# EFFECT OF THE REARING SYSTEM ON MEAT QUALITY OF CROSS-BRED $F_2$ (WILD BOAR X PIG)

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**Introduction**

Several researches have shown that rearing system affects behaviour and productive performances of pigs. Morrison *et al.*, (2003) have shown that pigs housed in large groups on deep-litter have longer feeding events with less disruption from other pigs compared to pigs maintained in conventional housing systems. In fact the absence of welfare, as a consequence of a non optimal rearing system, leads to stressed conditions. If these conditions are long term they may cause negative reactions such as alterations of social and feeding behaviour, growth reduction, reproductive ineffectiveness, but also pathological conditions such as gastric and intestinal damage, hypertension and immune suppression. This aspect is particularly important when we consider wild animals or rustic genotypes. For this kind of animals the space allowance is more consistent. The rearing of wild animals for human feeding supplies high quality and nutrition productions. It is however necessary to consider their welfare which is related to a greater demand of space, to a higher environmental quality and to the possibility of behavioural expression. The hybrid animals can also allow the improvement of some quantitative and qualitative traits of the animal productions. The rearing of the hybrid wild boar x pig, as any other wild or rustic genotype, can supply niche products with high added value (Vicenti *et al.*, 1991; Pugliese *et al.*, 2002). The aim of the current experiment is to examine the effects of different rearing systems (indoor *vs* outdoor) on the meat quality traits of pig hybrids, testing the positive effect of space allowance on animals and, potentially, on welfare and meat quality.

**Materials and Methods**

Fourteen second generation hybrids (wild boar x (wild boar x pig)), weaned at 50 days of age, have been subdivided into 2 groups, the first reared in indoor pigsty and the second one in an outdoor pen. Both groups have been fed on a complete feed (M.E. 3,008.00 Kcal/Kg). The chemical composition of diet, measured in accordance with A.S.P.A. indications (1980), is: Moisture 10.80; Protein 12.45; Fat 5.36; Ash 8.13; Crude fibre 5.02; N-free extract 22.61; NDF 23.01; ADF 7.56; AIA 0.76. The pH value has been measured at slaughtering ($pH_1$) and after 24 hours of storage at +4°C ($pH_2$). Meat colour has been estimated by the Hunter Lab system using a colorimeter (illuminant D 65), which measures the values of Lightness (L), Redness (a) and Yellowness (b). Tenderness has been measured using a Warner Bratzler shear device applied to an Instron 5544 and expressed as the cutting force (kg/cm2). The chemical composition of *Longissimus dorsi* (LD) and *Quadriceps femori* (QF) muscles has been measured in accordance with A.S.P.A. indications (1980), and the fatty acid composition has been determined, as extracted/methylated using a gas chromatography system (Chromopack CP9000) with a capillary 60 m silica-glass column and cyanopropyle film at 100%, by measuring the contents of saturated fatty acids (SFA), unsaturated fatty acids (UFA), mono unsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). The atherogenicity and thrombogenicity indexes have been calculated accordingly to Ulbricht and Southgate (1991). The PCL/PCE (plasma cholesterol lowering/plasma cholesterol elevating) ratio was also determined (Reiser and Shorland, 1990). The data have been analysed for variance and the significance between the means evaluated using Student's "t" test (SAS, 1996).

**Results and Discussion**

No significant differences of the colour parameters have been measured on the raw meat, except for the redness index "a" of the QF muscle, significantly ($P < 0.05$) higher for the meat of the animals reared in the outdoor pen (Table 1). The pH value has been significantly higher ($P < 0.01$) for the QF muscle, after refrigeration, of the indoor reared subjects (6.28 vs 6.02). The shear force has not been affected by the rearing system. The physical measurements have shown some differences, although not significant, of the pH and colour. This last parameter is mainly stronger and less bright in the outdoor reared animals, probably as a consequence of the higher concentration of myoglobin caused by the higher rate of movement in the outdoor pen (Mayoral et al., 1999). The chemical composition of meat has been significantly affected by the rearing system, the ash content was higher (1.50% vs 1.80%; $P<0.05$) for the cooked QF muscle of the animals reared outdoor (Table 2). Space allowance has significantly reduced the undetermined percentage of the cooked LD muscle of the indoor reared pigs (0.94% vs 1.71%). Meat produced from the outdoor rearing system has shown specific traits, in agreement with other studies on improved genotypes (Sather et al., 1997; Enfalt et al., 1997). Fatty acid composition of the muscles has not been affected by the rearing system, except the for MUFA content of cooked LD muscle, significantly higher (47.41% vs 43.95%; $P<0.05$) for indoor animals (Table 3).

## Conclusions

The substantial equivalence of the data from the two kinds of rearing systems suggests the possibility that the stress produced by the smaller space allowance could bring to the production of lean meat as well as the facility of movement of the animals reared outdoor. Data confirm that meat of outdoor reared animals has some dietary traits, such as the fatty acidic composition, more useful for human feeding (Pugliese *et al.*, 2002).

**Table 1:** Colour, pH and tenderness parameters.

| | | Indoor | Outdoor |
|---|---|---|---|
| Colour | | | |
| LD: | L | 45.07 | 49.08 |
| | a | 8.34 | 9.88 |
| | b | 11.95 | 14.23 |
| QF: | L | 43.99 | 43.84 |
| | a | 7.64 b | 9.39 a |
| | b | 8.57 | 9.24 |
| pH | | | |
| $pH_1$ : | LD | 7.03 | 6.80 |
| | QF | 6.95 | 6.75 |
| $pH_2$ : | LD | 6.31 | 6.01 |
| | QF | 6.28 A | 6.02 B |
| WBS ($Kg/cm^2$) | | | |
| LD raw | | 2.90 | 2.85 |
| QF raw | | 1.54 | 1.96 |
| LD cooked | | 3.23 | 3.36 |
| QF cooked | | 3.44 | 3.31 |

A, B: P<0.01; a, b: P<0.05

**Table 2:** Chemical composition of cooked meat (%).

| | QF | | LD | |
|---|---|---|---|---|
| | Indoor | Outdoor | Indoor | Outdoor |
| Moisture | 67.59 | 66.34 | 66.18 | **65.76** |
| Protein | 27.49 | 28.13 | 28.79 | 28.46 |
| Fat | 2.27 | 2.30 | 2.46 | 2.27 |
| Ash | 1.50 b | 1.80 a | 1.62 | 1.80 |
| Undetermined | 1.16 | 1.44 | 0.94 b | 1.71 a |

**Table 3:** Fatty acids composition of cooked meat (%).

| | QF | | LD | |
|---|---|---|---|---|
| | Indoor | Outdoor | Indoor | Outdoor |
| MUFA | 45.17 | 44.82 | 47.41 a | 43.95 b |
| PUFA | 8.92 | 10.22 | 8.04 | 9.57 |
| ω6 | 8.42 | 9.57 | 7.67 | 8.98 |
| ω3 | 0.50 | 0.64 | 0.37 | 0.60 |
| ω6/ω3 | 17.96 | 15.57 | 26.97 | 16.83 |
| Atherog. index | 0.64 | 0.62 | 0.60 | 0.67 |
| Thrombog. Index | 1.49 | 1.45 | 1.45 | 1.53 |
| PCL/PCE | 1.07 | 1.12 | 1.10 | 1.05 |

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