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Effects of rice husk supplementation during pre-finishing on production traits of Iberian pigs

Izquierdo, M.[1]; Hernández-García, F.I.[1], García-Gudiño, J.[2]; Matías, J.[1]; Garrido, N[1]; Cuadrado, I.[1] ; Pérez, M.A.[1]
[1]Center of Scientific & Technological Research of Extremadura (CICYTEX), Spain
[2]IRTA, Finca Camps i Armet, Monells, Spain

Aim

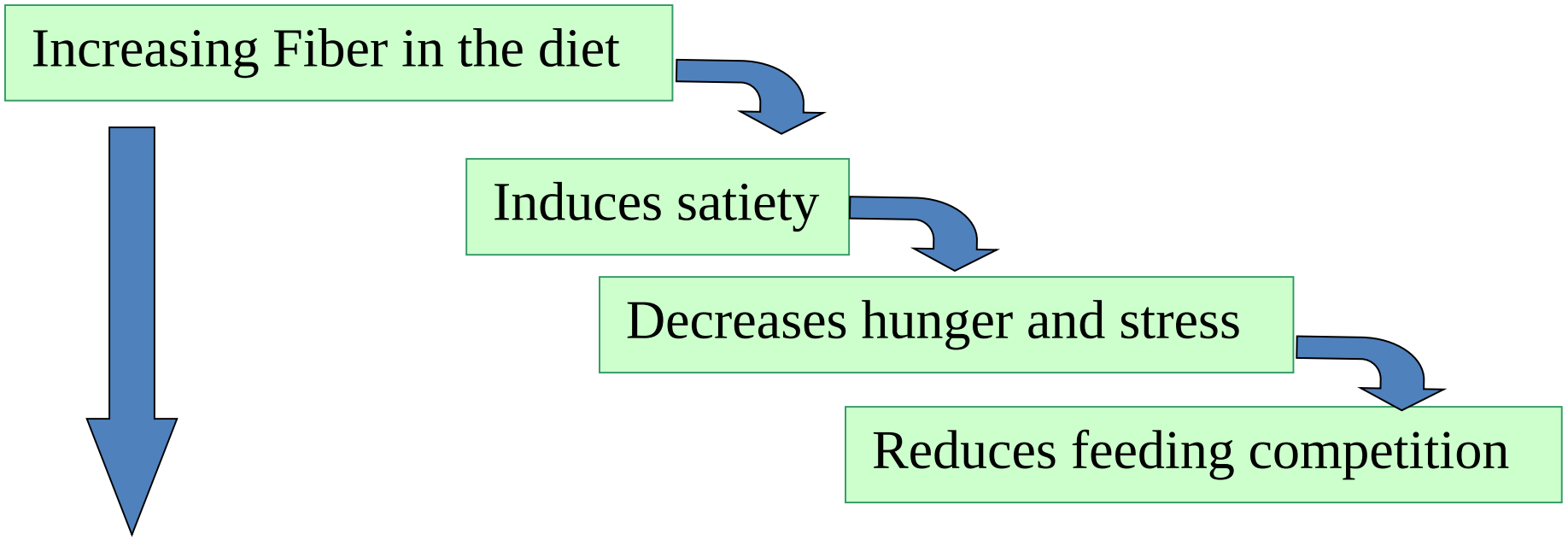
To evaluate the use of rice husk supplementation during *premontanera* on growth, carcass and fatty acid composition and additionally its effect on animal welfare.

TREASURE

CICYTEX CENTRO DE INVESTIGACIONES CIENTÍFICAS Y TECNOLÓGICAS DE EXTREMADURA

Why is important to increase the ammount on fiber in the iberian pig diet?

Using rice husk as welfare fiber could be an interesting alternative use for this abundant and underutilized agricultural byproduct.



Could reduce stress, weight gain variability and might improve carcass uniformity

METHODOLOGY

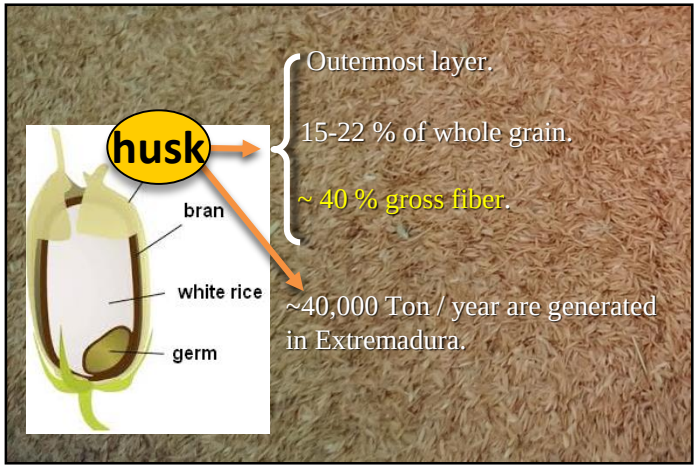
- 45 castrate male Iberian pigs.

- 3 treatment groups (n=15/group)

- From 9 to 13 months of age (*premontanera*; in large outdoor corrals) were fed 3 concentrate diets (1/group) differing in fiber content:

  - Control (**C**; 5.0 %) (regular concentrate),
  - Medium Fiber (**MF**; 8.5 %) (same , but rice husk added)
  - High Fiber (**HF**; 12.0 %) (same, but more rice husk added)

- Daily rations were isocaloric and approximately isoproteic.



Composition	Percentage
Ash	11.6 ± 0.1
Protein	2.8 ± 0.1
Gross fibre	39.8 ± 0.5
Cellulose	35.6 ± 0.5
Hemicellulose	14.5 ± 0.8
Lignin	16.1 ± 0.8
Chemical composition of the ash	
SiO_2	93.3 ± 0.4
K_2O	3.8 ± 0.1
CaO	1.0 ± 0.02
MgO	0.4 ± 0.01

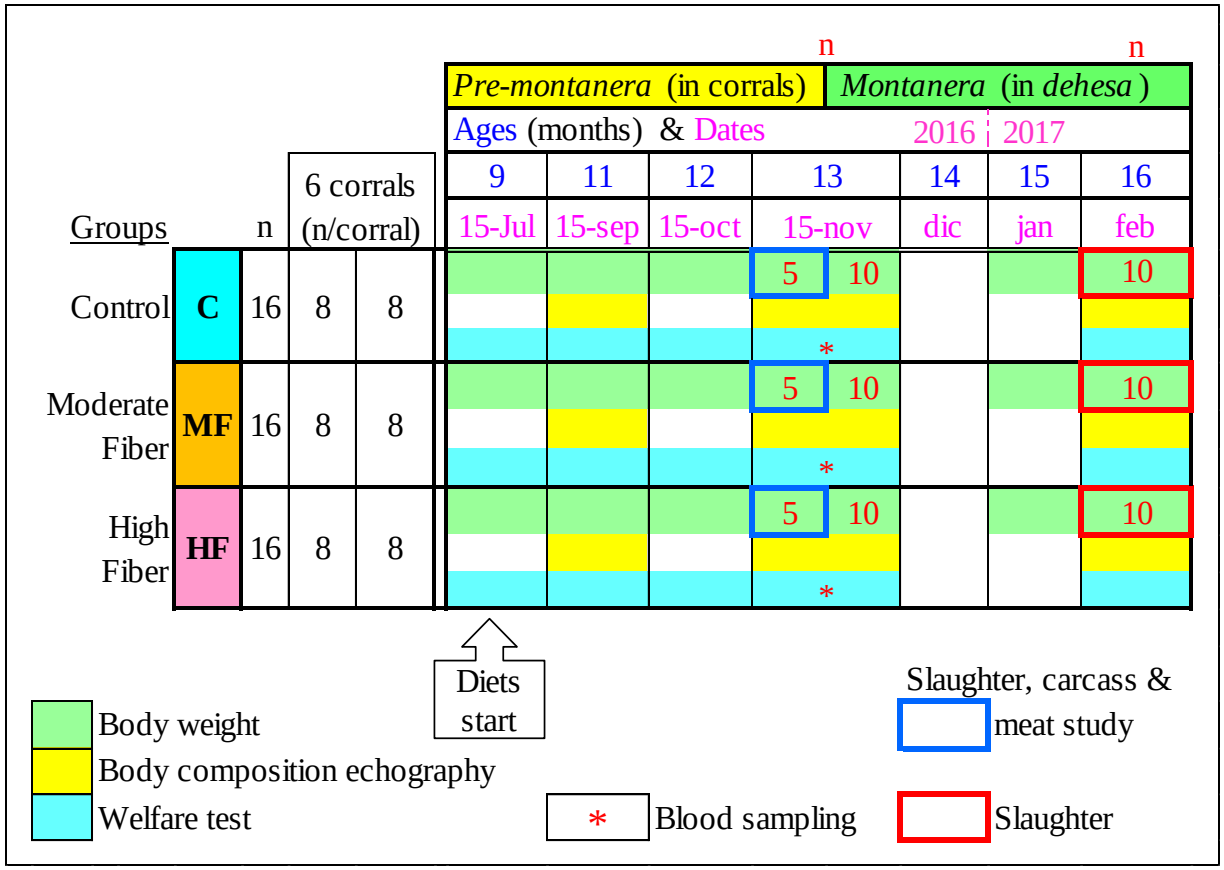
Table 1: Experimental treatments

Treatment	Diet	Daily feeding rations (kg/animal)
T1	D1	1.3
T2	D2	1.4
T3	D3	1.5

Chemical composition	**D1**	**D2**	**D3**
Ash (%)	5.1	5.6	6.6
Crude protein (%)	15.7	14.2	13.0
Fat (%)	2.6	2.9	3.8
Gross fibre (%)	5.0	8.5	12.0
N.D.F. (%)	14.7	18.5	22.9
M.E. (kcal/kg)	3,053	2,775	2,528
N.M.E. (kcal/kg)	2,247	2,073	1,900

Data collection:

- Body weight. *In vivo* ultrasonographic body composition (loin area, gluteus muscles depth, backfat thickness).
- During premontanera: Welfare Quality® protocol. Behavior.
- At the end of premontanera: Blood sampling: neutrophil/lymphocyte ratio as a chronic stress index (currently under study).



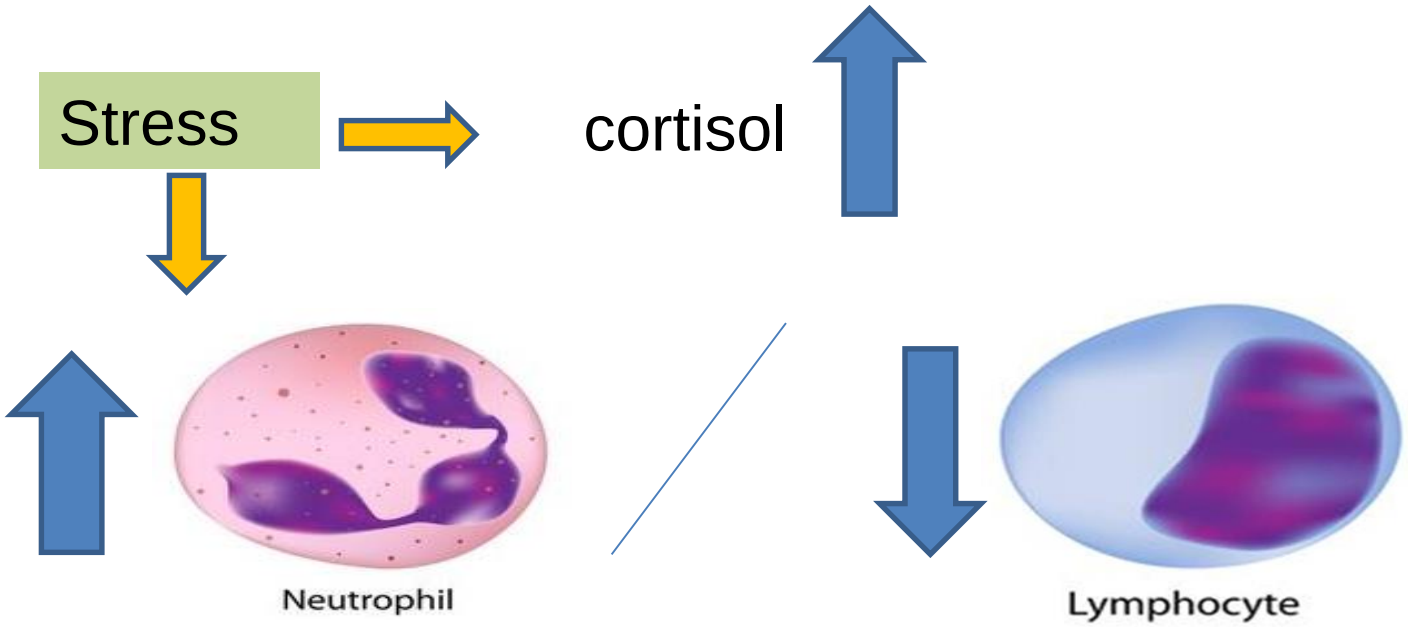
Carcass traits:

- Main cuts weight
- Last rib subcutaneous fat layers
- Percent Intramuscular fat
- Fatty acide composition
- Blood parameters

Chronic stress index

- Adrenal cortisol release and leukocyte response to stress are tightly linked.

- Several studies indicate that the ratio Neutrophil / Lymphocyte may be an easier way to measure chronic stress, since the ratio doesn't vary as a function of time of the day or sex and it takes hours for elevations in glucocorticoids to result in alteratios in white blood cell population




RESULTS

Table 2. Pig growth parameters for the three treatments

Trait	Control	Medium Fiber	High Fiber	Signif. level
W1	86.30	88.00	89.00	NS
W2	99.1^{b}	103.7^{a}	101.9^{ab}	S
W3	105.90	106.80	110.10	NS
W4	111.7^{b}	111.7^{b}	118.2^{a*}	S
TWG	25.4^{ab}	23.7^{b}	29.2^{a*}	S
TADG	0.201^{ab}	0.188^{b}	0.232^{a}	S

W1: Initial weight
W2: Second weight
W3: Third weight
W4: Last weight
TWG: Total weight gain
TADG: Total average daily gain

* Significantly lower CV for HF group than for Control group

- Mean daily BW gain from the 12th to the 14th month of age was greater for the HF group (significancy at 12-13th & 12-14th month intervals).
- In addition, the HF group exhibited an apparently steadier (in time) and more homogeneous (among animals) growth rate.

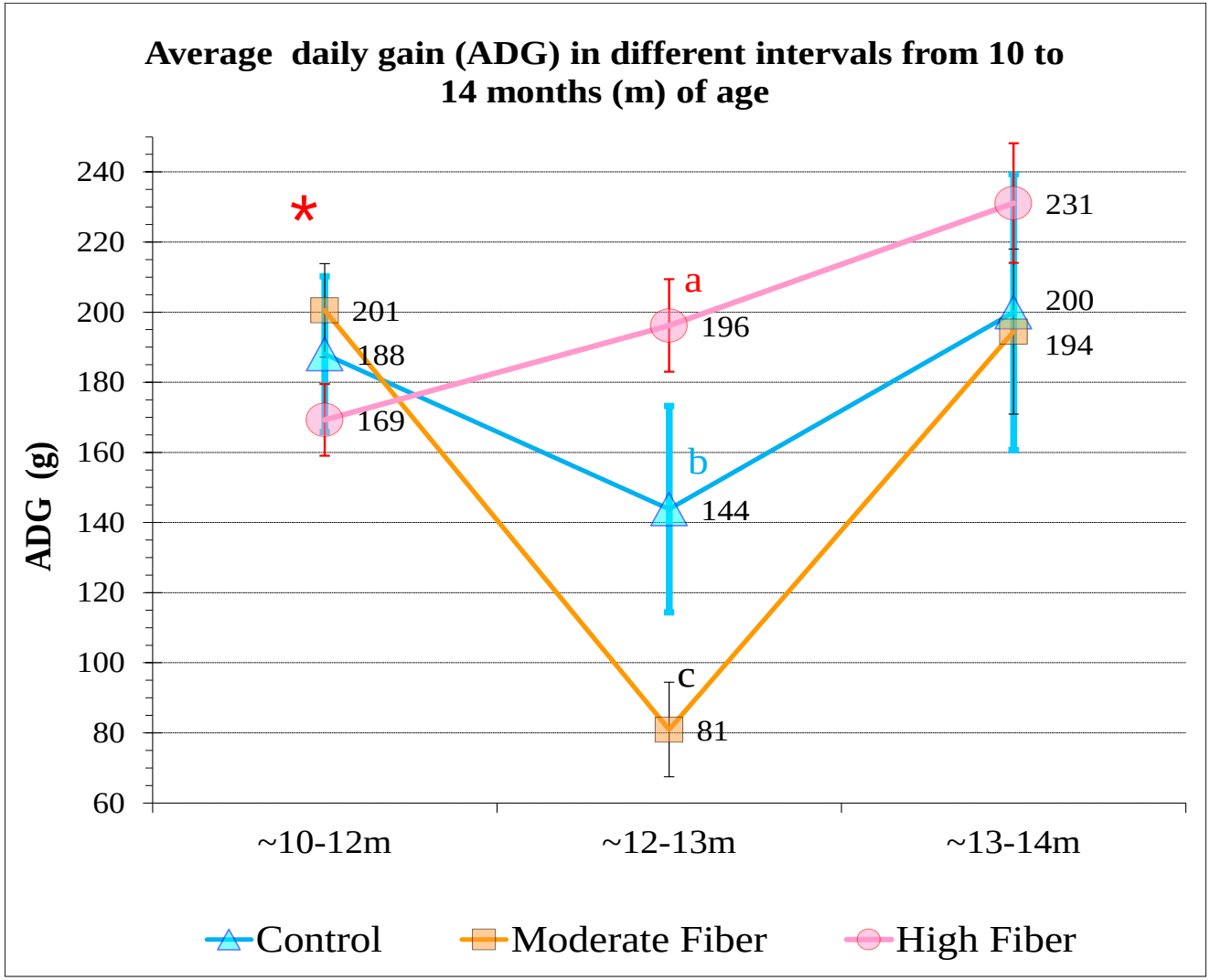


Table 3. Pig carcass and meat quality traits for the three treatments

Trait	Control	Medium Fiber	High Fiber	Signif. level
Ham weight	11.28	11.39	10.96	NS
Foreleg weight	7.95	8.15	8.11	NS
Loin weight	1.65	1.72	1.54	NS
Ham yield	0.24	0.25	0.24	NS
Foreleg yield	0.17	0.18	0.17	NS
Loin yield	0.04	0.04	0.03	NS
Inner backfat-14th rib	1.33^{a}	0.61^{b}	1.05^{ab}	S
Middle backfat-14th rib gm10	1.58^{a}	1.41^{a}	2.21^{b}	S
Outer backfat-14th rib ge10	1.02	0.90	1.02	NS
Total backfat-14th rib gt10	3.93^{a}	2.91^{b}	4.28^{a}	S
Intramuscular fat	4.47	3.05	3.15	NS
Meat colour L	34.78	36.25	35.20	NS
Meat colour A	6.86	7.94	7.80	NS
Meat colour B	0.61^{a}	1.14^{ab}	1.26^{b}	S

Table 4. Pig fatty acid composition for the three treatments

Trait	Control	Medium Fiber	High Fiber	Sign. Level.
C12	0.0757	0.0726	0.0756	NS
C14	1.4258	1.3975	1.4387	NS
C16	21.9709	21.8828	21.8083	NS
C16.1	2.4055	2.2168	2.4017	NS
C17	0.3391^{a}	0.3541^{a}	0.2828^{b}	S
C17.1	0.3395	0.3307	0.3119	NS
C18	12.0505	12.2571	11.2944	NS
C18.1	47.3438^{ab}	46.9288^{a}	49.1514^{b}	S
C18.2	11.4481^{ab}	12.0343^{a}	10.8216^{b}	S
C18.3	1.1397^{a}	1.1144^{ab}	0.8639^{b}	S
C20.1	0.1903	0.1973	0.1924	NS
C20.2	1.2648^{ab}	1.2119^{a}	1.3574^{b}	S
PUFA	13.8525^{ab}	14.3606^{a}	13.0429^{b}	S
MUFA	50.2791	49.6736	52.0573	NS
SFA	35.8620	35.9642	34.8998	NS

C12: Lauric acid;
C14: Myristic acid;
C16: Palmitic acid;
C16.1: Palmitoleic acid;
C17: Margaric acid;
C17.1: 10Z-Heptadecenoic acid;
C18: Stearic acid;
C18.1: Oleic acid;
C18.2: Linoleic acid;
C18.3: Linolenic acid;
C20.1: Eicosenoic acid;
C20.2: Eicosadienoic acid;
PUFA: Poly unsaturated fatty acids;
MUFA: Mono unsaturated fatty acids;
SFA: Saturated fatty acids

•*Table 5. Blood parameters for the three treatments*

Trait	Control	Medium Fiber	High Fiber	Signif. level
WBC	14.26	15.60	14.87	NS
NEU	5.79	5.62	5.85	NS
LYM	7.66^{a}	8.98^{b}	8.15^{ab}	S
N/L	77.27^{a}	63.28^{b}	73.89^{a}	S
PLT	235.43	278.77	275.38	NS
%NEU	0.41^{a}	0.36^{b}	0.39^{a}	S
%LYM	0.54^{a}	0.58^{b}	0.55^{a}	S
EOS	0.36	0.30	0.37	NS

WBC: White blood cells;
NEU: Neutrophils;
LYM: Lymphocytes;
N/L: Neutrophils/lymphocytes ratio;
PLT: Platelets;
%NEU: Percentage of neutrophils;
%LYM: Percentage of lymphocytes;
EOS: Eosinophils.

- None of the groups had diarrheic problems, regardless the fiber level.

- Behavior: HF group showed the lowest activity, mainly after daily ration ingestion.

CONCLUSIONS

- Supplementation with high levels of fiber (12%) from rice husk may be useful to favor growth uniformity during *premontanera*. The rice husk silica content (not only the fiber level) may be the cause of some of the beneficial effects (perhaps at the intestinal level).

- Increasing fiber in the diet does not affect prime cut weights or yields but may slightly change meat color.

- High fiber (**HF**) rice husk supplementation may reduce %SFA in fatty acid profile.
On the other hand, the **MF** (medium fiber) group had leaner carcasses, greater %PUFA and lower %MUFA than the HF group.

- The MF group had less stress (in terms of N/L index) than the other 2 groups, but the HF group showed the lowest activity, mainly after the ingestion of their daily ration.
Maybe the stress level was low for the 3 groups (castrates, enough space, small stable groups).

IMPLICATIONS: New studies testing rice husk fiber with immnunocastration (higher stress level) and comparing with another type of fiber (regular silica content).

CICYTEX Team
M. Izquierdo
F.I. Hernández-García
J. García-Gudiño
J.Matías
N. Garrido.
I. Cuadrado
M.A. Pérez

Thanks for your attention!!