Alicar: a database for carcass characteristics, diet composition and intake in ruminants

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Alicar: a database for carcass characteristics, diet composition and intake in ruminants

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Abstract

The Alicar database gathers published data on performance and carcass composition of ruminants as influenced by dietary conditions. It was developed with the Merise Method. The environment is APACHE, MySQL and PHP. The relational model of Alicar counts 11 tables: publication, experiment, animal group, treatment, measurement-results, methods, feeds, ingredient composition and ration intake, feed chemical composition, INRA feed specific code and meta-analysis code. Animals, feeding conditions and methods are finely described. Currently, Alicar includes 111 publications in cattle (794 treatments). Cattle data cover a range of animal maturing rates (mainly intermediate and early), and production types (mainly meat and dual purpose). Carcass composition is from chemical or physical measurements, and/or proxy traits.

Keywords: *database, carcass characteristics, diet composition, intake, ruminants*

Introduction

The amount of available published information on the impact of nutrition on carcass characteristics in ruminant animals is large. The information can be aggregated in databases and used to develop response equations by meta-analyses. The objective of the present work is to present the Alicar database (alimentation, animal performances and carcass characteristics): (1) its structure as an example of structuration of data from the literature for modelling purposes; and (2) its current contents from cattle based publications.

Material and methods

The Alicar Database was developed with the Merise method, similarly to the Flora database (Vernet and Ortigues-Marty, 2006) but with differences in the relational model. It was developed as part of a full web data warehouse Nutriflux (Vernet *et al.*, 2007). Hence, it has a SQL architecture and the environment is APACHE, MySQL and PHP. The current cattle dataset in Alicar was built from WOS based on the following criteria: carcass composition and dietary data (111 publications, 794 treatments). The distribution of data against animal factors modalities was studied. Descriptive statistics were calculated for the different variables and the effects of the main animal factors were studied by one way Anova (Minitab 17).

Results and discussion

The Relational model of Alicar presents the different data tables and the relationships between them (Figure 1).

First, 4 tables describe the publication (publication table), the experiment (experiment table), the animals (animal-group table) and the experimental treatments (treatment table) (Figure 1). Groups of animals are described as precisely as possible (species, breed, type of breed, sex, type of animal, physiological stage). The measurement-result table describes all types of measurements. Methods (method table) are indexed to evaluate the impact of methods on measurement-results. For the

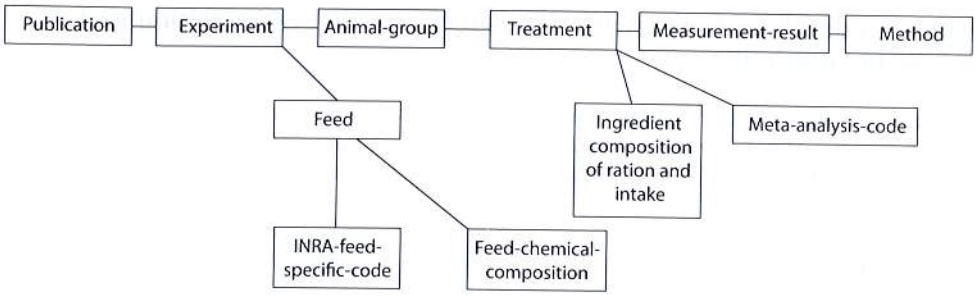

Figure 1 The Alicar relational model.

description of feeding characteristics, 3 tables are used to describe: the publication feeds and rations (feed table), the ingredient composition of rations and intake (ingredient-composition-of-rations-and-intake table), and the chemical composition of rations (feed-chemical-composition table). To have a fine description of publication diets, diets are characterized according to INRA (2007) feed tables, using the specific code of each relevant feeds (INRA-feed-specific-code table), with a link to INRA (in press).

Current cattle data (Table 1) show a wide range of animal characteristics and performances. Maturing rates are essentially intermediate (40.3%) and early (37.4%) followed by late (12.1%) and dairy breeds (10.2%). Production type are mainly meat (60.2%), dual purpose (29.6%), and dairy (10.2%). Physiological stages are first fattening (58.1%), then growth + fattening (27.1%), growth (11.7%) and not reported (3.1%). Sexes are castrated males (implanted or not, 42.1%), then castrated males (36.4%), males (7.2%), implanted females (3.9%) and the rest (10.4%). From those animals, average daily gains, slaughter weights and carcass yield, varied with sex, maturing rate, production type and stage. Carcass lipid and protein contents are reported in 19.8% of the publications, while proxy traits in 87% (sub cutaneous fat thickness) or 58.5% (yield grade). They all show a wide range of variation, and can be used for meta-analysis (Al-Jammas *et al.*, 2016).

Table 1. Meta-design of animal performances and carcass traits in cattle (Alicar database).[1,2]

	$N_{treatments}$	Mean	Sd	Min	Max	Sex	Mat-rate	Prod-ty	Stage
ADG (g/d)	734	1,362	330	212	2,240	***(28%)	***(13%)	***(4%)	***(3%)
FCR (kg/kg)	302	7.68	2.51	4.17	28.5	***(9%)	***(5%)	**(3%)	**(3%)
SW (kg)	351	524	82	169	753	***(28%)	***(15%)	***(6%)	***(19%)
HCW (kg)	715	326	54	94	516	***(12%)	***(7%)	***(5%)	***(8%)
CY (%)	307	60.68	2.95	50.9	65.5	***(34%)	***(42%)	***(26%)	*(1%)
SCFT	682	11.84	4.02	0.8	35	***(6%)	***(12%)	NS	***(3%)
YG	486	2.85	0.54	1.05	4.7	*(1%)	NS	NS	NS
Mar (10 points)	222	4.44	0.81	1.4	8.33	NS	***(6%)	***(6%)	NS
LIP%CC	238	31.27	4.07	8.4	40.4	***(16%)	***(28%)	***(5%)	***(9%)
Prot%CC	191	15.24	1.56	13.2	21.9	NS	***(9%)	*(2%)	***(10%)

[1] Mat-rate = maturing rate (early, intermediate, late; dairy breeds); Prod-ty = production type (meat, dairy, dual purpose); Stage = physiological stage (growth, fattening, growth + fattening); ADG = average daily gain; FCR = feed conversion ratio; SW = slaughter weight; HCW = hot carcass weight; CY = carcass yield; SCFT = sub cutaneous fat thickness; YG = yield grade; Mar = marbling score; LIP%CC = lipid weight % cold carcass weight; Prot%CC = protein weight % cold carcass weight.

[2] ***P<0.001; **P<0.01; *P<0.1; values in parenthesis: adjusted R^2.

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