Sheepdrove Organic Farm
Breed and Feed 1a

Interim Report
July 2004

Sheepdrove

Organic Farm

ELM FARM
RESEARCH CENTRE

Executive Summary

- This interim report summarises the results of the first part of the breed and feed 1 trial, a final report will follow the completion of the second half of the trial.
- The trial was undertaken to investigate the impact of removing the Soil Association derogation for 20 per cent non-organic component in organic table bird feed ration.
- The trial was also investigating the suitability of the ISA 257 breed currently used in the SOF system, as it has been questioned as to whether it is the most appropriate genotype to use.
- The objectives of the trial were to ascertain if there are differences between the performance of two genotypes of organic free-range table birds (ISA 257 and colourpac) and two ration types (80 per cent and 100 per cent organic) and establish if there is an interaction between the two.
- 2000 birds were grown in 2 identical houses divided into sections in mixed flocks of approximately 500, under organic free-range conditions conforming to Soil Association standards.
- Weekly weights were obtained for 50-bird samples of each genotype and ration combination in each flock/house. As were behavioural observations after week 6.
- Gait scoring was undertaken one week prior to depletion for a sample of birds of each genotype and ration combination in each flock/house.
- At depletion, feather damage, bird cleanliness, pododermatitis (pad burn) and hock burn, carcase weight, carcase bruising (fresh and old), wing haemorrhages, damage to the skin (breast blisters and other blemishes) and carcase conformation scores were collected for a sample of 51 birds of each genotype and ration combination from each flock/house.
- There were no differences in live weight (g) between the two genotypes, but there was a difference in relation to ration type. The 80 per cent ration produced significantly higher weights in both genotypes than the 100 per cent ration. Possibly due to nutrient composition, or the disease challenge experienced by the birds.
- Although there was a statistically significant difference in live weight between the ration types, the actual difference in the means is very small (approx 150g). In practice, based on the evidence gathered at this point, in terms of bird welfare and production the difference is minimal. This, could however, be an artefact of the disease challenge, and should be investigated further in future trials.
- There was a higher level of food consumption on the 80 per cent organic ration, possibly due to the disease challenge, hence should be investigated further.
- The bird gaits all scored low and were similar across ration type and genotype.
- There were no significant differences in bird cleanliness, feather damage, hock burn, carcase conformation and breast damage, but some trends were observed that merit further investigation.
- Pododermatitis levels were relatively high, but not significantly different, across ration type and genotype. However, regardless of ration type and genotype pad burn was significantly more severe in the flocks situated in the rear of the houses, possibly due to litter condition.
- Wing haemorrhage and red wing tips were significantly more prevalent in ISA 257 birds than colourpacs. This was possibly the result of increased flapping or could be the result of a difference in bird robustness. This merits further investigation through scoring bird flapping during depletion operations in future trials.
- There was a very slight trend for higher yield in colourpac birds, but it is very small and considers whole carcase yield and not yield in terms of carcase composition. This should be investigated further in future trials by considering carcase composition by portioning and weighing a small number of carcases.
- Future trials should also include the effect of ration type and genotype on meat quality.

Sheepdrove Organic Farm Breed and Feed 1a.

Josie O'Brien, Lois Philipps, Claire Aspray, (EFRC), Andy Butterworth, Lindsay Wilkins, Steve Brown, Claire Weeks, Toby Knowles (University of Bristol)

1. Background

1.1. The Soil Associations organic certification of broiler chickens (table birds) currently allows the use of up to 20 percent non-organic component in the feed ration. In August 2005 this derogation will be removed.

1.2. There are concerns that this will impact on the nutritional quality of the ration, as some ingredients currently being used within the 20 per cent that is non-organic may not be available from an organic source. There is concern that the change to a 100 percent organic ration may result in poor animal health and welfare, as well as have an impact on performance, yield and quality of the final product (and so finances) of the system.

1.3. It has been questioned whether the genetic base of the ISA 257 bird, currently used in the SOF system, is the most appropriate bird for an organic table bird system. However, working within the tight constraints dictated by the market for weight and conformation, there is limited availability of alternative breeds in the numbers required by SOF for production. There is currently little choice other than the ISA or closely related breeds.

1.4. One alternative breed that would fit the market requirements and is available in the required numbers is the colourpac. The colourpac shares a parent with the ISA 257 and will enable a significant change without moving too far from the market expectations.

2. Objectives

2.1. To compare the impact of feed composition (100 percent organic ration with the currently used 80 percent organic ration), when addressing the nutritional needs, production traits and behaviour of SOF birds within the confines of the SOF system and the market requirements.

2.2. To ascertain if there are differences between the performance of two breeds of table bird chickens, ISA 257 and the colourpac, in the SOF system.

2.3. To ascertain if there is an interaction between feed and breed in relation to the production traits and behaviour.

3. Materials and Methods

3.1. The two breeds of birds were grown under organic free-range conditions conforming to Soil Association standards in mixed flocks of approximately 500 birds containing equal numbers of each breed.

3.2. Birds were housed in two identical brooder houses, with one house fed on 80 per cent organic ration and the other on 100 per cent organic ration (see appendix 1, protocol A).

3.3. Birds were weighed on arrival and then each week whilst in the brooder sheds. Fifty birds of each genotype, from each brooder, were weighed each week (see appendix 1, protocol B).

3.4. The birds from the brooder sheds were divided between two field sheds ("Top" and "Bottom") in the same field (see appendix 1, protocol C). Each shed had been divided in two, with their own separate ranging areas, to create four groups. The treatments were replicated in the second house but were reversed in terms of house end.

3.5. Whilst in the field sheds fifty birds of each genotype, from each group, were weighed each week, and one day prior to depletion (see appendix 1, protocol D). The data for bird weights was analysed and mean values produced for each week, and at depletion.

3.6. Behavioural observations of the birds were undertaken weekly, after week six (see appendix 1, protocol E).

3.7. Gait scoring of the birds was undertaken in week nine, one week prior to depletion (see appendix 1, protocol F).

3.8. Birds from the bottom shed were depleted on 10.05.04 and from the top shed on 12.05.04. A sub-sample of fifty-one birds from each ration and genotype treatment were caught at random (see appendix 1, protocol G).

3.9. On each slaughter day the four groups of genotype and ration were processed consecutively (see appendix 1, protocol H).

3.10. Feather damage, bird cleanliness, pododermatitis and hock burn were assessed on line (see appendix 2).

3.11. Carcases were weighed and inspected for bruising (fresh and old), wing haemorrhages, damage to the skin (breast blisters and other blemishes and subjectively scored for conformation (see appendix 2).

4. Results

4.1. For bird live weights see table 1 and figure 1.

4.1.1. There was no significant difference in average weights between the two genotypes and no significant difference between the two sheds. Figure 1 demonstrates a trend for a lower average weight for the birds on 100 per cent ration; this difference was a statistically significant (df = 100, F = 13.673, $p < 0.001$).

	Weight (g)			
	80% ration		100% ration	
Age	ISA 257	Colourpac	ISA 257	Colourpac
Day Old	45.73	43.64	46.56	44.42
Wk 1	120.52	124.00	111.45	119.29
Wk 2	284.09	282.80	230.44	254.36
Wk 3	460.65	484.93	367.79	405.52
Wk 4	629.69	635.71	517.04	586.24
Wk 5	870.79	941.40	785.85	850.13
Wk 6	1155.94	1163.20	1018.92	1062.22
Wk 7	1314.46	1487.30	1196.05	1311.88
Wk 8	1753.33	1821.00	1642.28	1712.14
Wk 9	2101.32	2188.99	1971.27	2082.55
Wk 10	2372.43	2370.24	2219.38	2223.20

Table 1: Weekly average weights (g) of ISA 257 and Colourpac birds on 80 per cent and 100 per cent organic rations.

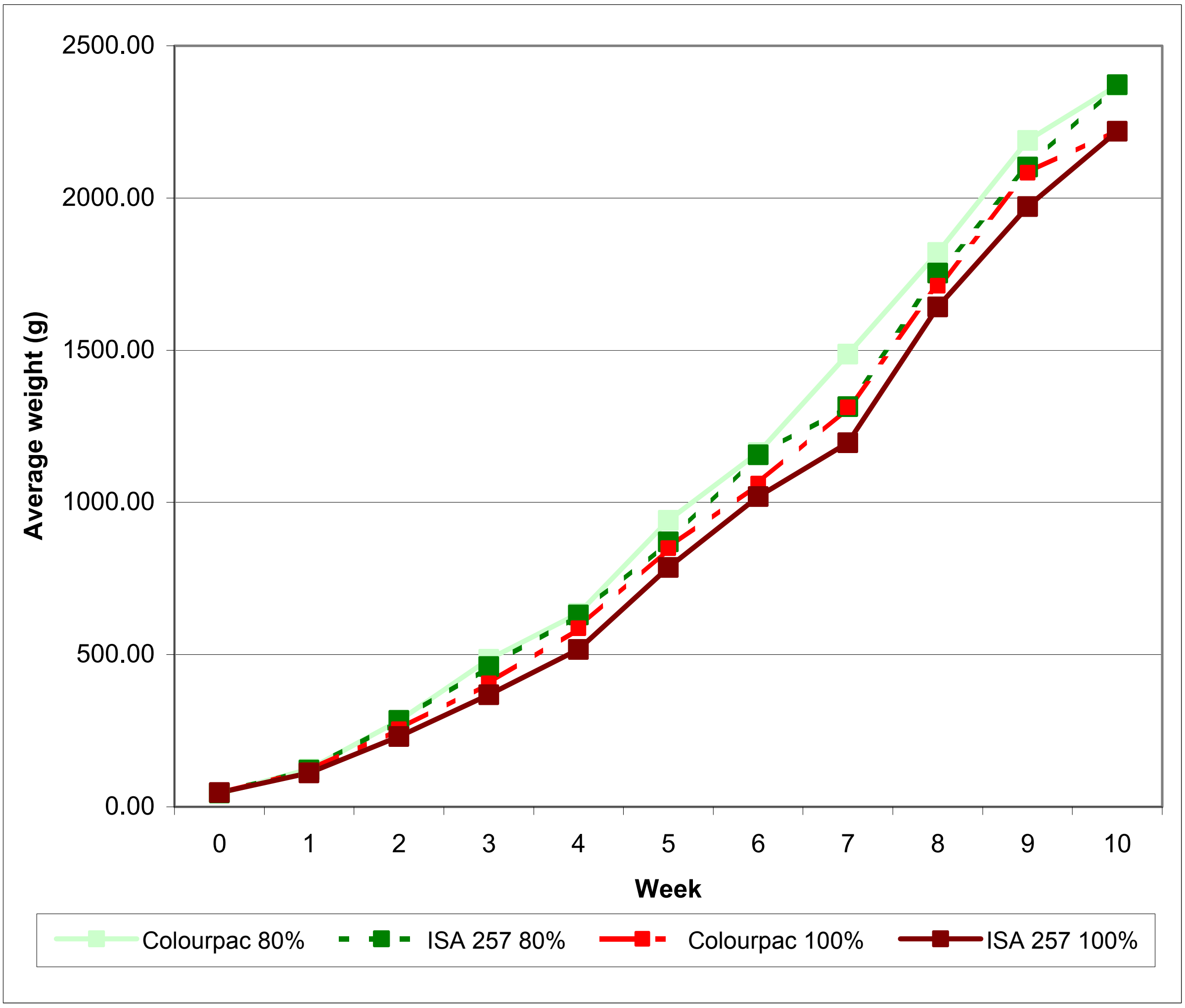

Figure 1: Weekly average weights (g) of ISA 257 and colourpac birds on 80 per cent and 100 per cent organic rations.

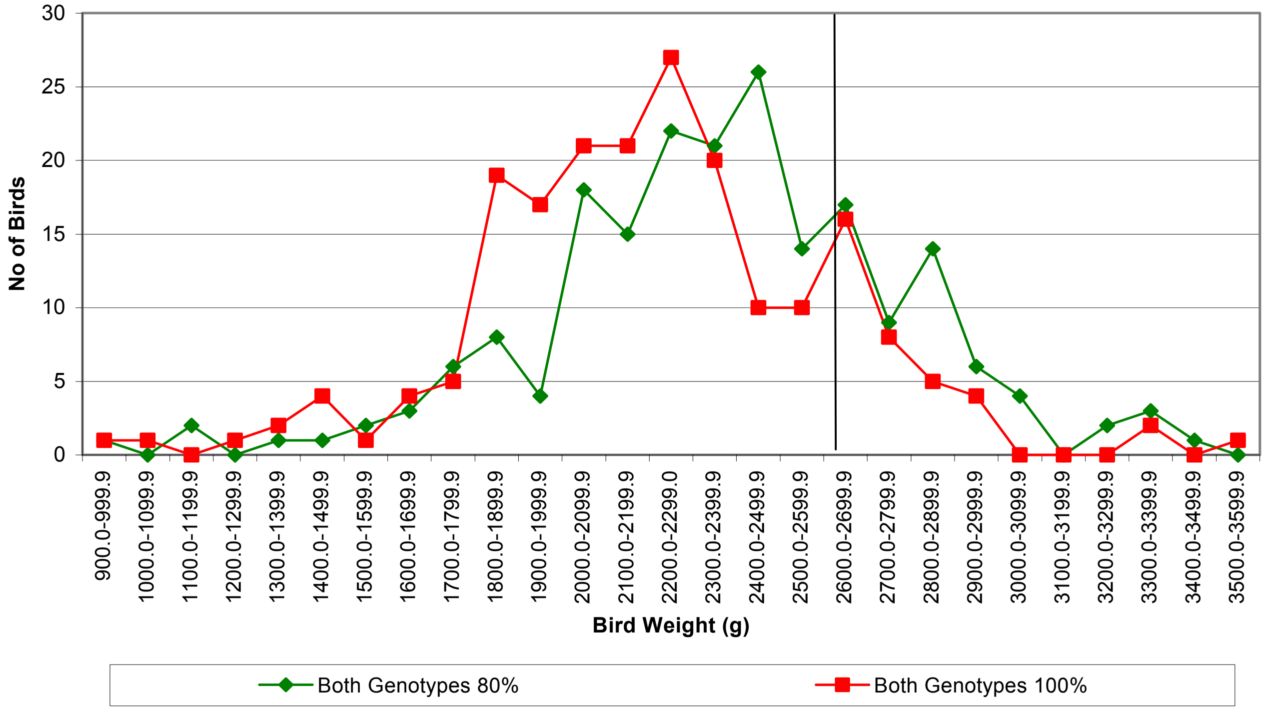

Figure 2: Population distribution, day 70 and 72, both genotypes on 80 per cent and 100 per cent organic rations.

4.1.2. Figure 2, demonstrates that the population distribution for both genotypes on the two ration types, 80 per cent and 100 per cent organic, were of similar shape and range.

4.2. Feed Consumption

4.2.1. Figure 3, demonstrates the differences in total feed consumption for the trial birds on the two rations in the different sheds.

4.2.2. The figure demonstrates a difference in feed consumption for the two ration types, with a trend for a lower feed consumption on the 100 per cent organic ration.

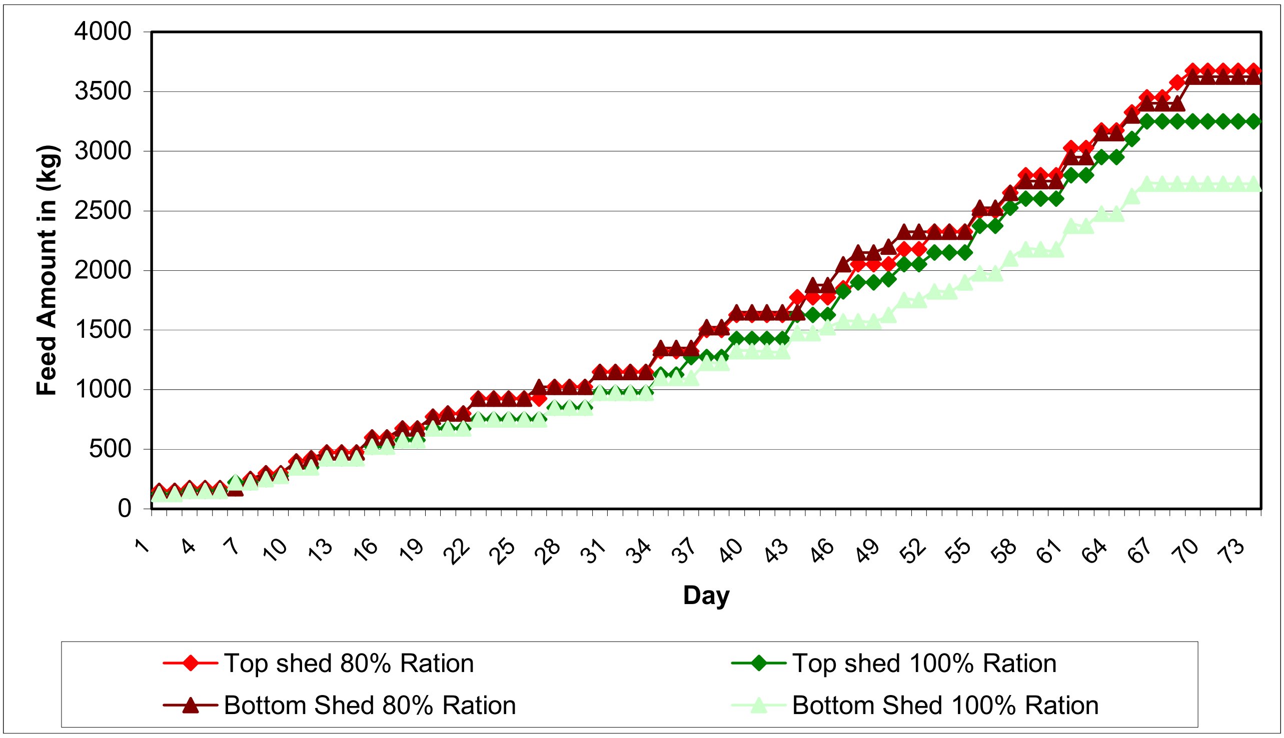

Figure 3: Comparisons of cumulative feed consumption (kg) for the trial birds on the 80 per cent and 100 per cent organic rations in the two sheds.

4.3. Gait Scoring

4.3.1. For gait scores see figure 4.

4.3.1.1. 0 - a bird with no lameness

4.3.1.2. 1 - slight lameness barely detectable

4.3.1.3. 2 - favouring a leg, more obvious lameness

4.3.1.4. 3 - heavily favouring a leg, obvious lameness, not much walking

4.3.1.5. 4 – will walk if encouraged but sits at first opportunity

4.3.1.6. 5 – bird will not walk

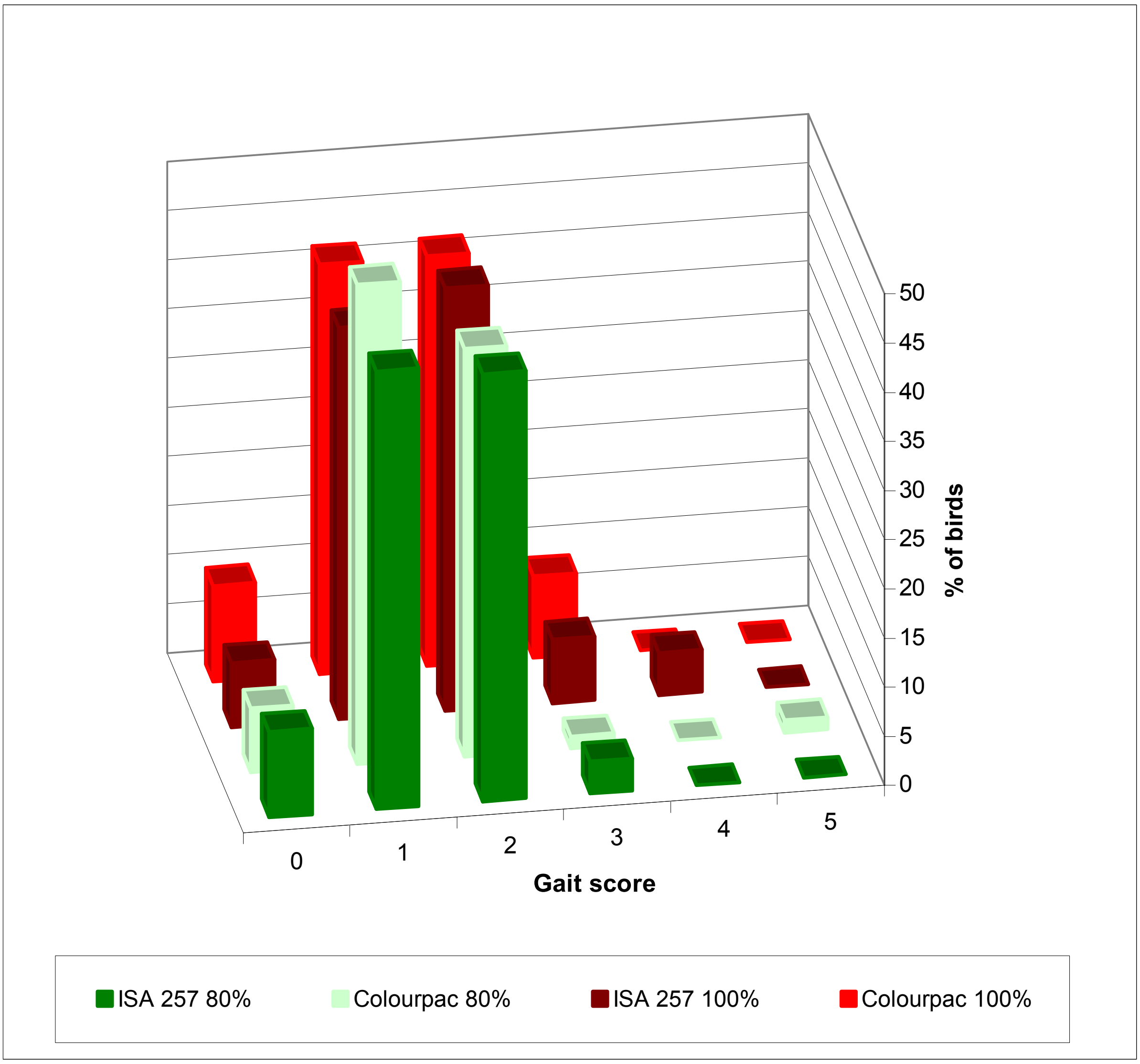

Figure 4: Gait Scores for samples of ISA 257 and colourpac birds on the 80 per cent and 100 per cent rations one week prior to depletion.

4.3.2. As demonstrated by the graph the majority of the birds had low gaits scores one week prior to slaughter. Which indicated low levels of lameness in the flock.

4.4. Performance

4.4.1. Bird cleanliness contact dermatitis and carcase conformation

4.4.1.1. For scores of bird cleanliness, contact dermatitis and carcase conformation see table 2.

4.4.1.2. ISA 257 assessed as slightly dirtier, but this was not significant and it was possible this was to the ease of evaluation in ISA 257 birds, as they are white.

4.4.1.3. The level of pad burn was relatively high for all the birds, with no difference for ration type or genotype.

4.4.1.4. Regardless of ration type or genotype, pad burn was slightly more severe for the birds in the rear of the field sheds (in red on table). Possibly due to litter condition.

4.4.1.5. The level and severity of hock burn was very low for all the birds with no statistically significant differences between ration type and genotype.

4.4.1.6. Carcase conformation showed a slightly improved subjective score for the ISA 257s.

Slaughter date	Condition	Colourpac 80% ration	ISA 257 80% ration	Colourpac 100% ration	ISA 257 100% ration
10/05	Cleanliness (0-8 scale)	3.46	4.54	3.28	4.24
10/05	Pad burn (1-5 scale)	2.71	2.29	1.76	1.98
12/05	Pad burn (1-5 scale)	2.29	2.43	2.80	2.31
10/05	Hock damage (1-5 scale)	0.24	0.27	0.27	0.25
12/05	Hock damage (1-5 scale)	0.18	0.24	0.29	0.25
12/05	Conformation (0-3 scale)	1.31	1.43	1.39	1.43
12/05	Conformation (0-3 scale)	1.43	1.61	1.54	1.59

Table 2. Effect of genotype and ration type on average scores for bird cleanliness, contact dermatitis and carcase conformation.

4.4.2. Feather damage and carcase downgrading conditions

4.4.2.1. For scores of feather damage, and carcase downgrading conditions see table 3.

Slaughter date	Condition	Colourpac 80% ration	ISA 257 80% ration	Colourpac 100% ration	ISA 257 100% ration
12/05	Feather damage	15/43	7/51	12/51	7/51
10/05	Breast skin damage	7/51	4/51	7/51	6/51
12/05	Breast skin damage	9/51	1/51	4/51	5/51
10/05	Red wing tips	12/51	26/51	8/51	24/51
12/05	Red wing tips	6/51	23/51	9/51	19/51
10/05	Wing haemorrhage	1/51	6/51	1/51	4/51
12/05	Wing haemorrhage	0/51	2/51	0/51	8/51

Table 3. Effect of genotype and ration type on feather damage and the prevalence of carcase downgrading conditions, (Number of birds affected / total number of birds sampled)

4.4.2.2. Feather damage was greater in colourpac birds, but not significantly.

4.4.2.3. Breast damage was more prevalent in colourpac birds, but not significantly.

4.4.2.4. Wing haemorrhage and red wing tips was significantly more prevalent in ISA 257 birds (see table 3 and figure 5).

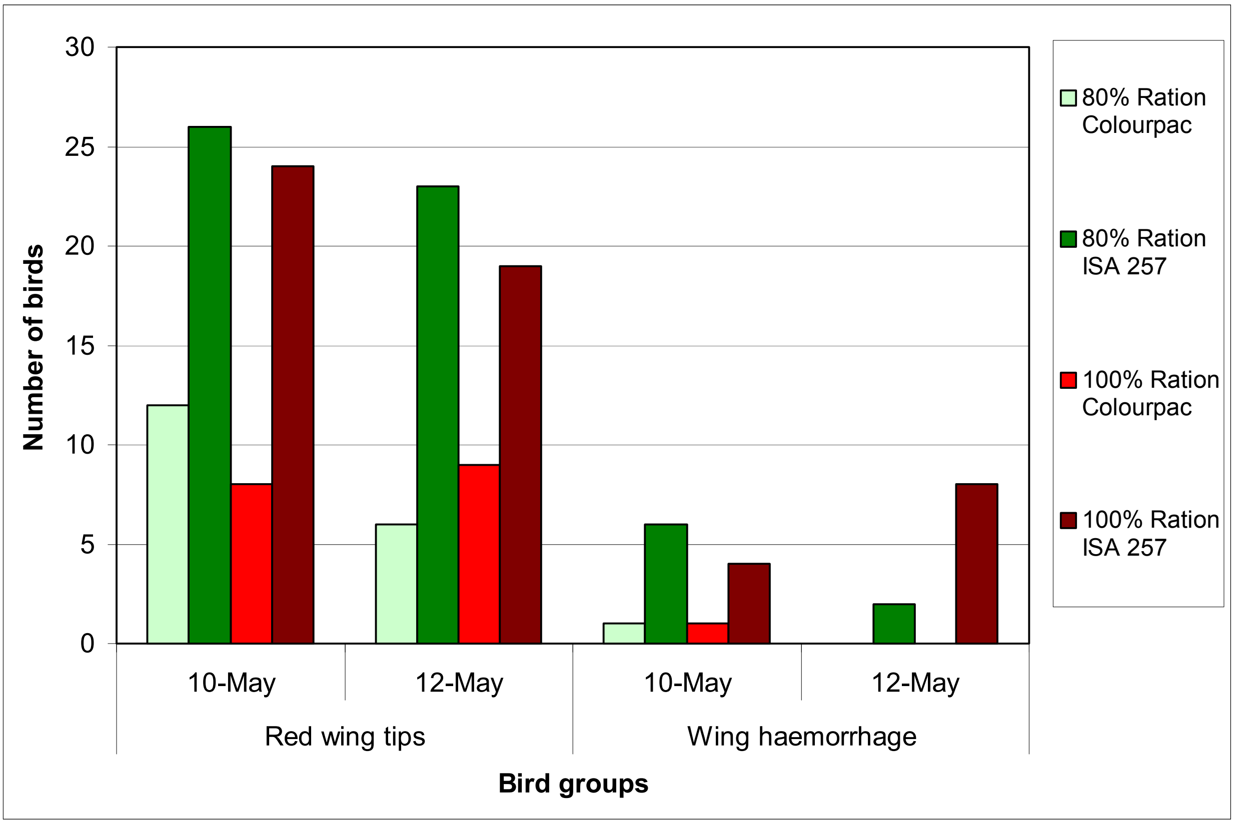

Figure 5. Prevalence of red wing tip and wing haemorrhage in ISA 257 and colourpac birds on 80 and 100 per cent organic rations.

4.4.3. Carcase Weight

4.4.3.1. For carcase weights see table 4.

4.4.3.2. The ISA 257 on the 100 per cent ration had the lowest average carcase weight and the colourpac on the 80 per cent organic ration had the highest.

Carcase Weights	80% Ration		100% Ration	
	Top Shed	Bottom Shed	Top Shed	Bottom Shed
ISA 257	1630.90	1616.20	1566.20	1489.96
Colourpac	1654.94	1656.59	1587.57	1583.29

Table 4: Average carcase weights (g) of the ISA 257 and colourpac in the two sheds and the 80 per cent and 100 per cent organic rations.

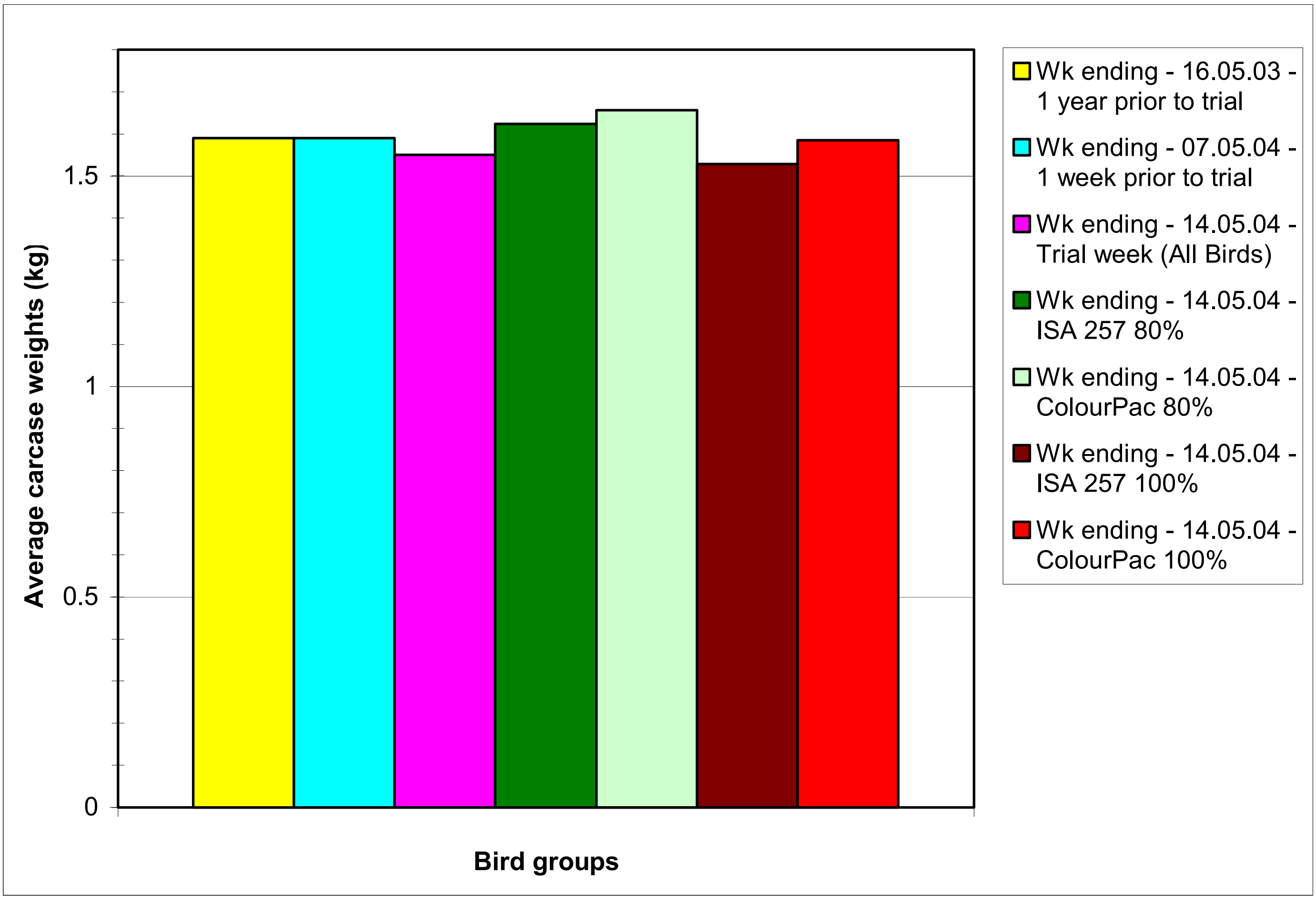

Figure 6: Comparisons of average carcase weight (kg) for trial birds (All birds, genotype and ration type groups) the production birds of the previous week, and the equivalent week of the previous year.

4.4.3.3. Figure 6 demonstrates that the average carcase weight for the trial birds, as a whole group, was slightly lower than that of the production birds of the previous week and year.

4.4.3.4. However, when considering genotype and ration type the carcase weights are slightly higher than that of the production birds for both genotypes on the 80 per cent ration.

4.4.4. Yield

4.4.4.1. Figure 7, demonstrates the differences in total yield, percentage of live weight converted to carcase weight, for the different genotypes and ration types.

4.4.4.2. The trend suggests a marginally better yield for colourpac birds than ISA 257's, with a greater conversion for birds on the 100 per cent ration. However, only a very small difference in yield (3 per cent range) can be seen between the genotypes and ration types.

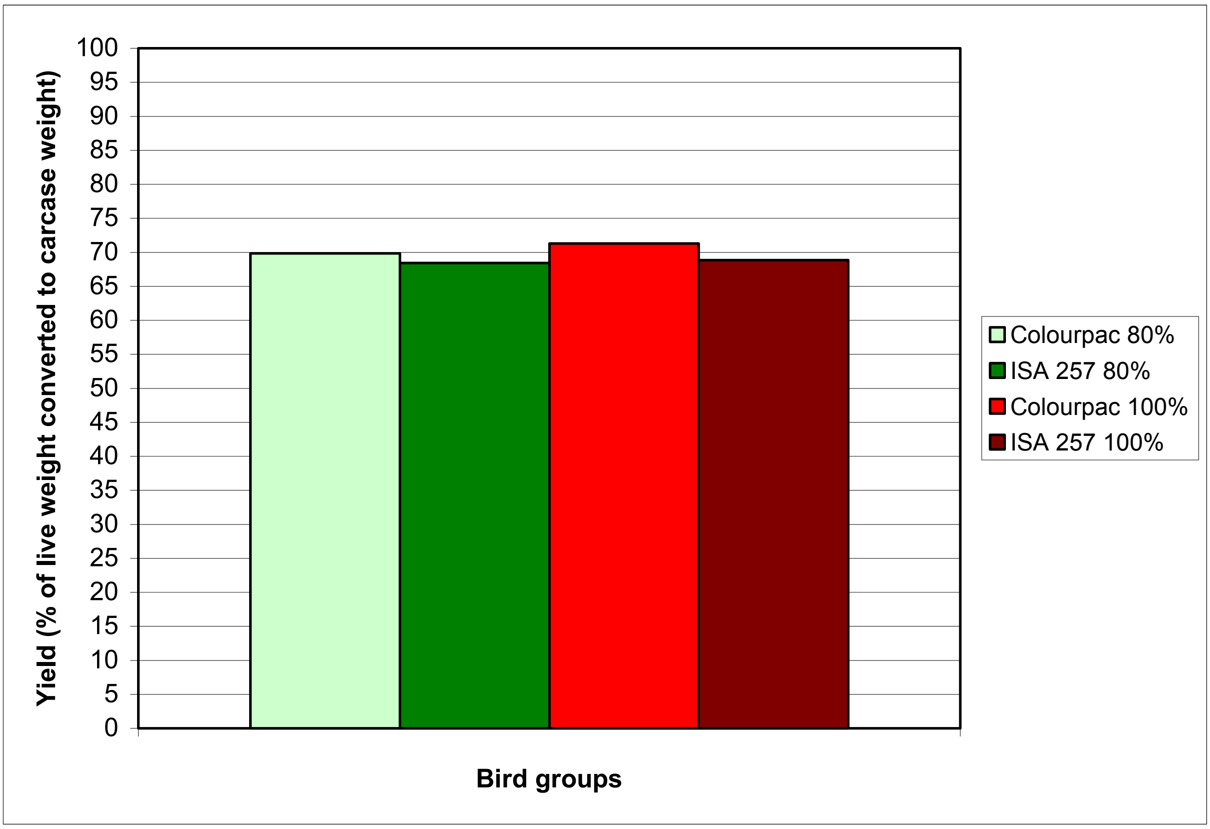

Figure 7: Comparisons of the per cent of average live weight (g) converted to average carcase weight (g) for the ISA 257 and Colourpac birds and the 80 per cent and 100 per cent organic rations.

5. Conclusions & Recommendations

5.1. The results for average weight suggest a trend towards higher weight on the 80 per cent ration; this is a statistically significant difference. This suggests similar performance regardless of genotype but a difference in relation to ration type.

5.2. This difference could be due to the difference in nutritional composition of the two rations. However, the trial birds experienced a disease challenge early in growth. This challenge may have compromised their growth, and may have had a more adverse effect on the birds on the 100 per cent organic ration.

5.3. In addition, although there is a statistically significant difference in the live weights between the ration types, the actual difference in the means is very small (approx 150g). In practice, based on the evidence gathered to this point, in terms of bird welfare and production, the difference is minimal. This is demonstrated by the similarities in the population distributions and ranges of weights for the two genotypes (see figure 2). This could however be an artefact of the disease challenge, and should be investigated further in future trials.

5.4. There was a difference in feed consumption between the two rations, with a trend for a lower consumption on the 100 per cent organic ration (figure 3). This may have been due to the disease challenge and hence should be investigated further.

5.5. In addition, further analysis will be undertaken on feed consumption, output and margins of production on the 80 per cent and 100 per cent organic rations which will be included in the final report.

5.6. Gait scoring indicated low levels of lameness in the flock, with similar scores across ration type and genotype. This suggests that there is no effect of ration type or genotype on gait. However, further statistical analyses are required, as well as a comparison with gait scores for the replica trial 1b.

5.7. There was an observed difference in cleanliness scoring between the two genotypes, with the ISA 257 assessed as dirtier. This difference was not statistically significant and was possibly due to the ease of evaluation of the ISA 257 birds (being white) rather than to a true difference. As a result this assessment was not carried out for the second slaughter day in favour of feather damage assessment.

5.8. Feather damage was greater in colourpac birds than ISA 257, but not significantly. However, further investigation into feather damage, as well as any injurious pecking around the tail region, should be undertaken in future trials as feather damage is thought to be the result of pecking and this can be a welfare issue.

5.9. There was a significantly higher prevalence of red wing tips and wing haemorrhaging in the ISA 257 birds on both ration types when compared with the colourpac. This could be the result of increased wing flapping during catching, crating and hanging-on or a difference in the general robustness of the two genotypes. This will be investigated further in future trials including an assessment of the amount and severity of flapping during depletion operations.

5.10. There was no significant difference in the levels of pododermatitis between the ration types and genotypes. However, there was a significant difference in levels when considering the position in the shed. This could be the result of litter condition, and should be investigated further.

5.11. There was little difference between ration type and genotype in relation to carcase conformation, with the ISA 257's boasting slightly better conformation. This breed difference should be investigated further as without a disease challenge the difference may be significant for trial 1b.

5.12. The results suggest a slight trend for differences in average carcase weight between the ration types and genotypes, which reflect those found for live weight. However, this is very slight and suggests similar performance regardless of ration type or genotype. This finding requires further statistical analysis to be confirmed, and merits continued investigation with the replica trial 1b.

5.13. The observed trend for a very slight difference in yield, but this is only very small (3 per cent range). However, this measurement of yield considers the whole carcase, and not carcase composition, which is more relevant to production. Future studies should consider not only live and carcase weight but also carcase composition and meat quality. This would enable detailed investigating of how ration type affects the composition of the two genotypes. By portioning up a small number of carcases per treatment, the information could be gained at minimal cost since the portions will be available for sale.

5.14. Future studies as to the effect of genotype and ration type on components of meat quality, such as colour, water holding capacity (WHC) and pH, should be considered, resource permitting. WHC and pH requiring a total sample of only 5g of muscle to be removed from the dorsal tip of the muscle and colour being measured on the exposed surface of the fillet.

APPENDIX 1

Protocols

A. Chick Arrival

- Time of arrival varies, from any time after 1pm, minimum of 2 people required
- Arrive as hatched (mixed sex), in genotype separated crates of 120-130 birds per crate
- Trial brood sheds assigned ration type, one of 100 per cent and one of 80 per cent
- Crates of each genotype divided equally between two allocated trial brood sheds
- Birds counted out of crates to obtain exact numbers of each genotype in each brood shed
- 50 birds of each genotype from each brood shed are weighed as they are counted out of the crates
- Birds are weighed using Welltech 'chick weigher'

B. Weekly Weighing in Brood Sheds

- To be carried out weekly, will require a minimum of 2 people
- Using MDF boards (part of the existing brood shed furniture) construct a temporary holding pen, leaving an opening in order for the chicks to enter
- In order to herd the birds into the holding pen identify a large group of individuals. Approach from the rear of the group walk slowly behind the chicks, herding them into the pen taking care to minimise stress
- Suffocation is a risk, therefore assess numbers and release some individuals if necessary
- Fifty birds of each genotype from each brood shed are weighed, with details recorded on Breed and feed data sheet 1 (B&F sheet 1)
- Birds are weighed using Welltech 'chick weigher' and are replaced back into the main brood shed area and not the holding pen

C. Transfer of birds from Brood Sheds to Field Sheds

- To be carried out in week three and will require a minimum of 4 people in total
- All brood shed furniture to be removed by the poultry team
- Ensure there are no birds in the conservatory, then close pop-hole
- Using MDF boards herd all chickens into approximately one third of brood shed area. There needs to be enough floor space available in the pen to place three module trays and ensure the birds do not suffocate
- Member of the poultry team to transfer two modules into the brood shed, one module will be unloaded into one end of each field shed
- Loading the modules must be completed in semi-darkness, in order to keep the birds calm, therefore close all skylights and turn off lights. Leave just enough light to be able to determine genotype
- Once the birds have settled, place 3 module drawers in the pen, one person to load each draw. Place an empty module draw on top of the one being loaded in order to prevent birds jumping out
- Drawers must be genotype specific with a maximum of fifty birds in each
- Fourth person to co-ordinate, their role includes:
    1. Ensuring fifty per cent of the birds from each genotype are allocated to each module and the module drawers are labelled according to ration type for that brood shed
    2. Keeping note of total number of each genotype in each module

    iii. Organize loading of drawers into modules (top-down, column-wise for bird safety)
- Repeat process for second brood shed
- Member of the poultry team to load modules onto trailer and transport to field sheds
- One module from each brood shed to be unloaded into the allocated end of each field shed for the relevant ration type, according to pre agreed field shed layout
- Unload module drawers (bottom-up, column-wise)

D. <u>Weighing in Field Sheds</u>

- To be carried out weekly, in the final week (week 10) sheds to be weighed the day before depletion. A minimum of 2 people required.
- Close the pop holes on one side of the shed
- Using MDF boards (existing shed furniture) construct a temporary holding pen, leaving an opening in order for the birds to enter
- In order to herd birds into holding pen identify a large group of individuals. Approach from the rear of the group, walk slowly behind the chickens herding them clockwise passed the closed pop-hole into the pen, taking care to minimise stress
- Suffocation is a risk, therefore assess numbers and release some individuals if necessary
- Fifty birds of each genotype from each end of the field sheds are weighed (a total of 400 birds), with details recorded on B&F sheet 2
- Birds are weighed using Welltech 'adult bird-weigher', suspended from a structural beam with a large bucket attached, and are replaced back into the main field shed area, not the holding pen

E. <u>Behavioural Observations</u>

- To be carried out weekly commencing week six, only 1 person required
- Observations to be made for each ration type in each shed both inside and out (8 sets of observations), recording details on B&F sheet 3
- A set of observations include a scan sample for each genotype of the following behaviours:- feeding (inside only), pecking straw/grass, pecking objects, pecking lose feathers, feather peck (bird), bird peck (flesh) and dust bathing.
- Approach sheds quietly so as not to disturb the birds
- Prior to starting each set of observations, the birds are given five minutes habituation time in which to adjust to the observer's presence
- Before each set of observations the total number of birds of each genotype visible are recorded (a bird is visible if the observer can see its head)
- Each behaviour is assessed for 30 seconds per genotype. The number of birds of the relevant genotype performing the behaviour being observed in that 30 second time frame are recorded on B&F sheet 3
- Fighting is a two way interaction and so may occur between birds of different genotypes, therefore within a set of observations it is recorded once over a 1 minute time period and all birds (i.e. both ISA 257s and Colourpacs) involved in fights are recorded
- For outside observations, total bird counts are made between each behavioural scan sample
- For inside observations, three total bird counts are performed during a set of observations. Additional counts may be needed if there is a noticeable large movement of birds during the observations

F. <u>Gait Scoring</u>

- To be carried out in week nine, prior to depletion, a minimum of 2 people required. At least one person needs to have completed a half an hour training session with Andy Butterworth, University of Bristol
- Enter the shed quietly, taking care not to scare birds
- Using MDF boards (existing shed furniture) construct a temporary holding pen around a large group of individuals. <u>DO NOT</u> herd birds into the pen as with weighing so not to select for birds that can walk well
- Encourage birds to walk out of the holding pen, one at a time, and score their gait, using the gait scoring system supplied by Andy Butterworth, University of Bristol during the training session
- Aim to collect scores for fifty birds of each genotype for both ends of each shed, details to be recorded on B&F sheet 4

G. <u>Depletion - Catching</u>

- To be carried out in week 10, one shed on the Monday (Day 71) and the other on the Wednesday (Day 73), approximately 1000 birds to go to processing each day.
- Catching starts at 4am and will require 3 members of the research team in addition to the 5 members of the regular catching team
- Catching must be completed in darkness, in order to keep the birds calm, therefore all the sheds doors and windows must be closed before catching begins
- Member of the poultry team to place one module in front of field shed just outside the door
- Fifty-one birds of each genotype from each ration type (end of the shed) are required for examination during processing
- Four members of the poultry catching team identify and catch 51 birds of one genotype from the door end of the shed
- Birds are caught by both legs, their breast being held against the catchers leg to calm it, two birds are caught in each hand
- Caught birds are passed to two researchers by the shed door who check the genotype and place the birds in a module drawer
- Module drawers must be genotype specific with seventeen birds in each. One person must stand either side of the draws to count the birds in and to ensure they don't jump out of the trays
- Module drawers are filled top-down row wise, for bird safety, with one genotype to a row (51 birds in each row).
- A researcher checks bird numbers and colour-codes the drawers using ribbon
- The second genotype of bird from the door end is caught and loaded into the second row of module drawers using the same procedure
- The two genotypes for the far end of the shed are caught using the same procedure but are handed over the divide to the two researchers who transfer them to the module, where they are loaded into the third and fourth row of drawers in the module, again loaded by genotype
- Member of the poultry team to load modules on to trailer
- Remaining birds caught as per normal for the production birds and loaded into modules by all personnel
- Procedure repeated on the Wednesday for the second trial shed remembering that the two ration types will be in the opposite ends to the first shed
- Member of the poultry team transport the birds to lairage at the processing plant to await the next stage

H. **<u>Depletion – Processing</u>**

- Processing starts at 8am on the same days as catching, see Protocol G, a total of four people will be required.
- Member of hanging on team to transfer trial bird module from lairage to the hanging-on room
- The hanging-on room is lit only by blue light in order to keep the birds calm, as birds can not see blue light
- A member of the research team to be in the hanging on room to ensure the trial module is unloaded first and appropriate gaps are left between each genotype and ration type
- Members of the hanging on team to unload the module bottom-up row-wise, so birds are placed on the line in ration/genotype groups
- Between groups there is a 10 shackle gap, so the groups of 51 birds can be easily identified by staff and researchers
- Post hanging, on but pre-plucking, the birds are scored for feather pecking using scoring system supplied by Lindsay Wilkins, University of Bristol (1 person required)
- Post plucking the birds are scored for foot and hock burn using scoring systems supplied by Steve Brown, University of Bristol (2 people required)
- The birds then enter the chiller which takes approximately 1 and a half hours for the birds to pass through
- Post chilling the carcases are placed in baskets, by members of the processing team, as they come off the production line therefore they are kept in their genotype/ration groups. They are now scored for breast blisters, skin blemishes, breast bruising, leg bruising, red wing tips, and wing haemorrhage, using scoring systems supplied by Lindsay Wilkins, University of Bristol. Data collected and analysed by Lindsay Wilkins and Steve Brown, University of Bristol
- Carcase weight are obtained and recorded by members of the EFRC research team on B&F sheet 5.

Appendix 2

Report on assessment of whole bird and carcase quality of broilers reared at Sheepdrove Organic Farm

LJ Wilkins, University of Bristol

Background to assessments

At the present time certification of broiler chickens as organic allows for the incorporation of up to 20 per cent of a non-organic component in the overall ration. This derogation will shortly be disallowed and it is anticipated that the requirement to change to 100 per cent organic rations may affect the overall performance, yield and quality of the final product. To investigate this possibility a series of trials was designed to compare the impact of feed composition on production traits of two breeds of broiler chicken, Colourpac and ISA 257.

Materials and Methods

The two breeds of birds were grown under free-range conditions conforming to Soil Association standards in mixed flocks of approximately 500 birds containing equal numbers of each breed. Within the same field, birds were housed in two identical broiler houses which had been divided in two to create four separate rearing groups, each with their own separate ranging areas. Birds in one half of the house were fed an 80 per cent organic ration and those in the corresponding half were fed a 100 per cent organic ration. The treatments were replicated in the second house but were reversed in terms of house end. At the end of the growing period birds were caught and transported, using a modular system, to the on-site processing plant for slaughter. Birds from the bottom house were cleared on 10.05.04 and from the top house on 12.05.04. On each occasion a sub-sample of 51 birds from each breed/feed treatment were caught at random to enable identification of treatment to be applied to individual birds throughout the processing operation. On each slaughter day these birds were processed as four consecutive groups.

During processing assessments of feather damage, bird cleanliness, pododermatitis and hock burn were carried out simultaneously on line. Feather damage around the tail region was assessed using a 3-point scale where 0 indicated no damage, 1 indicated some damage principally to the tips of the feathers and 2 indicated more severe damage, often to the feather shaft. Bird cleanliness and hock and pad burn were assessed using an 8-point and 5-point photographic scale respectively. Following primary processing the finished carcases were weighed and inspected for evidence of bruising (both fresh and old), haemorrhages in the wings and damage to the skin in the form of breast blisters and other blemishes. Assessments were made using a 3-point scale where 0 indicated no damage and 1 and 2 indicated increasing severity of observed damage. Finally a subjective estimate of carcase conformation was made using a 4-point scale where an increasing grade indicated improved breast conformation.

Results and Discussion

To simplify presentation and analysis, where a 3-point scale was employed the results for conditions assessed as either a 1 or a 2 have been combined to give a single estimate of prevalence. The results are summarised in the two tables included in this section. Bird cleanliness was only recorded on Day 1 because of the difficulty of ensuring equitable assessment between the brown and white breeds. Additionally only the results obtained on Day 2 relating to feather damage have been included since those obtained on Day 1 were confounded by simultaneous assessment of more than one body region.

Overall there was no effect of feed composition on any of the conditions assessed, either the live bird or the processed carcase. There was however an effect of breed, particularly with regard to the prevalence of haemorrhagic conditions in the wings, and this was observed on both slaughter days.

Slaughter date	Condition	Colourpac 80% ration	ISA 257 80% ration	Colourpac 100% ration	ISA 257 100% ration
12/05	Feather damage	15/43	7/51	12/51	7/51
10/05	Breast skin damage	7/51	4/51	7/51	6/51
12/05	Breast skin damage	9/51	1/51	4/51	5/51
10/05	Red wing tips	12/51	26/51	8/51	24/51
12/05	Red wing tips	6/51	23/51	9/51	19/51
10/05	Wing haemorrhage	1/51	6/51	1/51	4/51
12/05	Wing haemorrhage	0/51	2/51	0/51	8/51

Table A. Effect of breed and feed ration on feather damage and the prevalence of carcase downgrading conditions

Damage to feathers in the tail region assessed on Day 2 was greater in the brown birds than in the white birds although this difference was not significant. Such damage has been widely reported in laying hens housed in a wide range of extensive (non-cage) systems but is less common in broiler strains where the duration of the production cycle is much reduced. Its occurrence is thought to be the result of non-aggressive pecking and can, in hens at least, result in complete feather removal leading to skin damage and increased pecking episodes. Where severe such conditions can have a major impact on bird welfare.

The Colourpac birds showed a slightly higher prevalence of skin damage over the breast but again this was not significant. The results presented combine both breast blisters, thought to be the result of irritation of the skin and underlying tissues through contact with poor litter, and a range of other skin blemishes.

The ISA birds showed a much greater prevalence of both wing haemorrhaging and red wing tips than the Colourpac birds and those differences were highly significant for both conditions ($P<0.001$) and for both slaughter days. Red wing tips can be produced by a range of ante-mortem events including vigorous bouts of flapping either during catching or during handling at the processing plant, and during conveyance to the waterbath stunner. This damage will be exacerbated if the wings make contact with any solid objects during any of these operations. Similarly haemorrhages throughout the wings will occur as a result of poor handling during catching, crating, hanging on to the processing line and conveyance to the stunner particularly where the wings are able to strike hard surfaces. Both types of damage are also increased as a result of electrical stunning and high stunning currents have been shown to greatly increase their prevalence. Since all birds received the same operating voltage resulting in a high current flow, which did not appear to vary between the breeds, it is likely that the differences observed are the result of differences in the amount of flapping ante-mortem rather than any effect of the stunning current *per se.* In this trial some flapping on line was observed but possible differences between the breeds were not investigated.

Slaughter date	Condition	Colourpac 80% ration	ISA 257 80% ration	Colourpac 100% ration	ISA 257 100% ration
10/05	Cleanliness	3.46	4.54	3.28	4.24
10/05	Pad burn	2.71	2.29	1.76	1.98
12/05	Pad burn	2.29	2.43	2.80	2.31
10/05	Hock damage	0.24	0.27	0.27	0.25
12/05	Hock damage	0.18	0.24	0.29	0.25
12/05	Conformation	1.31	1.43	1.39	1.43
12/05	Conformation	1.43	1.61	1.54	1.59

Table B. Effect of breed and feed ration on bird cleanliness, contact dermatitis and carcase conformation

The cleanliness of all birds inspected was good and while the ISA breed was assessed as being slightly dirtier this difference was thought to be primarily due to the difficulty of appraisal in the brown birds and was in any event not significant. While the poultry industry does not have the equivalent of the red meat industry 'Clean Livestock Policy', good practice dictates that one should aim to provide the factory with birds in as clean a condition as possible since minimising the amount of contamination taken into the plant on the surface of birds is beneficial in maintaining good standards of hygiene.

The overall level of pododermatitis (pad burn) was relatively high but no differences due to either breed or feed ration were apparent. However there was a small effect of position within the housing environment, with birds at the rear of the house showing a greater severity of the condition regardless of breed or ration (2.53 vs 2.12). This might reflect the condition of the litter at the two ends of the house where entry is confined to the front. The occurrence of this lesion is thought to be a result of poor litter condition, and this will in itself be affected by litter management during the production period. Conversely, the level and severity of hock burn was very low and again no differences between treatments were apparent. As a form of contact dermatitis, hock burn would also be expected to reflect litter condition and should therefore be closely related to levels of pad burn. In the present trial no evidence was found to support this contention and indeed ongoing studies confirm this lack of a close relationship between the two seemingly similar conditions.

Carcase conformation showed a slightly improved subjective score for the ISA birds, based on the shape of the breast portion but this was not significant. It might be anticipated that a better conformation would be the result of an increased yield of breast meat in proportion to overall carcase weight.

An interesting observation was that many of the carcases were found to have badly deformed keels. The condition was not objectively assessed and its prevalence was not recorded corresponding to breed or diet. Where severe it is possible that this condition may constitute a welfare issue.

Recommendations

The trial has produced some interesting findings, some unexpected, which might warrant further study. In addition, with the increased background knowledge gained during our two visits to Sheepdrove we would suggest the following on line observations and measurements should be considered for future trials.

Feather condition around the tail region should be assessed to check for potentially injurious pecking, which could constitute a welfare problem if damage is severe. This damage can be related to observations of pecking behaviour during production. With laying hens, composition of the diet has been shown to affect the overall prevalence of feather pecking and it will be interesting to see if a similar situation exists with free range broilers. In addition do we know which birds are doing the pecking (brown or white)

The occurrence of red wing tips and wing haemorrhaging should be further investigated to determine the causes of the high prevalence observed in the ISA birds. This might include assessment of the amount and severity of flapping during the catching, crating and hang-on operations.

The overall level of pododermatitis found in the present trial requires substantiation in future trials since these levels are higher than normally observed in flocks reared in conventional systems. It would also be useful to further investigate the effect of position in shed on its incidence, since the small difference found between the front and back of the houses suggests that relatively trivial aspects of litter management may be important in this regard.

In the absence of data we are unable to compare the relative effects of breed and feed composition on final live weight, carcase weight and thus yield. Future studies concerned with the effects of the new organic feed requirements and how different breeds of birds respond to them, should consider not only live and carcase weight but also carcase composition and meat quality. Irrespective of whether birds are to be sold as portions or as whole birds, the relative contribution of breast meat to the overall carcase weight can have a major impact on overall value. Where sold whole an increased breast meat component improves the conformation of the carcase and improves its appearance. When sold as portions the breast meat is by far the most expensive and increasing yield delivers increased profit. This exercise could be carried out at Sheepdrove using either University staff or processing plant staff to portion up to 20 carcases per treatment. In this way the information can be gained at minimal cost since the portions will be available for sale.

Little information exists regarding the effects of rearing conditions on subsequent meat quality and eating quality of extensively reared broilers. Within the framework of the trial described above concerned with yield and carcase composition, it would be advantageous to measure a number of components of meat quality on the breast fillets after removal. Colour, water holding capacity (WHC) and pH can be measured with minimal damage, WHC and pH requiring a total sample of only 5g of muscle to be removed from the dorsal tip of the muscle and colour being measured on the exposed surface of the fillet.