

THE USE OF BALE COMPACTOR TO PRODUCE HIGH DENSITY WRAPPED BALES OF SEVERAL FORAGES AND GRAINS

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INTRODUCTION

The need to ensile fine chopped forages, milled grains, crop residues, and by-products has become important to reduce the production costs of milk and meat, especially for small to medium farms, where bunker management poses high risks for aerobic deterioration. The **baler-wrapper compactors** are able to bale many different materials, such as corn silage, high moisture grain silage, grass and legume chopped forages, sugar pulp, total mixed rations (TMR), etc. The formed bales are tied with plastic film and then wrapped with stretch film, with dry matter (DM) densities above 300 kg/m³, with peaks of 600 kg/m³ for high moisture corn silages.

OBJECTIVE: to assess the **fermentation characteristics, microbial profiles, aerobic stability, and DM density** of forages and grains **baled on farm with compactors** under different DM contents and lengths of conservation

MATERIAL AND METHODS



- Two-year period on farm survey (**140 bales**)
- Wrapped bales** secured with 3 layers of polyethylene (PE) film and wrapped with 8 to 9 layers of PE stretch film;
- Different products: **whole crop cereals** (corn, sorghum, winter cereals), **wilted chopped forages** (alfalfa, Italian ryegrass, permanent meadows), **high moisture ear corn**, and total mixed ration (**TMR**)
- Analyses:** DM content, pH, fermentative profile by HPLC, microbial count of yeasts and molds, and aerobic stability (increase of 2°C above ambient temperature), fresh and DM densities and weight losses



RESULTS AND DISCUSSION

- DM densities** from 159 to 591 kg/m³
- Yeast** count higher than 3 log cfu/g in less than 33% samples (47 out of 140)
- Aerobic stability** highly variable in relation to ensiled material, DM content, and length of conservation
- Fermentation profiles** comparable or even better than silages conserved in horizontal silos at similar conditions
- Weight losses** very low, ranging from 0.68% to 5.06%
- Costs** for harvesting, baling, and wrapping from 18 to 24 € per bale

Table 1. Main characteristics of the silages analyzed (n =140). Minimum and maximum value in brackets (cfu = colony forming units; TMR = total mixed ration for dairy cow)

Silage	DM (%)	pH	Lactic acid (g/kg DM)	Acetic acid (g/kg DM)	Butyric acid (g/kg DM)	Ethanol (g/kg DM)	1,2-propanediol (g/kg DM)	Yeast (log cfu/g)	Aerobic stability (h)
Winter cereals	29 (25-32)	3.83 (3.61-4.27)	55.4 (12.9-79.0)	27.5 (11.0-58.3)	7.2 (<0.01-48.5)	31.3 (22.2-45.3)	10.2 (0.2-21.3)	2.64 (0.50-8.70)	127 (30-260)
Italian ryegrass	43 (19-68)	4.48 (4.12-4.94)	53.4 (24.9-75.8)	13.2 (2.9-26.3)	4.2 (<0.01-71.4)	3.6 (<0.01-14.3)	1.6 (<0.01-7.2)	1.8 (0.50-3.79)	527 (115-1028)
Alfalfa	53 (31-78)	4.97 (4.37-5.85)	33.7 (<0.01-95.6)	7.8 (<0.01-31.4)	<0.01	3.2 (<0.01-10.6)	0.1 (<0.01-0.7)	1.86 (0.50-4.00)	309 (295-315)
Permanent meadow	29 (22-44)	4.13 (4.00-4.28)	38.5 (14.7-48.8)	12.1 (3.0-18.2)	<0.01	5.9 (2.1-9.2)	1.5 (<0.01-3.6)	1.99 (0.50-4.23)	-
High moisture corn	58 (53-69)	4.02 (3.72-6.21)	24.6 (<0.01-37.9)	4.4 (<0.01-8.8)	0.02 (<0.01-1.5)	5.9 (<0.01-13.5)	0.4 (<0.01-6.4)	4.1 (0.50-8.08)	109 (26-345)
Corn silage	38 (35-42)	3.7 (3.52-3.78)	41.9 (<0.01-58.9)	7.6 (<0.01-12.2)	<0.01	12.3 (<0.01-19.5)	0.6 (<0.01-2.9)	2.89 (0.50-7.32)	120 (26-345)
Sorghum	46 (29-58)	4.84 (4.56-4.97)	9.03 (7.1-11.3)	4.8 (4.2-6.7)	<0.01	23.2 (19.9-29.2)	<0.01	-	-
TMR	52 (48-55)	4.85 (4.31-5.24)	32.6 (16.8-57.4)	21.1 (11.5-32.8)	<0.01	6.03 (2.85-19.3)	<0.01	4.11 (0.50-6.83)	-

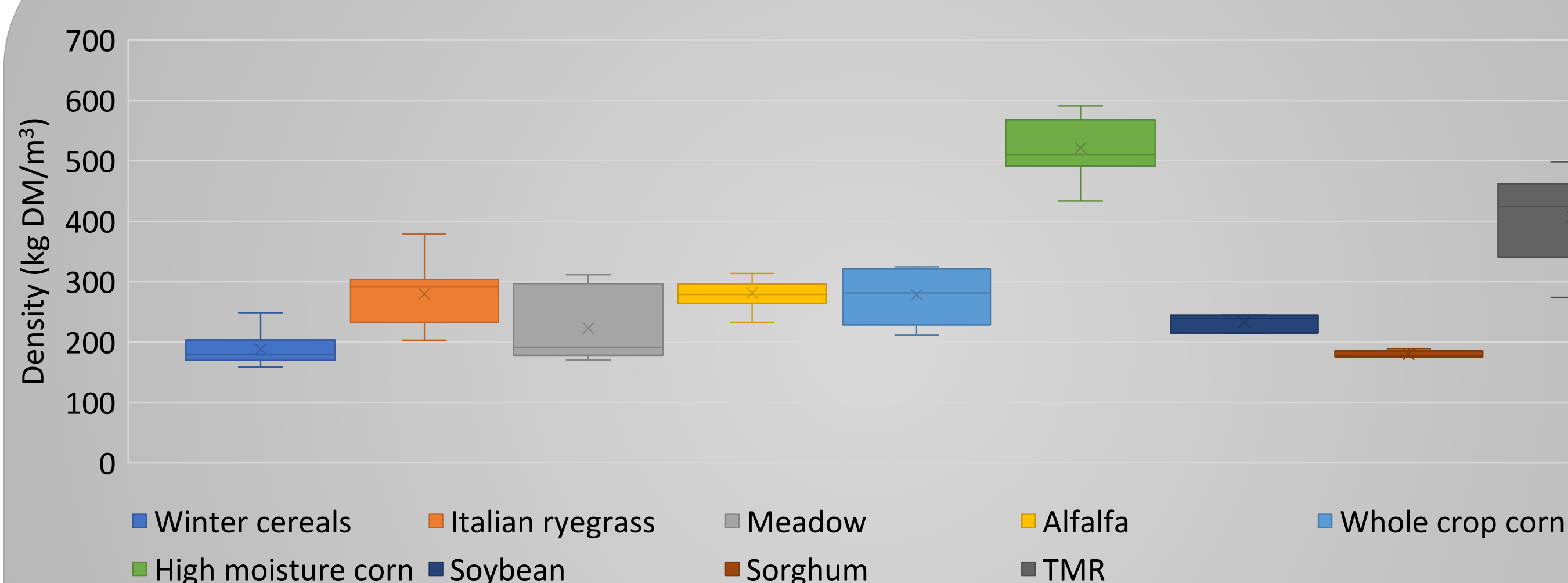


Figure 1. Boxplot of DM densities of different silages ensiled in high-density bales

CONCLUSION

- Agricultural compactors offer a **wide flexibility** for **small to medium farms** that have too low daily silage consumption to be conserved in horizontal silos
- This **highly efficient method** of conserving forages permits to valorize different home-grown crops **without having problems of contemporary managing several feed-out silo faces and/or silos of inappropriate dimensions**