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The aim of the present study was to jointly evaluate the correlated responses to selection in two lines divergently selected for residual feed intake (RFI), while bred in the tropical environment of the French West Indies (FWI) and the temperate environment of selection in France, Europe (FE).

Ten gilts per line from the seventh generation of selection, sibs of the sows breeding in the FE farm, have been transported to the tropical environment in FWI. The semen of four and five boars selected to produce the eighth generation in the RFI^- and RFI^+ lines, respectively, have been used for insemination in the two environments. The experimental design and conditions (feed composition, pen density, etc.) applied to the tested pigs were similar in FE and FWI. All pens were equipped with single place electronic feeders for individual recording of feed intake. A total of 269 pigs born in FE and 236 pigs born in FWI were tested from 11 to 23 wk of age (45% females and 55% castrates). Records were available for body weight (BW) at 11, 15 and 23 weeks of age (wk) and ultrasonic measurements of backfat thickness (BF) at wk 23. Average daily gain (ADG) was computed for the different test periods. After adaptation to the feeders, the individual average daily feed intake (ADFI) was recorded from wk 15 to 23 for all pigs, and feed conversion ratio (FCR) was computed for this period. The average temperature and humidity in FWI were 24.5°C and 94.5% respectively during the test. Data were analysed with a linear model accounting for the covariate age of the pig, and the fixed effects of contemporary group within environment, sex, environment, line, sire within line and the interaction line x environment. Despite average BW being similar at birth in FE and FWI (1.42 kg on average), BW after weaning was higher in FE than in FWI. Thus, models for all traits - except BW - included the BW at the record or at the start of the test as a covariate ($P<4.10^{-3}$ for all traits).

Line differences for BW varied significantly with the environment (Table 1). At wk 11, RFI^- pigs were 3.3 kg lighter than RFI^+ pigs in FWI, compared to 1.7 kg difference in FE. The line differences reached 6.0 kg in FWI *vs* 3.0 kg in FE at wk 15, and 8.5 kg in FWI *vs* 2.6 kg in FE at wk 23. As a consequence, in FWI the line difference for ADG was higher in the period from wk 11 to 15 compared to the period from wk 15 to 23: the RFI^- pigs grew on average 73 g/d less in the early period compared to RFI^+ pigs, whereas the line difference was -54 g/d in the later period. On the contrary, ADG was similar in the two lines in FE. The line differences for ADFI were not significantly different with the environment, and surprisingly, ADFI was not reduced in FWI, whereas reduction of ingestion is a major expected response to heat stress. As a result, FCR was significantly greater in RFI^+ pigs than in RFI^- pigs in FWI as well as in FE, despite a slightly reduced difference in the FWI environment. Finally, line differences for BF were affected by environment, both lines showing similar BF at wk 23 in FWI whereas RFI^- pigs were leaner than RFI^+ pigs in FE. All together, these results suggest a higher depressive effect of tropical environment in the early stages of growth on the RFI^- pigs compared to the RFI^+ pigs, that is not compensated during the growing-finishing period and needs further examination. As a conclusion, GxE interactions affected most of the traits: despite line difference for FCR being maintained in the tropical environment, RFI^- pigs had reduced ADG and similar BF compared to RFI^+ pigs in FWI, which was different from responses in FE and suggests major impacts of tropical stress on the metabolism.

Table 1: Significance (P value) of the effects of line, environment (E) and line x E (****: P<0.0001), and least square means (LSMEAN) of the line x environment interaction.

Stat	Effect	BW (kg) 11 wk	BW (kg) 15 wk	BW (kg) 23 wk	ADG (kg/d) 11-15 wk	ADFI (g/d) 15-23 wk	ADG (kg/d) 15-23 wk	FCR (kg/kg) 15-23 wk	BF (mm) 23 wk
P value	Line	****	****	****	****	****	0.33	****	****
	E	****	****	****	****	0.22	0.62	0.69	0.0008
	Line x E	0.02	0.002	0.0001	0.04	0.71	0.02	0.008	****
LSMEAN[1]	FE x RFI+	31.2^{a}	52.1^{a}	95.3^{a}	0.797^{a}	2290^{a}	0.776^{ab}	2.98^{a}	18.4^{a}
	FE x RFI-	29.5^{a}	49.1^{b}	92.7^{b}	0.770^{a}	2043^{b}	0.788^{ab}	2.61^{b}	15.9^{b}
	FWI x RFI+	29.1^{b}	45.1^{c}	88.9^{c}	0.583^{b}	2345^{a}	0.806^{a}	2.92^{a}	15.7^{b}
	FWI x RFI-	25.8^{c}	39.1^{d}	80.4^{d}	0.510^{c}	2080^{b}	0.773^{b}	2.69^{b}	16.0^{b}
RSD[2]		3.8	5.8	8.6	0.114	256	0.102	0.27	1.9

[1]Subscript indicate values different at P<0.05 within traits; [2] RSD = residual standard deviation of the linear model