > 0.50). Our result indicated that the geneticists have paid more attention in keeping genetic diversity of the Taiwan Yellow Cattle herd.

Key Words: Taiwan Yellow Cattle, Genetic diversity, Microsatellite marker

杜洛克母豬與配高畜黑公豬之後裔性能表現

66.杜洛克母豬與配高畜黑公豬之後裔性能表現

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本研究旨在調查杜洛克母豬與配第6 代（K6）、第7 代（K7）高畜黑公豬（梅山 豬 × 杜洛克），其雜交後裔杜洛克級進一代之性能表現。母豬分娩後調查出生窩 仔數、出生活仔數、出生體重、21 日齡重、70 日齡重、左乳頭數、右乳頭數，以 及總乳頭數。本試驗一共收集83 胎母豬繁殖資料，合計758 頭雜交後裔性能資料。 試驗結果顯示，杜洛克母豬與配高畜黑公豬之出生窩仔數為8.73±2.2 頭、出生活 仔數為7.28±2.39 頭、出生體重為1.87±0.41 公斤、21 日齡體重為6.68±1.38 公斤、70 日齡體重為28.62±4.54 公斤、左乳頭數為6.60±0.63 個、右乳頭數為6.64±0.67 個，總乳頭數為13.22±1.24 個。綜合上述，杜洛克母豬與配高畜黑公豬，雖沒明 顯增加窩仔數，卻能改善後裔仔豬生長性狀。

關鍵語：杜洛克母豬、高畜黑公豬、性能

THE PROGENY PERFORMANCE OF DUROC SOWS SIRED WITH KHAPS BLACK BOARS

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The purpose of this study was to investigate the performance of the F1 hybrid of Duroc sows sired with KHAPS black boars. The data of total number of piglets born (TNB), total number of piglets born alive (NBA), body weight at birth (BWB), body weight at 21 days (BW21), body weight at 70 days (BW70), teat number on the left side (TNL), teat number on the right side (TNR), total teat number (TTN) were recorded after piglets were born. Sow reproductive data (n = 83 parities) and records of progeny performance (n = 758) were collected. The results showed that the TNB, NBA, BWB, BW21, BW70, TNL, TNR and TTN were 8.73 ± 2.22, 7.28 ± 2.39, 1.87 ± 0.41 kg, 6.68 ± 1.38 kg, 28.62 ± 4.54 kg, 6.60 ± 0.63, 6.64 ± 0.67 and 13.22 ± 1.24, respectively. In summary, though the litter size of Duroc sows sired with KHAPS black boars did not increase remarkably, the growth performance of F1 progeny piglets was improved.

Key Words: Duroc sows, KHAPS black boars, Performance

耐熱型台灣乳牛之培育

67.耐熱型台灣乳牛之培育

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適應濕熱環境的耐熱型台灣乳牛之育種策略上，是以夏季乳量、乳質及繁殖性狀兼顧的選拔為主，來培育乳牛熱帶品系。本研究應用2001年1月至2009年10月間DHI資料庫www.angrin.tlri.gov.tw乳樣記錄，進行篩選四至九月間(熱期)乳量乳質檢測六個月次的泌乳牛。進行耐熱型台灣乳牛選拔要項有四：(1)六月次之305-2X-ME乳量平均大於9,000Kg、(2)同期乳量育種價大於700Kg、(3)體細胞數平均低於10萬/mL、與(4)乳蛋白質率高於3.5%，再以乳蛋白質率高低排序並計算乳量乳質性狀選拔指數。符合選拔要項的耐熱型台灣乳牛頭數自2001至2009年，依序有8、10、24、19、26、30、39、51、44頭；其中乳量為10,000Kg以上的天噸(Ten tons)乳牛頭數則分別為0、1、7、11、9、9、22、33、26頭。在2001年選拔母牛的月齡平均為55月齡，而2009年選拔母牛的月齡平均為61月齡。這九年來，乳牛乳量增加至10,000Kg以上的比率提高外，也兼顧乳質及母牛在養月齡。因此，應用DHI資訊把熱期高乳量牛的蛋白質率及體細胞數等乳質性狀之乳量乳質兼顧的選拔方法，有利於耐熱型台灣乳牛群性能之改進。

關鍵語：乳牛、選育、乳質

SELECTION OF HEAT-TOLERANCE DAIRY COWS IN TAIWAN

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Breeding scheme of heat-tolerance dairy cattle, selection on milk yield and quality associated with reproductive performance is essential to the hot and humid weather. Data were used to select the heat-tolerance dairy cows from January of 2001 to October of 2009 based upon www.angrin.tlri.gov.tw. The milking cow must have six milk sampling test from April to September (hot period) and meet the four criteria as follows: (1) the average of six monthly milk yield of 305-2X-ME greater than 9,000Kg, (2) the breeding value of 305-2X-ME greater than 700Kg, (3) the average of somatic cell counts lower than 10,000/mL, and (4) the average of milk protein percentage greater than 3.5%. Cows were ranked by their milk protein percentage in highest and with the calculation of selection index based upon milk yield and quality. Number of cows met the selection criteria of heat-tolerance were 8, 10, 24, 19, 26, 30, 39, 51, 44 from 2001 to 2009, respectively. Number of heat-tolerance cows having a higher than 10,000Kg of milk yield were 0, 1, 7, 11, 9, 9, 22, 33, 26 from 2001 to 2009, respectively. In 2001, the age of selected cows averaged to 55 months of age but an average of 61 months of age in 2009. Selection on

both milk yield and quality trait in those of heat-tolerance cows along with traits of age at milking, protein percentage and somatic cell counts would be feasible to establish a population of heat-adapted dairy cattle.

Key Words: Dairy cattle, Selection, Milk quality

微衛星遺傳標記分析高產杜洛克種豬基因頻率

81.微衛星遺傳標記分析高產杜洛克種豬基因頻率

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台灣杜洛克種豬是以詳細的血統登錄及嚴格的外觀體型審查為基礎，雖依生長性能、產肉及屠體性能，分別選育出生長、精肉等不同特性品系，在長且寬體型要求下，組合新的生長精肉杜洛克種豬已有成果，但產仔數增加的目標仍要追求。追蹤2006年分娩的1907胎產仔資料，平均活仔數9.78(SD=2.28)，相較1996年的5251胎，平均活仔數8.57(SD=2.61)，顯示杜洛克種母豬繁殖力已受重視。本研究應用第一號染色體微衛星遺傳標記交替基因序列SW1514、S0316與SW1301分析高產杜洛克種豬，從2006與2008年種豬7646胎分娩登錄資料篩選出3年內同一母豬生產兩胎，每胎活仔豬數達13頭以上之種母豬有45頭，採得25頭樣品，分布在5家種豬場。其基因頻率為 SW1514 with B3 allele 40%、S0316 with B6 allele 60% 與SW1301 with B2 allele 0%，與廖仁寶(2006)等統計分析交替基因SW1514 with B3 allele (P
關鍵語：豬、微衞星標記、交替基因

Analysis of Microsatellite Markers for Prolific Duroc

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Taiwan Duroc is famous on its reliable registration system and rigid type evaluation procedures. There are several lines selected for different goals, such as fast growth rate, high meat production or good carcass quality, for breeding farms. Although long and open body type can be achieved successfully by line cross mating, litter size is expected to further enhance. Analysis of 1907 records of litter size data, from 2006 to 2009, the average of born alive was 9.78(SD=2.28) which was better than 8.57(SD=2.61) of 5251 litters' of the old data set(1996). Results showed that reproduction performance has been paying attention by breeders continuously. In this study, Microsatellite alleles, SW1514, S0316 and SW1301 of chromosome one was studied for Durocs. There were total 7646 litters from sows having at least two litters in three years, from 2006 to 2008. Twenty five samples were collected from 45 prolific sows which had at least 13 piglets per litter. SW1514 with B3 allele 40 % ,S0316 with B6 allele 60% and SW1301 with B2 allele 0% . Compared with Liaw et al.(2006), which showed SW1514 with B3 allele (P
Key Words:Pig, Microsatellite marker, Allele

藍瑞斯母豬與賓朗公豬雜交種自交後裔F2之生長性狀與屠體性狀

93.藍瑞斯母豬與賓朗公豬雜交種自交後裔F2之生長性狀與屠體性狀

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本試驗旨在調查藍瑞斯母豬(L)與賓朗公豬(U)雜交種自交後裔F2(LU×LU)之生長性狀與屠體性狀，並進行LU×LU雜交肉豬19頭閹公豬及19頭女豬之生長性狀與屠體性狀之間相關性分析。兩年內共收集277頭(129♂、148♀)LU×LU仔豬生長性狀資料，其平日增重、背脂及飼料效率分別為0.56±0.11kg、2.07±0.25cm及3.22±0.52。屠宰率、屠體長、瘦肉率、脂肪率、骨骼率、左肋骨數、右肋骨數、活體重、心臟重、肝臟重、腎臟重及小腸長度，分別為85±3%、62.2±4.3cm、46±3%、15±4%、13±1%、14.4±0.6根、14.4±0.6根、73.3±10.1kg、352.9±165.7g、1022.9±244.3g、416.6±133.2g及1603.1±180.8cm。Pearson相關分析顯示平均日增重分別與屠體長、活體重及肝臟重之間有正相關(0.684、0.621及0.485)，但與骨骼率之間有負相關(-0.337)；平均背脂分別與心臟重、腎臟重及小腸長度有正相關(0.598、0.526、0.385)，但與肝臟重之間有負相關(-0.326)；平均飼料效率分別與心臟重及小腸長度有負相關(-0.356及-0.387)。

關鍵語：生長性狀、屠體性狀、賓朗豬

GROWTH AND CARCASS TRAITS OF THE F2 PROGENY FROM CROSSES BETWEEN LANDRACE SOW AND PEINAN BOAR

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The purpose of this study was to investigate growth and carcass traits of the progenies from LU×LU, in which L and U stood for Landrace and Peinan breed, respectively. The correlation between growth traits and carcass traits of 38 heads of LU×LU hogs (19 barrows and 19 gilts) was carried out by SAS Pearson correlation analysis. The growth traits included average daily gain (ADG), back fat (ABF) and feed efficiency (AFE) from 277 (129♂ and 148♀) heads of LU×LU piglets has been collected during the last two years. The results showed that the ADG, ABF and AFE of LU×LU piglets were 0.56±0.11kg, 2.07±0.25cm and 3.22±0.52, respectively. The dressing, carcass length (CL), lean percentage, fat percentage, bone percentage (BP), the number of left rib and right rib, live weight (LW), the weight of heart (WtH), liver (WtL) and kidney (WtK), and the length of small intestinal (LI) were 85±3%, 62.2±4.3cm, 46±3%, 15±4%, 13±1%, 14.4±0.6, 14.4±0.6, 73.3±10.1kg, 352.9±165.7g, 1022.9±244.3g, 416.6±133.2g and 1603.1±180.8cm, respectively. The coefficient of correlation between ADG and CL, LW and WtL were 0.684, 0.621 and 0.485 (P
Key Words: Growth trait, Carcass trait, Peinan breed