種豬市場的機會-商業型肉豬的需求與品質要求

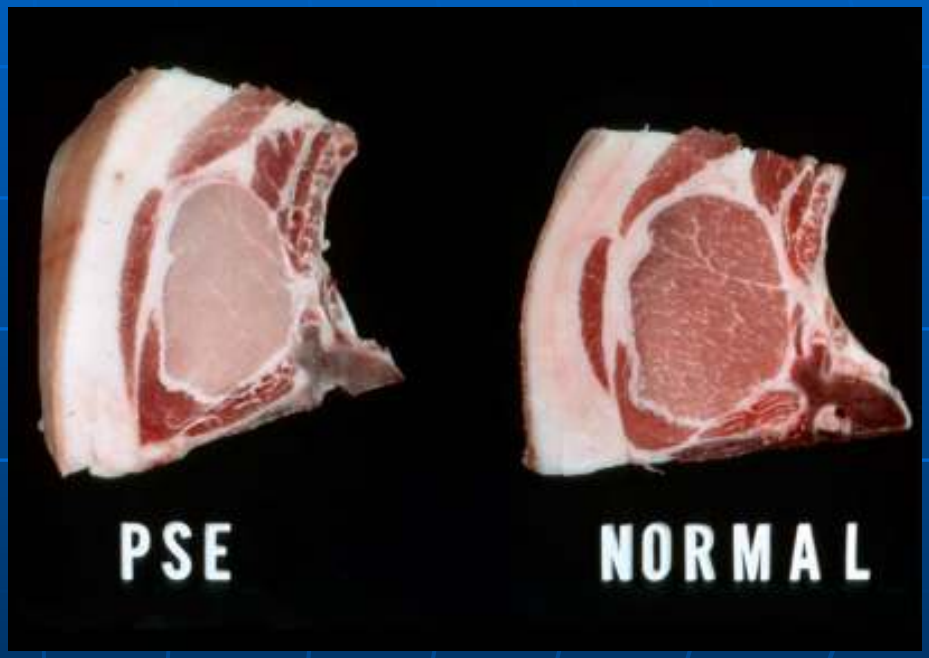
東海大學畜產與生物科技學系
吳勇初

肉豬生產者之終極目標

生產最佳肉質之豬肉供應消費者

理想豬肉品質

- 顏色
  - 櫻桃紅
- 滴水失重
  - < 0.5%
- 最終 pH
  - 5.6 – 6.2
- 大里石紋
  - 具有2.5-4%之肌肉內脂肪



屠體組成與肉質之相關

實際上肉量之增加與肉質之提高往往成反比

- 在遺傳育種不斷改進下 精肉率有明顯提高之現象

但是精肉率極高之動物往往會有較差之肉質

美國種豬之狀況

NBS (1987-1996) 3,224 pigs

Breed	Minolta color	LMA sq. in.	pH	IMF
Berkshire	23	5.3	5.8	3.24
Duroc	25	5.8	5.7	3.97
Hampshire	23	6.5	5.5	2.35
Landrace	28	6.0	5.6	2.31
Poland China	25	5.8	5.7	2.87
Spot	25	5.8	5.7	2.87
Yorkshire	25	5.9	5.7	2.24

EFFECTS OF GENETIC SELECTION

丹麥之育種方向以提高屠體精肉率為主

Breed	IMF % 1978	1988	1992
Landrace	1.89	1.58	1.00
Large White	1.93	1.59	1.00
Duroc	4.15	3.21	2.05
Hampshire	2.47	1.86	1.00

Danes have changed their breeding goal to include IMF

EFFECTS OF GENETIC SELECTION

- 以遺傳率而言屠體精肉率與肌肉內脂肪是-.37
- 在英國過去育種之結果是
  - 33% 背脂降低
  - 35% 腹脂降低
  - 27% 大部分品種大里石紋低於2%
- 德國 Landrace and Yorkshire breeds have 1% IMF
- 丹麥 Yorkshire 1.32% IMF

Measurement and Evaluation of the Carcass

屠體評估

What is Value-Based Marketing?

- Method of establishing carcass value based upon demand for product leaving the slaughter plant
- 我們知不知道消費者要怎樣的豬肉

Information Needed for Efficient Implementation

- Methods of evaluating live animals 活體評估
- Methods of evaluating carcasses for composition and meat quality 屠體與肉質評估
- Consumer research on what is desired 消費者需求探討

What methods are currently available for evaluation of live animal composition?

活體評估

Evaluation of Live Animal Composition 活體評估

- Eyeball method 目視法
- Backfat probe 儀器
- Weight, age, other linear measurements 其他

Evaluation of Live Animal Composition

- Ultrasound / real time imaging
  - Can estimate fat depth and muscling without slaughtering the animal
  - 利用超音波測試

What methods are currently available for carcass composition?
屠體與肉質評估

Dressing Percent
屠宰率

$$DP = \frac{\text{Chilled Carcass Weight 屠體重}}{\text{Live weight 活體重}} \times 100$$

活體重 屠體重 屠宰率 精肉率

Average Dressing Percent by Species
平均屠宰率

- Lamb 羊 50%
- Beef 牛 60%
- Pork 豬 70% 台灣 82.5-84.5%
- Poultry 雞 60-70%

Cutting Test
分切試驗

- Determine the percentages of muscle, fat and bone 實際計算精肉 脂肪 骨骼比率
- Can do "Proximate Composition" or % protein, % fat, % water, and % ash on each 化學分析 蛋白質 脂肪 水分 灰分含量

Heritabilities and Genetic Correlations for Carcass Traits Estimated from NGEP Data

	Leng.	BF10	LRBF	LMA
Length	.51			
Tenth Rib Backfat	-.34	.46		
Last Rib Backfat	-.58	.79	.36	
Loin Muscle Area	.02	-.61	-.26	.48

Heritabilities on diagonal and genetic correlations below diagonal.

Other Methods
其他

- Back penetration probes
- Optical lean-fat probes
  - predict lean meat %
  - increase number of probes increases accuracy

Carcass Grading
屠體評級

- Determination of yield grade is typically done for Beef, Lamb and Pork 產肉率評級

Evaluation of Carcass Quality
屠體品質評估

- pH – 45 minutes post mortem
  - Looking for PSE or DFD carcasses 酸鹼度測試
- Fiber optic probes
- Optical lean-fat probes

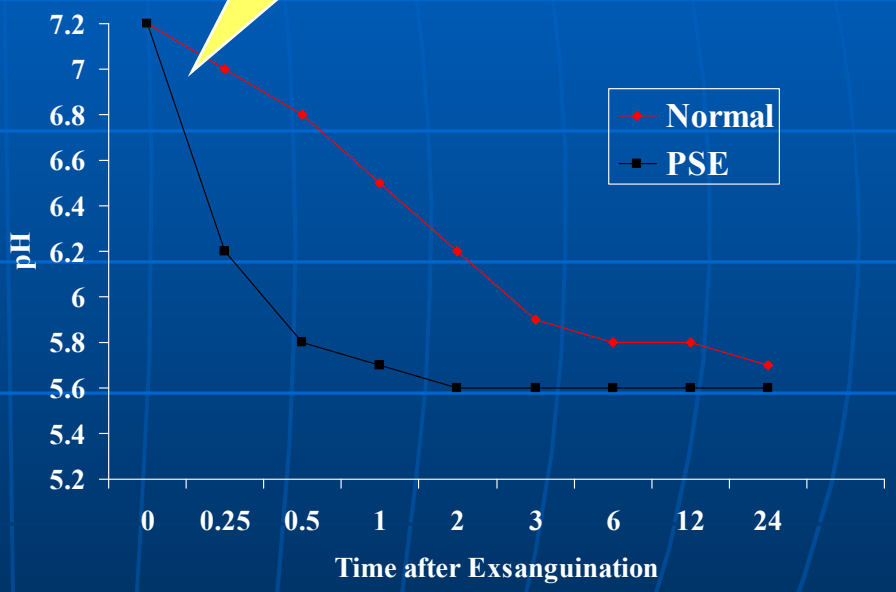
pH 酸鹼度

- Measure of the relative acidity of meat 測量肉之酸鹼度
- Related to: 與酸鹼度相關
  - Color 顏色
  - Drip loss 滴水失重
  - Firmness 緊實度

pH

Rapid Metabolism

- pH 下降產生水濸肉
  - 酸鹼度在一小時內極速下降 產生水濸肉



遺傳與處理方式都有影響

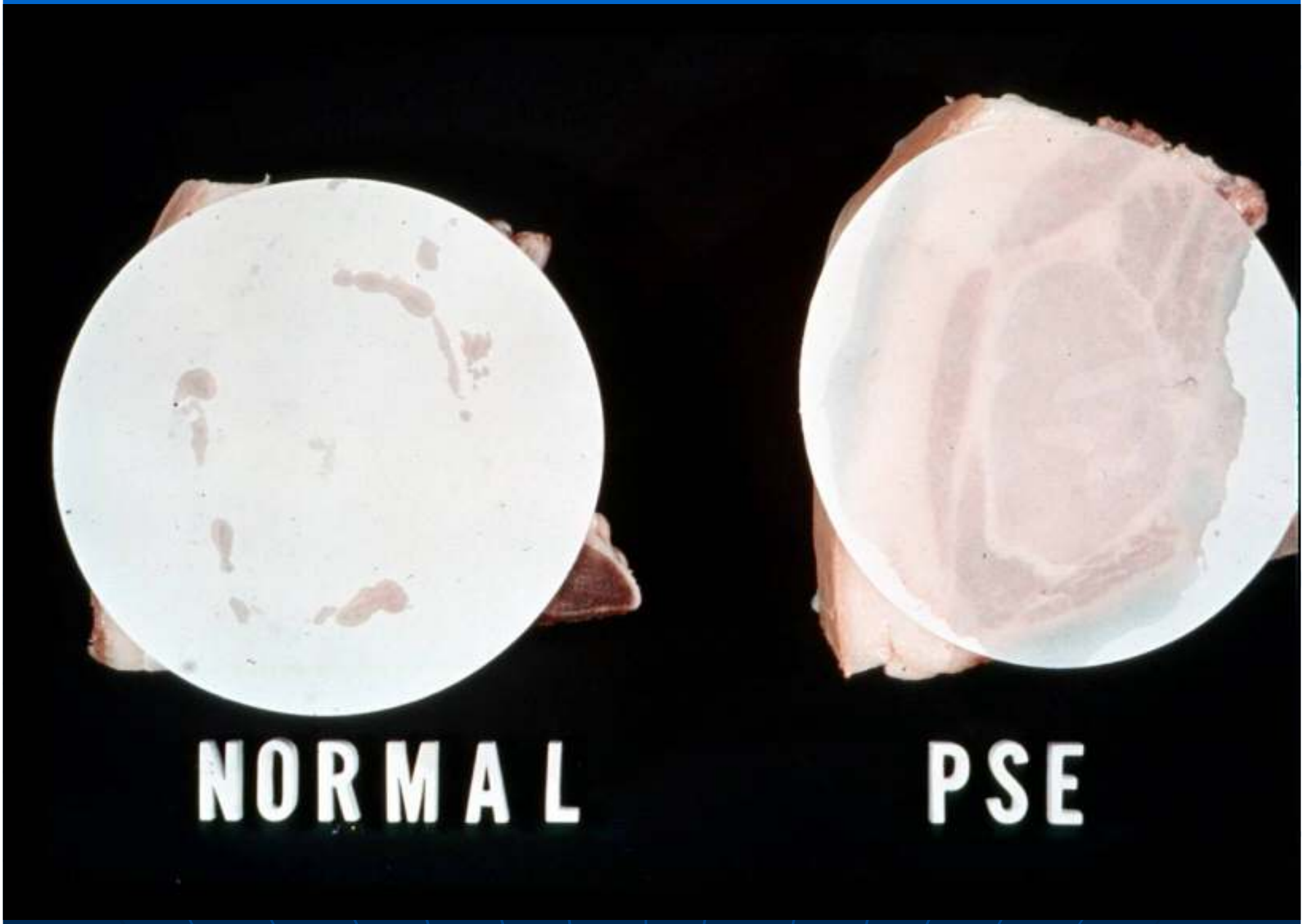
Handling Effects on Quality
屠前處理不當

在牧場運輸途中及屠宰場正確之操作可以減少下列損失

水漾肉

瘀傷

出血點


NORMAL
PSE

Evaluation of Carcass Quality
屠體評級

- Carcass Grading
  - Determination of quality grades is typically done for Beef, Lamb, Pork and Poultry

Purpose of Assigning "Grades" 評級之目的

- Separation of carcasses into like groups for purchase or marketing purposes 將屠體依使用方式分級

Yield Grades 產率分級

- Estimate of the yield (in percent) of boneless, closely trimmed retail cuts 精肉率 對生產者影響較大

Quality Grades 品質分級

- Estimate of palatability
  - How tender and flavorful the meat will be 屠肉適口性 對消費者影響較大

Pork 豬肉

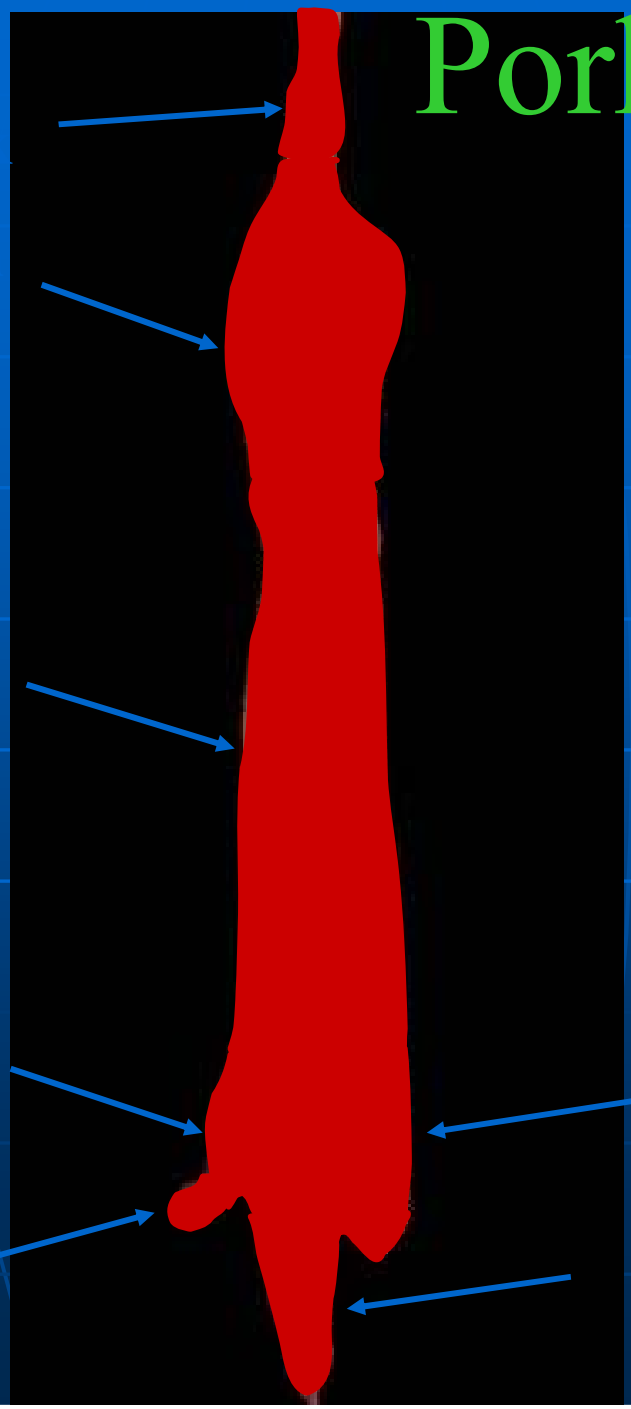
豬肉之產率及品質評級

Barrows and Gilts

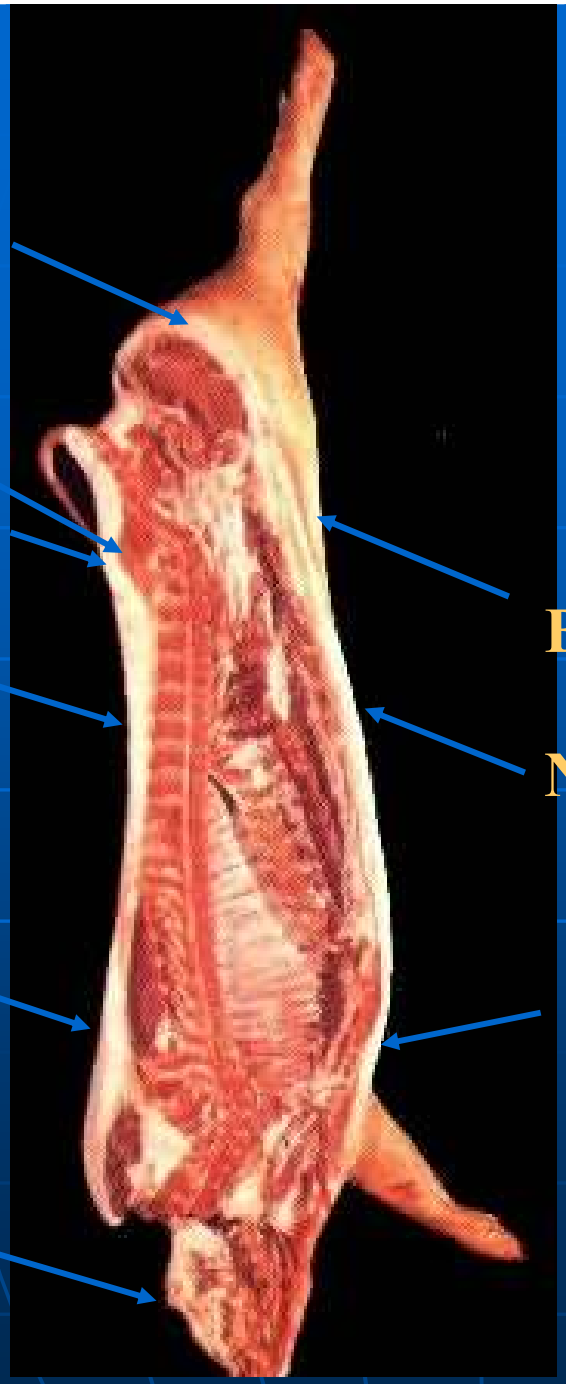
US 1	Lean
US 2	
US 3	
US 4	Fat
US Utility	Unacceptable quality of lean

Pork Carcass Evaluation

Pork Carcass



Pork Carcass



Lumbar Lean

Last Lumbar Vertebrae

Last Rib

First Rib

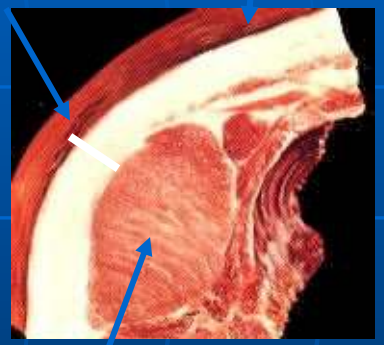
Jowl

Belly Pocket

Navel Edge

Sternum

Fat Opposite 10th rib

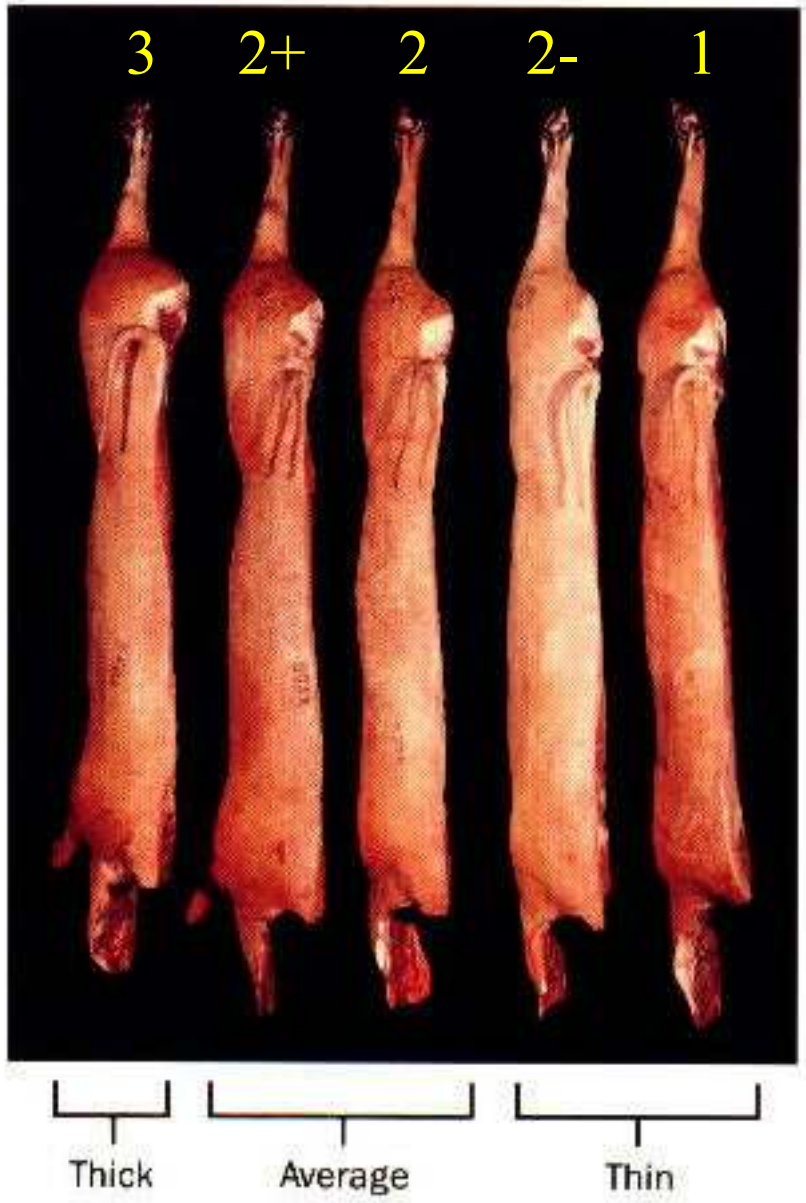


Loineye

影響屠體精肉率之因子

- 屠體外可見脂肪
- 屠體精肉外觀
  - 可用儀器測量

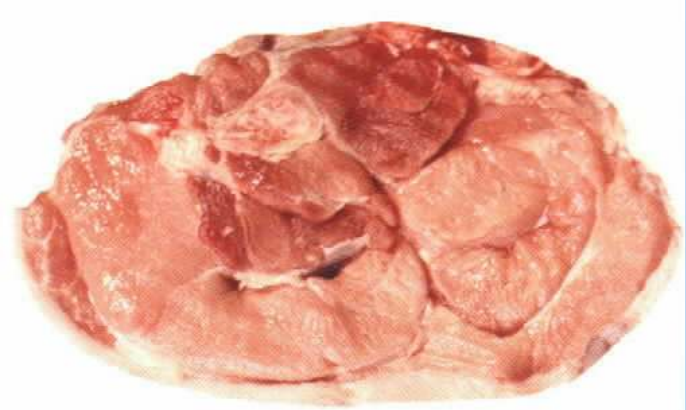
Muscle Scores



Factors Affecting Pork Quality
影響豬肉品質因子

- Lean color 顏色
  - Reddish-pink is ideal 櫻桃紅佳
  - Pale is bad 蒼白不佳
- Firmness of the lean 精肉緊實度
  - Firmer is better 緊實佳
  - Softer is bad 柔軟不佳
- The amount of marbling present in the loineye 有適當大里石紋
- Pale, soft, and exudative lean is unacceptable 水漾肉不可接受

Pork Quality



PSE-Pale pinkish gray, very Soft and Exudative. Undesirable appearance and shrinks excessively.

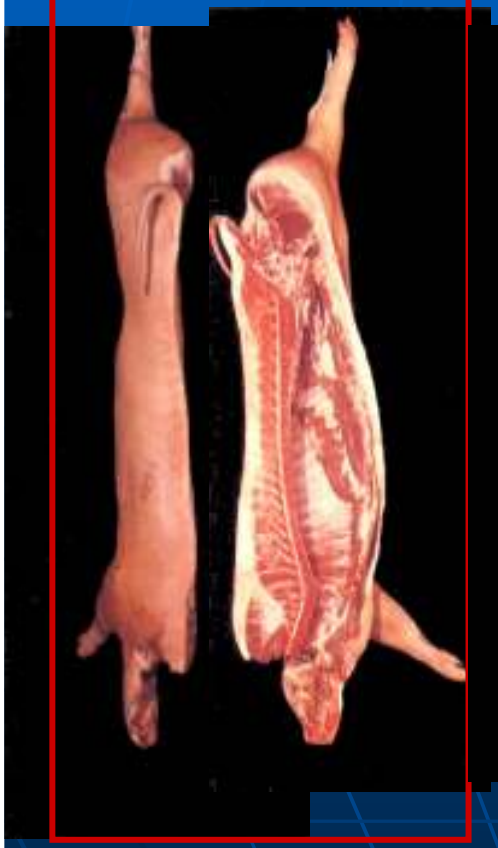
RSE-Reddish pink, Soft and Exudative. Desirable color but subject to excessive shrinkage.

RFN-Reddish pink, Firm and Non-exudative. "IDEAL". Desirable color, firmness and water-holding capacity.

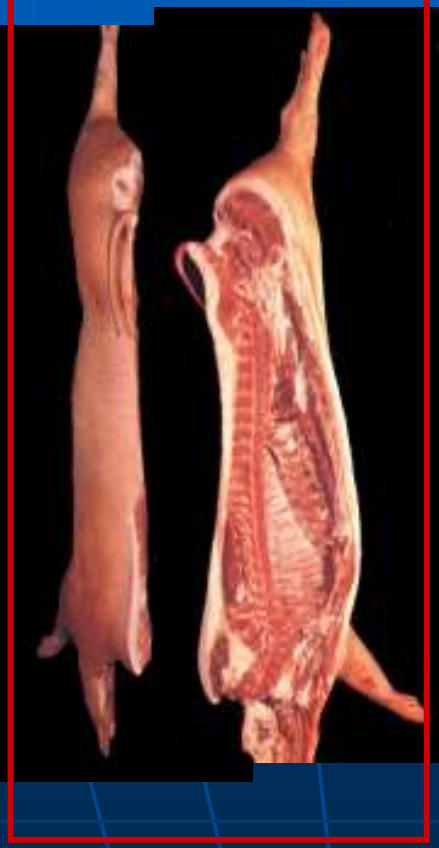
DFD-Dark purplish red, very Firm and Dry. Firm and sticky surface, high water holding capacity.

How Would You Rank These Carcasses?

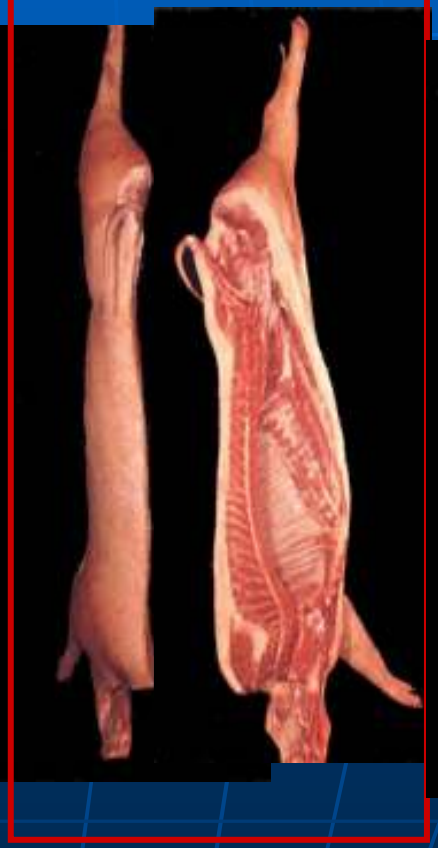
1



2

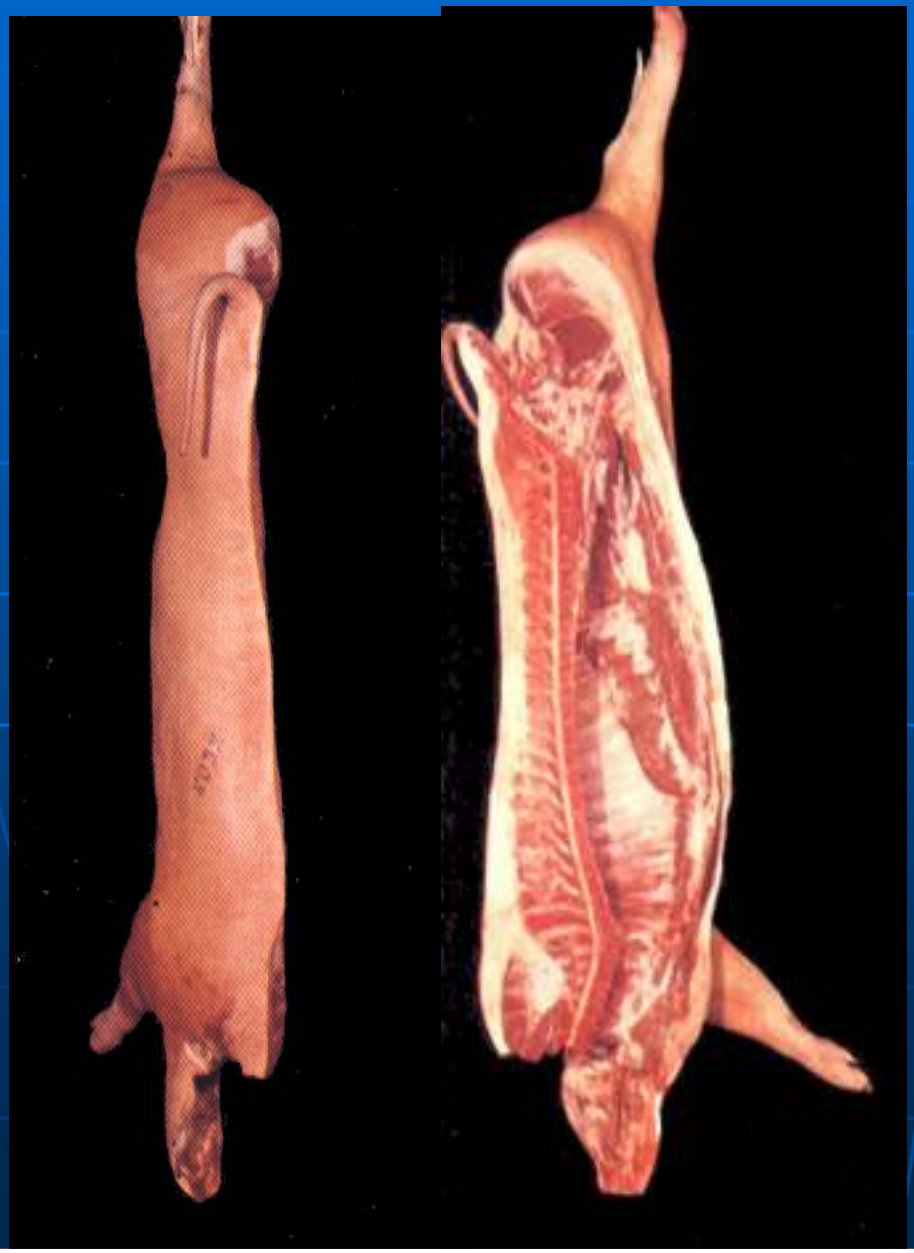


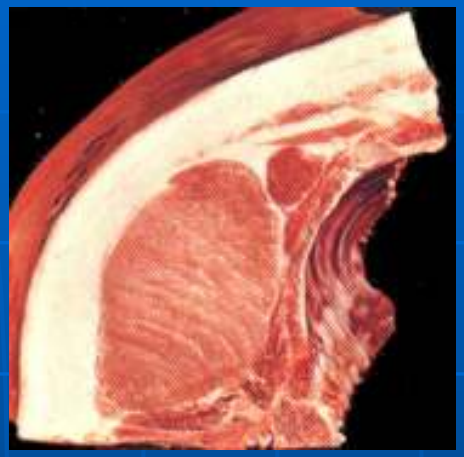
3



4

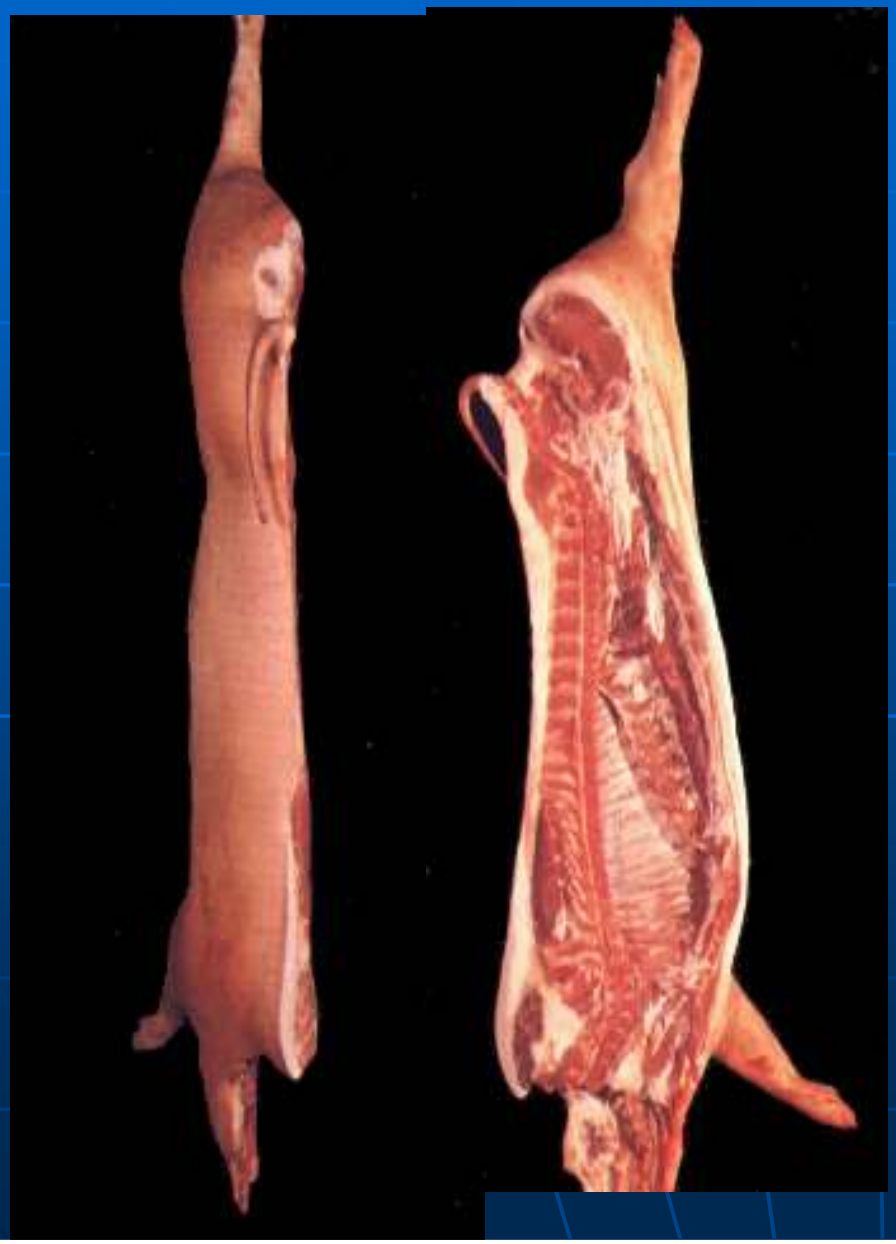
Carcass # 1





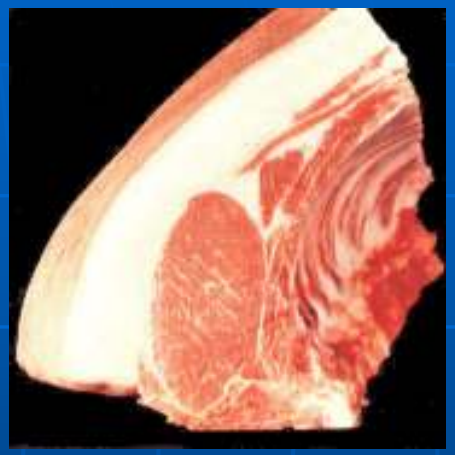
Avg. Backfat : 0.85
LEA : 7.6
Muscle Score : 3

Carcass # 2



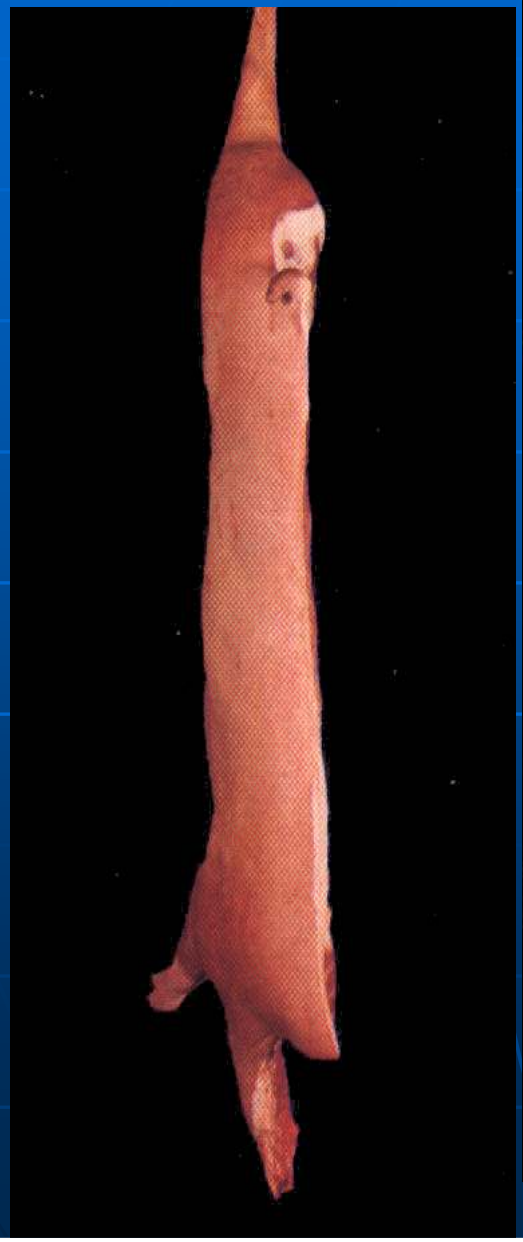
Avg. Backfat : 0.8
LEA : 5.4
Muscle Score : 2+

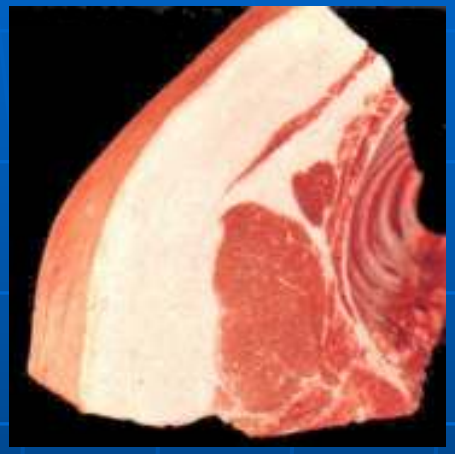
Carcass # 3



Avg. Backfat : 0.9
LEA : 4.5
Muscle Score : 2

Carcass # 4





Avg. Backfat : 1.82
LEA : 4.9
Muscle Score : 2-

- 具有品牌之豬肉

日本鹿兒島黑豬之介紹

鹿兒島黑豬
Kagoshima Berkshire

- 約在400年前從琉球傳入到日本
- 從明治時代起在黑豬的本來特長的基礎上一直進行著品種改良
- 發展出「甘薯」、「new甘薯」、「甘薯2001」等三個系統豬
- 純系Berkshire種豬，中型豬，全身黑色六點白（四肢、鼻端、尾端）

鹿兒島黑豬
Kagoshima Berkshire

- 肌纖維較細較多
- 肉的保水性高
- 中性糖與氨基酸含量高
- 脂肪融點較高且色白

鹿兒島黑豬
Kagoshima Berkshire

- 脂肪融點較高且色白

鹿児島黒豬

Kagoshima Berkshire

鹿児島黒豚
黒豚炭火焼豚

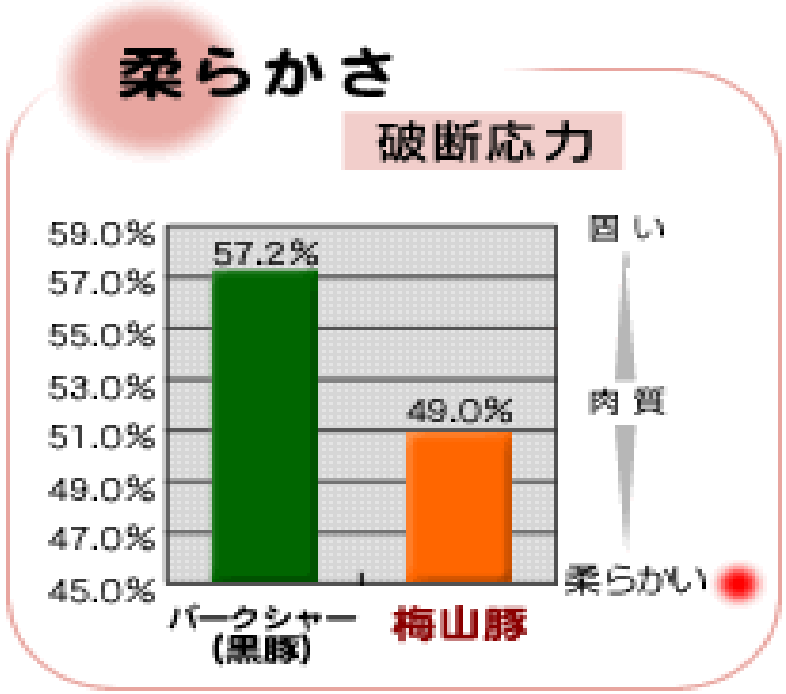
梅山豚

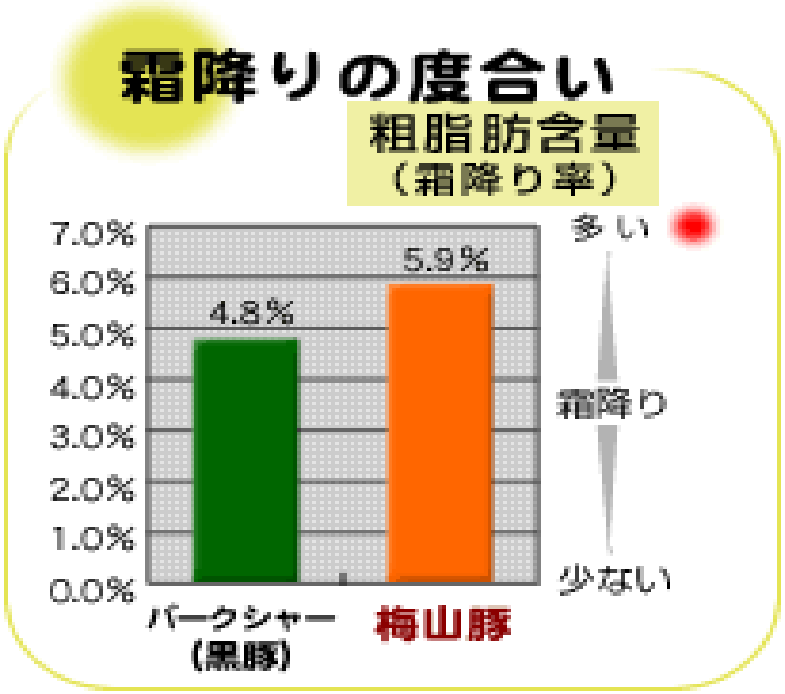
- 中國太湖豬系之原種豬
- 採林間放牧
- 完全以植物性食品副產物餵飼
- 商標認證，採會員制、宅配服務

塚原牧場

梅山豚

メイ シャン トン

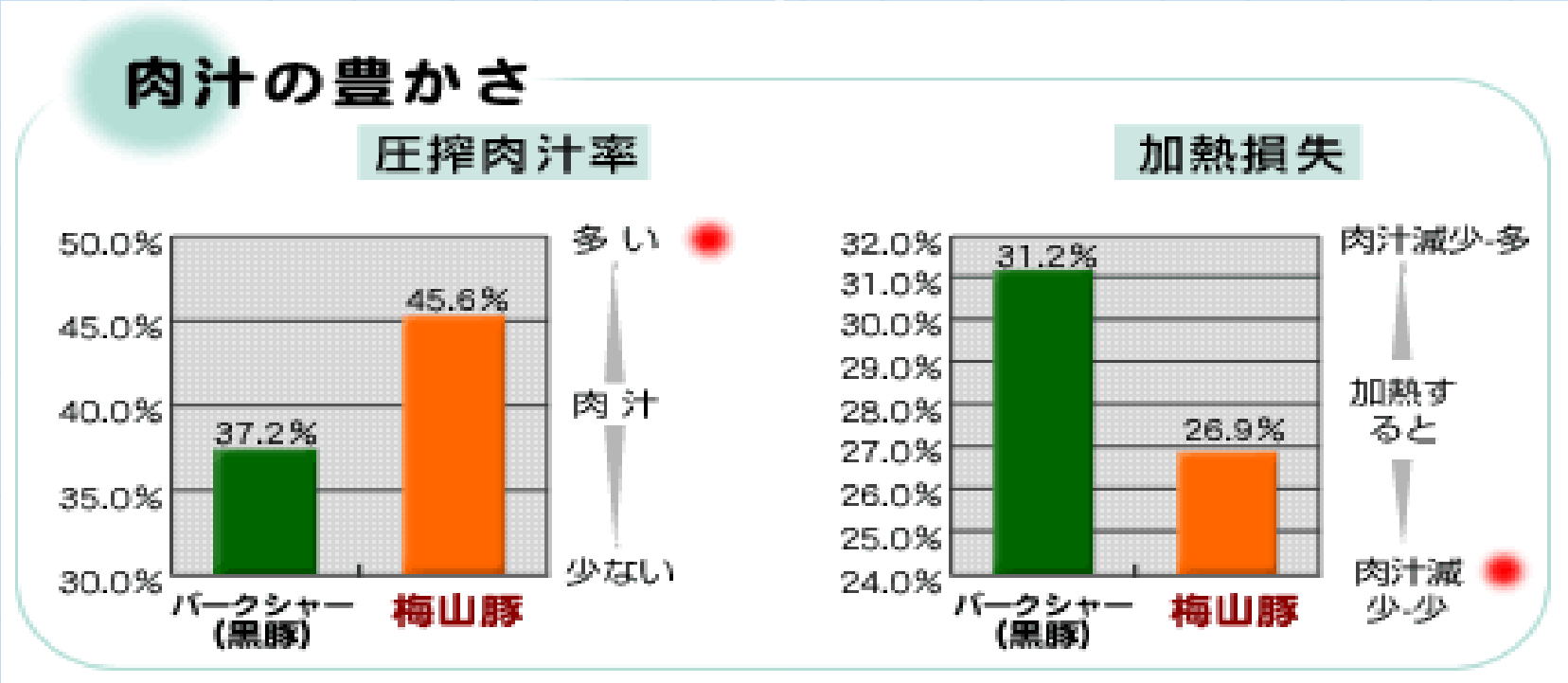




- 肉質柔軟

  梅山豬之破斷應力較黑豬低8%

- 霜降度較高



- 水分含量高，且蒸煮失重低。固加熱烹煮後風味損失較少，且多汁性較佳。

台灣黑豬之介紹

畜試黑豬

25%桃園豬

75%杜洛克豬

- 外型特徵：全身毛色黑色，垂耳，懸蹄，背直，捲尾，乳頭數6對以上。
- 平均分娩總仔數為9.8頭

脂肪酸組成

不同來源豬里脊肉的脂肪酸組成比較

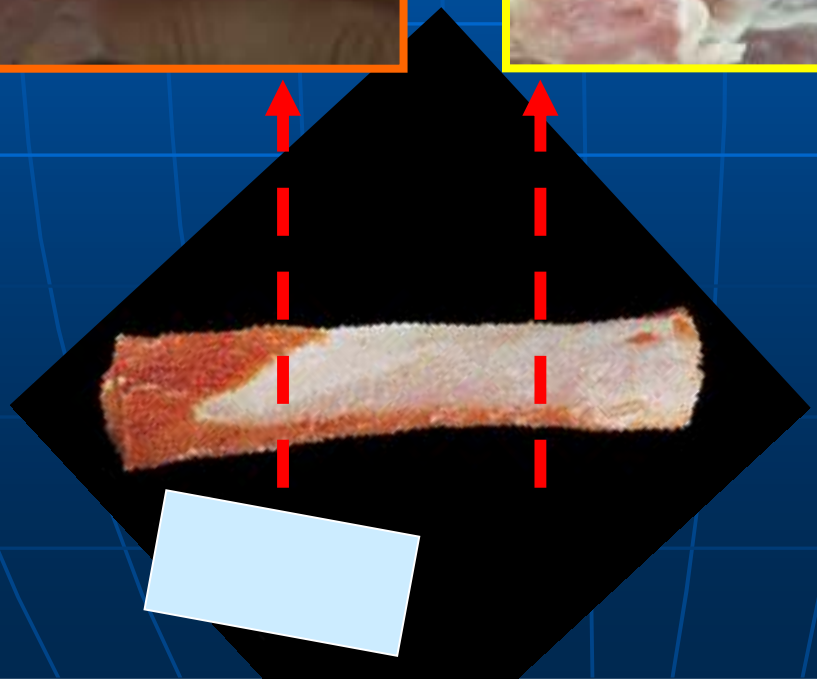
Fatty acid (%)	Source	
	W	B
C12:0	1.018[a]	1.659[b]
C14:0	3.846[a]	2.301[a]
C16:0	23.128[a]	30.990[b]
C16:1	3.092[a]	4.114[b]
C18:0	12.998[a]	11.726[a]
C18:1	40.242[ab]	42.372[b]
C18:2	14.141[b]	5.650[a]
C18:3	0.572[b]	0.147[a]
C20:1	0.602[a]	0.874[b]
C20:4	0.361[ab]	0.167[a]
SFA	40.990[a]	46.676[b]
MUFA	43.936[ab]	47.360[b]
PUFA	15.074[b]	5.964[a]

[a-c]：同列中不同字母表示有顯著差異（$p < 0.05$）。

肉質評級

里脊肉後段切面

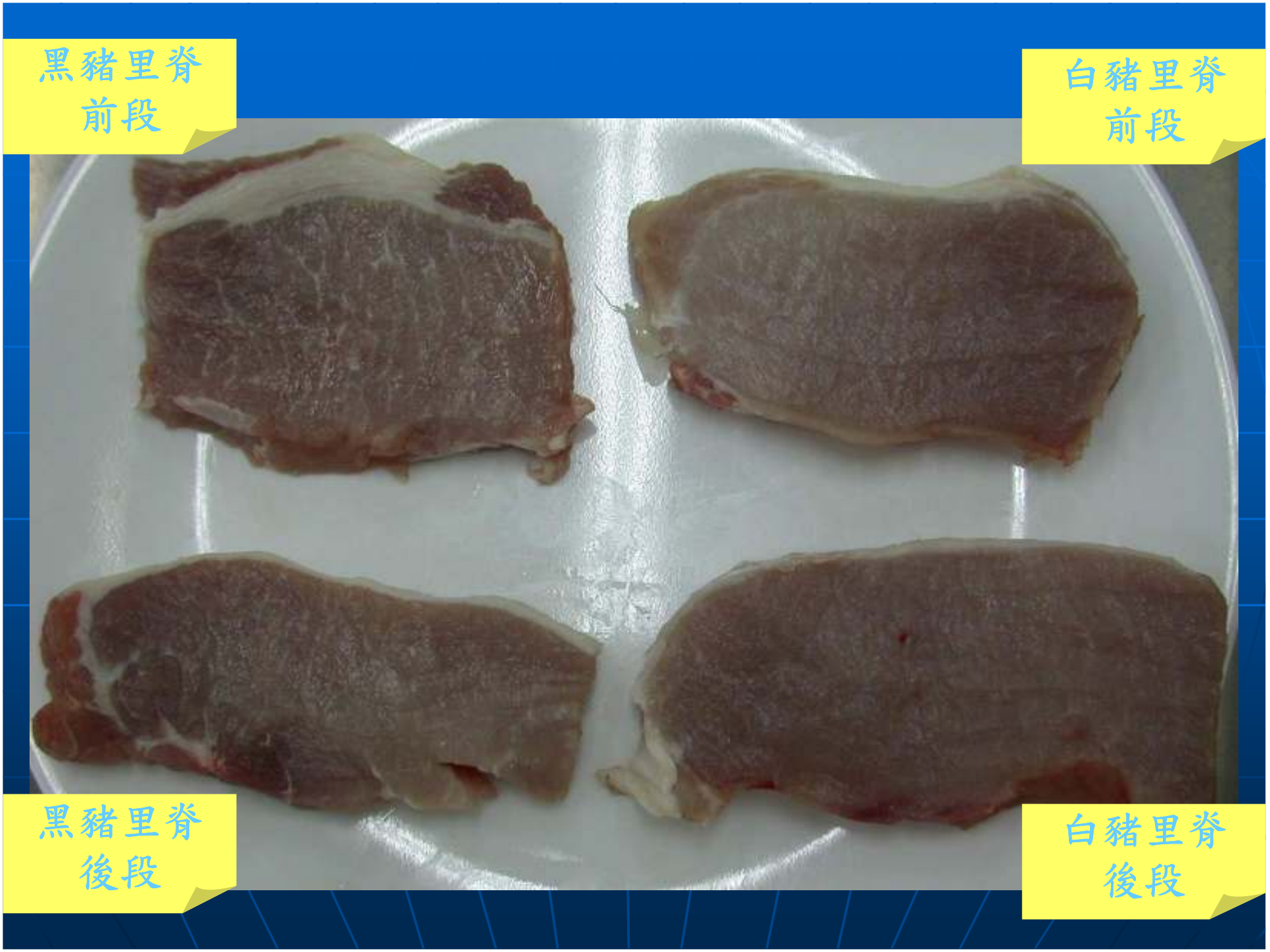
里脊肉前段切面



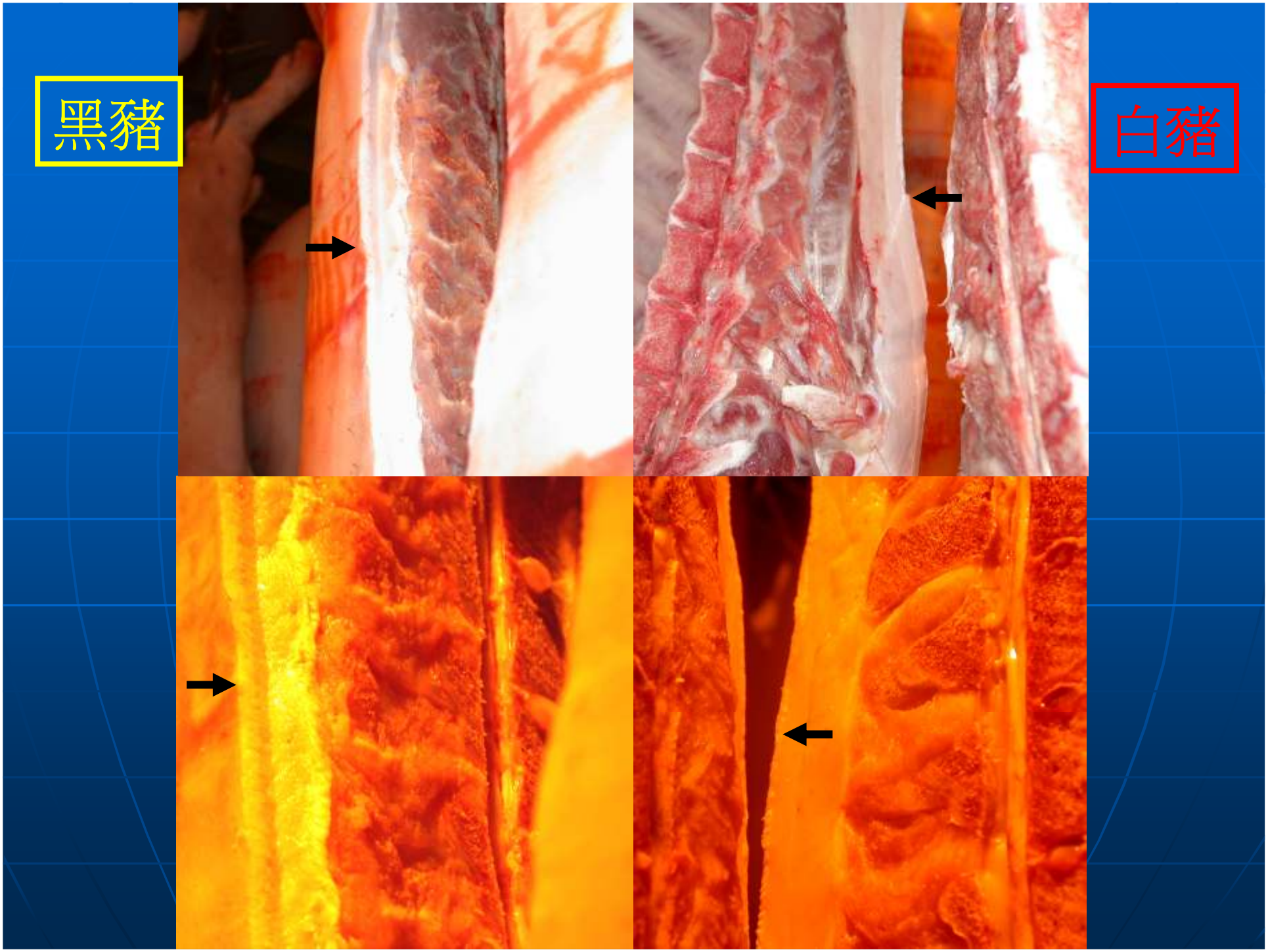
- Color Scores
- Firmness Scores
- Marbling Scores

LYD白豬與畜試黑豬一號之前、後段里脊切面評級及其pH值

品種	部位	pH	屠體評級項目 Color Scores	Firmness Scores	Marbling Scores
LYD 白豬	前段	6.556	2.0	3.0	1.3
	後段	6.506	2.1	3.1	1.0
畜試一號黑豬	前段	6.029	2.6	2.5	3.0
	後段	6.087	2.4	2.3	2.1


黑豬里脊
前段
白豬里脊
前段
黑豬里脊
後段
白豬里脊
後段

豬皮特性及膠原蛋白含量


黑豬
白豬

結果

- 黑豬豬皮平均厚度較白豬豬皮厚
- 黑豬豬皮彈性指數較白豬豬皮高；剪力值亦為黑豬豬皮較高
- 豬皮蒸煮後其膠原蛋白溶出量，黑豬豬皮膠原蛋白溶出量較白豬豬皮高。

感官品評

白豬與畜試黑豬一號之前段里脊肉感官品評

項目	LYD白豬里脊肉	畜試一號黑豬里脊肉
顏色	3.8	5.8
氣味	4.7	4.2
嫩度	4.2	5.4
多汁性	6.3	6.4
甘味	5.0	6.0
風味	5.7	6.8
總接受度	5.4	6.1
剪力值	8.764	4.720

感官品評採九分制:顏色以一分為極淺，九分為極深；氣味以一分為極淡，九分為極濃；嫩度以一分為極硬，九分為極嫩；多汁性以一分為極乾，九分為極多汁；甘味以一分為極不甘甜，九分為極甘甜；風味以一分為極淡，九分為極濃；總接受度以一分為極討厭，九分為極喜歡。

白豬與畜試黑豬一號之後段里脊肉感官品評

項目	LYD白豬里脊肉	畜試一號黑豬里脊肉
顏色	2.8	5.5
氣味	4.7	5.6
嫩度	5.8	4.8
多汁性	5.2	5.6
甘味	4.5	5.6
風味	5.7	7.0
總接受度	5.3	6.2
剪力值	7.318	6.105

感官品評採九分制:顏色以一分為極淺，九分為極深；氣味以一分為極淡，九分為極濃；嫩度以一分為極硬，九分為極嫩；多汁性以一分為極乾，九分為極多汁；甘味以一分為極不甘甜，九分為極甘甜；風味以一分為極淡，九分為極濃；總接受度以一分為極討厭，九分為極喜歡。

肌肉纖維組織切片結果

LYD白豬里脊肉
肌肉組織切片

畜試一號黑豬里脊肉
肌肉組織切片

40X

- 黑豬里肌肉之肌纖維較白豬細，在數量上亦較白豬多

核苷酸關聯物

表12 LYD白豬與畜試黑豬一號里脊肉核苷酸關聯物感官品評之比較(μg/g)

品種	ATP	ADP	AMP	IMP	Hypoxanthine	Inosine	Total
白豬	34.1990	8.9535	0.1460	199.6740	28.6225	40.3290	311.9240
黑豬	31.6770	8.9395	ND	265.6775	36.3850	44.0375	386.7165

胺基酸組成

	白豬	黑豬
Serine	0.1056	0.0642
Threonine	0.1794	0.1539
Glycine	0.0098	0.0975
Arginine/Alanine	3.6853	3.7178
Vaiine	0.0443	0.0294
Proline	0.3374	0.1346
Tryptophan	0.0436	0.0251
Isoleucine	0.0355	0.0211
Leucine	0.0481	0.2331
Methylhistidine	-	-
Phenylaianine	0.0710	0.0509
Anserine	0.4388	0.4806
Lysine	0.0935	0.0434
Histidine	0.0766	0.0563
Carnosine	1.1535	1.3606
Threonine	0.0301	0.0290
Total	6.3525	6.4975

表13　LYD 白豬與畜試黑豬一號里脊肉胺基酸組成之比較(mg/g)

結果

- 黑豬所含核苷酸關聯物總量較白豬高，主要呈味核苷酸關聯物IMP含量亦以黑豬較白豬高。
- 總游離胺基酸含量方面黑豬里脊肉含量較白豬高，在抗氧化物肌肽(Carnosine)及甲肌肽(Anserine)含量上黑豬里脊肉亦高於白豬里脊肉

- 大麥豬
- 自然豬
- 活力豬
- 香草豬
- 網室豬

如何利用遺傳選拔之優勢達成
精肉高且肉質佳之豬肉

Thank you for your attention

敬請指教