THE INFLUENCE OF HOUSING ON THE PERFORMANCE OF GROWING PIGS IN A SUB-TROPICAL ENVIRONMENT

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Summary

The growth and efficiency of food conversion of growing pigs was compared under different housing conditions during summer in a sub-tropical area.

Two groups of five pigs were housed under small iron shelters where temperatures ranged from a minimum of 11 ˚C to a maximum of 43°C. From approximately 20 to 89 kg, their average daily gain was 558 g and the food conversion ratio was 3.23 : 1.

Two similar groups of pigs were housed in partly insulated pens where temperatures ranged from a minimum of 13 ˚C to a maximum of 39˚C. Over the same weight range, they had an average daily gain of 636 g and a food conversion ratio of 2.89 : 1.

I. INTRODUCTION

The production of bacon pigs in the Dawson and Callide Valleys of Central Queensland is expanding. Biloela (latitude 24° 22' S; longitude 150° 3 1' E; altitude 173 m above sea level) is the marketing centre of this area and is situated some 65 miles (105 km) south of the Tropic and an equal distance inland from Gladstone. The annual average daily maximum temperature is 28.3°C and the minimum 12.2°C. During the summer months, December to March, inclusive, the average daily maximum is 32°C. Similar temperatures have been shown to depress performance of growing pigs (Heitman, Kelly and Bond 1958).

In a series of preliminary observations during previous summers (Todd and Daniels, unpublished data), pigs housed in partly insulated concrete floored pens appeared to grow faster and convert food more efficiently than pigs housed under small iron shelters in a bare fallow yard.

The work reported here was designed to evaluate the effect of housing on food conversion and growth rate of pigs during a period of high ambient temperatures.

II. MATERIALS AND METHODS

Twenty Large White pigs, the progeny of two litter mate sows and one boar, were first stratified according to litter of origin, live weight and sex, and then allotted at random into four groups of five pigs. They were nine weeks old and averaged 20 kg live weight at the start of the trial on November 28, 1966.

Two of the groups were housed in adjoining farrowing pens (pens). Each pen had weatherboard walls, a concrete floor in which bottles had been incorporated, and an unpainted corrugated galvanised iron roof enclosing an area of 7.4 sq m.

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The roof was about 2 m above floor level, insulated by a layer of aluminium foil* between the rafters and the iron. A ventilation shutter about 2.7 m long by 0.9 m deep was incorporated high up in the rear wall. This was open at all times. An opening on the northern side led on to an open, concrete floored yard,, about 6.7 sq m in area, enclosed by mesh partitions and provided with an unshaded automatic water bowl.

The two other groups were housed in half tank shelters (shelters). Each shelter consisted of four sheets of curved, unpainted corrugated galvanised iron, bolted together and mounted on a wooden platform. The area covered was approximately 4.56 sq m and the roof had a maximum height of 86 cm. The southern end was enclosed by galvanised iron sheeting to within 15.2 cm of the top centre but the northern end opened on to a square wooden feeding platform 5.95 sq m in area. Along the side of the shelter and platform, a 3.66 m by 1.22 m dunging area of raised wooden slats was constructed. An unshaded self waterer was installed on a concrete block in one corner. The total area of each rectangular site was 17.86 sq m, enclosed by a fence. No shade, other than that provided by the shelter, was available. Bedding was not provided in either type of accommodation. Maximum and minimum thermometers were placed inside wire guards hung 45.7 cm above floor level in the sleeping areas. Readings were taken daily at 0900 h. As individual feeding facilities were not available, the pigs were fed as groups with dry meal, given in two equal feeds at 07 15 h and 1615 h daily. The feed was placed on the floor of the sleeping area inside the pens or in a trough on the wooden feeding platform outside the shelters.

Intake was restricted according to a scale based on the average live weight of the pigs in each group at weekly weighings. This provided a daily intake of 2.3 lb (1.04 kg) at 40 lb (18.16 kg) live weight, increasing by 0.3 lb (0.136 kg) for each 10 lb (4.54 kg) increase in live weight up to 130 lb (59 kg). From this weight, daily intake remained constant at 5 lb (2.27 kg). The mixture contained 8 1.75% wheat meal, 5.0% fish meal, 6.5 % soybean oil meal, 5.0% lucerne meal and 1.25% of a mineral plus vitamin supplement. Its crude protein content, as given, was 18.4%.

The pigs were consigned to a Brisbane bacon factory as soon as possible after reaching live weights of 86 kg, the average weight on the morning of dispatch being 88.7 kg. The last pig was dispatched on April 24, 1967.

The cold dressed carcasses of the pigs were appraised, using the Queensland system (Bostock 1964).

III. RESULTS

Some details of the temperature conditions during the trial are set out in Table 1. During most of the trial, maximum temperatures in the shelters were appreciably higher than in the pens. While the pigs were growing to 68 kg, shelter temperatures exceeded 37.2°C on about half the days involved while the pens only exceeded this temperature on two occasions. Cooler conditions towards the end of the trial reduced maximum temperature differences while minimum temperatures in the shelters were lower than in the pens over this period.

*"Sisalation 420" Australian Sisalcraft Pty. Ltd.

TABLE 1

Temperature conditions in pens and shelters

Live weight	Average Daily Temperatures and Range in Values (°C)			
	Maximum		Minimum	
Range (kg)	Pens	Shelters	Pens	Shelters
20-45	33.2 (29-39)	37.2 (32-43)	20.0 (16-24)	19.5 (13-26)
46-68	34.2 (29-37)	37.3 (32-41)	21.7 (17-26)	21.1 (16-26)
69-89	33.1 (27-37)	34.0 (27-39)	21.1 (13-26)	16.7 (11-23)

While all pigs showed signs of stress during the hottest days, the symptoms were more pronounced and more prolonged among those in the shelters. They had a rapid respiration rate and discharged saliva from open mouths. Shortly after reaching an average of 45 kg, some of them lost appetite and appeared fevered. There was no evidence of any infection but rectal temperatures taken at this time reached 41.2°C. As soon as the weather became cooler, the condition of the pigs returned to normal and appetite improved. The signs of stress among pigs in the pens was limited to some panting and general lassitude. Although the pigs appeared to be in good health when dispatched to the factory one was found to be dead on arrival. This was considered to be due to trucking conditions during the 400 mile (640 km) journey.

Details of growth rate, food conversion ratio and certain carcass characteristics are given in Table 2. The pigs housed in the pens grew faster ($P<0.01$) although the difference just failed to reach significance during the period from 69 kg live weight, a period which coincided with the onset of rather cooler weather. The food conversion ratio, calculated from the total food used by each group and their weight gain over each period, tended to be better among the pigs housed in the pens, however these data were not analysed due to insufficient replication. There

TABLE 2

Performance of ***Pigs Housed in Pens and Shelters***

Attribute	Treatment 1 Pens	Treatment 2 Shelters	S.E. of difference ±	Significance
Daily gain (g) 20-45 kg	563	504	1.36	1>2**
,, ,, 46-68 kg	695	558	2.72	1>2**
,, ,, 69-89 kg	699	617	2.72	N.S.
,, ,, overall	636	558	2.72	1>2**
Food conversion (g food per g gain) 20-45 kg	2.45	2.79	—	not analysed
,, ,, 46-68 kg	3.08	3.53	—	,, ,,
,, ,, 69-89 kg	3.34	3.54	—	,, ,,
,, ,, overall	2.89	3.23	—	,, ,,
Carcass dressing percentage	73.2	74.5	0.37	2>1*
Area index of loin 'eye' (sq mm)	3379	3653	81.2	2>1*
Backfat (mm)	20.2	18.2	1.05	N.S.
Length (mm)	797	804	5.62	N.S.

N.S. $P>0.05$; * $P<0.05$; ** $P<0.01$.

was no evidence of any food wastage even when the pigs lost appetite. The dressing percentage and area index of loin 'eye' muscle was superior among those pigs housed in the shelters ($P<0.05$).

IV. DISCUSSION

Constant high temperature has a marked effect on the growth of pigs, particularly at heavy body weights (Heitman and Hughes 1949; Heitman, Kelly and Bond 1958). Body temperatures of up to 42.6°C were reported by the former authors in heavy pigs which survived a five day period at 37.8°C on a dry floor. Bond, Kelly and Heitman (1963) studied the effect of diurnal air temperature cycles, including ranges which correspond more nearly to the Biloela situation. They reported daily gains of about 522 g and a food conversion ratio of 4.5 among pigs, of 51 kg live weight fed to appetite and exposed to diurnal temperature cycles of from 2 1.1 to 43.3 °C. At 55 kg, the same pigs exposed to a diurnal temperature cycle of from 21.1 to 32.2°C gained about 726 g daily, a rate very similar to that obtained at a constant temperature of 21.1 °C, which Bond, Kelly . and Heitman (1963) considered almost ideal.

The Biloela results show a similar effect; quite a moderate reduction in the maximum temperature improved performance. The importance of reducing the stress imposed by a high temperature is considerable. If the difference between pens and shelters is applied to a pig growing from 18 to 90 kg, it results in a saving of about 25 kg of food and about 16 days to market.

It is possible that factors other than temperature may have influenced the result, since the pigs were not kept under identical housing conditions. Similar comparisons are being undertaken during autumn and winter conditions. So far, it appears that there is little or no difference in performance during the autumn, suggesting that summer temperatures were a major influence.

The superior dressing percentage and area index of loin 'eye' muscle from the shelter pigs may be a result of their slower growth and greater age at slaughter. The possibility that carcass characteristics were influenced by the conditions in the shelter cannot be excluded but there is insufficient evidence on this aspect.

V. ACKNOWLEDGMENTS

The assistance in the field of Mr. P. M. Davies is acknowledged. Thanks are also due to Miss P. M. Pepper, who made the statistical analysis.

VI. REFERENCES

BOND, T. E., KELLY, C. F., and HEITMAN, H., Jr. (1963). ***Trans. Am. Soc.*** *agric. Engrs.* ***6:*** 132.

BOSTOCK, F. (1964). *Qd. agric.* ***J. 90: 46.***

HEITMAN, H., Jr., and HUGHES, E. H. (1949). *J.* ***Anim. Sci. 8:*** 171.

HEITMAN, H., Jr., KELLY, C. F., and BOND, T. E. (1958). ***J. Anim. Sci.*** 17: 62.