

# Supplementary Materials: Effect of Oats and Wheat Genotype on In Vitro Gas Production Kinetics of Straw

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**Table S1.** Effect of oats and wheat genotypes from three breeding trials (Oats 1, advanced breeding lines and commercial varieties; Oats 2, commercial and historical varieties; Wheat, advanced breeding lines and commercial varieties) on straw morphology.

Breeding trial	Response	Overall mean	SEM <sup>1</sup>	Min	Max	Genotype <i>p</i> =
Oats 1	<i>avΦ</i> <sup>2</sup> (mm)	5.63	0.120	4.93	6.47	0.002
	<i>RΦ</i> (mm/mm)	0.910	0.0118	0.891	0.942	0.049
	%Leaves (g/100 g)	26.1	0.931	20.6	29.7	0.003
	δ (g/cm <sup>3</sup> )	0.125	0.00387	0.108	0.145	0.004
Oats 2	<i>avΦ</i> (mm)	5.10	0.103	3.94	6.31	0.001
	<i>RΦ</i> (mm/mm)	0.904	0.0110	0.885	0.925	0.060
	%Leaves (g/100 g)	24.4	0.948	18.1	27.3	0.004
	δ (g/cm <sup>3</sup> )	0.122	0.00414	0.0947	0.177	0.001
Wheat	<i>avΦ</i> (mm)	4.44	0.0559	4.13	4.74	0.002
	<i>RΦ</i> (mm/mm)	0.962	0.00813	0.920	0.985	0.008
	%Leaves (g/100 g)	31.7	0.964	28.3	37.6	0.003
	δ (g/cm <sup>3</sup> )	0.128	0.00446	0.0919	0.148	0.002

<sup>1</sup> SEM: standard error of the mean, Min: minimum, Max: maximum; <sup>2</sup> *avΦ* = Average diameter of the first and second internodes; *RΦ* = Diameter of the first internode / diameter of the second internode; %Leaves = percentage of leaves by mass; δ = apparent density.

**Table S2.** Prediction of in vitro dry matter digestibility from gas production at 8, 24 and 40 h of incubation and from the theoretical maximum and the fractional rate of gas production.

Predictor	Regression equation
<i>P</i> <sub>8</sub> (mmol/g DM incubated) <sup>1</sup>	<i>IVDMD</i> = −18.4(±9.57; <i>p</i> = 0.059) + 36.7(±5.29; <i>p</i> < 0.001) <i>x</i> ; <i>R</i> <sup>2</sup> = 0.40( <i>p</i> < 0.001)
<i>P</i> <sub>24</sub> (mmol/g DM incubated)	<i>IVDMD</i> = −35.7(±10.3; <i>p</i> < 0.001) + 26.7(±3.29; <i>p</i> < 0.001) <i>x</i> ; <i>R</i> <sup>2</sup> = 0.48( <i>p</i> < 0.001)
<i>P</i> <sub>40</sub> (mmol/g DM incubated)	<i>IVDMD</i> = −23.7(±9.34; <i>p</i> = 0.013) + 19.2(±2.50; <i>p</i> < 0.001) <i>x</i> ; <i>R</i> <sup>2</sup> = 0.45( <i>p</i> < 0.001)
<i>P</i> <sub>max</sub> (mmol/g DM incubated)	<i>IVDMD</i> = −3.17(±7.67; <i>p</i> = 0.68) + 12.0(±1.79; <i>p</i> < 0.001) <i>x</i> ; <i>R</i> <sup>2</sup> = 0.39( <i>p</i> < 0.001)
<i>c</i> (h <sup>−1</sup> )	<i>IVDMD</i> = 62.5(±5.15; <i>p</i> < 0.001) − 285(±101; <i>p</i> = 0.006); <i>R</i> <sup>2</sup> = 0.10( <i>p</i> = 0.006)

<sup>1</sup> *P*<sub>8</sub>: gas production at 8 h of incubation, *P*<sub>24</sub>: gas production at 24 h of incubation, *P*<sub>max</sub>: theoretically maximal gas production, *c*: fractional rate of gas production, *IVDMD*: in vitro apparent digestibility of dry matter, expressed as a percentage of dry matter incubated.

**Table S3.** Coefficients of determination between agronomic traits and gas production kinetic parameters of straw from three genetic improvement trials (Oats 1, advanced breeding lines and commercial varieties; Oats 2, commercial and historical varieties; Wheat, advanced breeding lines and commercial varieties) incubated in rumen in vitro cultures.

Breeding trial	Gas production kinetics parameter	Grain yield (ton/ha)	Lodging incidence (%area)	Lodging severity (1–5)	Halo blight (%)	Barley yellow dwarf virus (N)	Crown rust (%)
Oats 1	$P_8$ (mmol/g DM incubated) <sup>1</sup>	0.010 <sup>2</sup> ( $p = 0.64$ )	0.21 ( $p = 0.024$ )	0.23 ( $p = 0.019$ )	0.0020 ( $p = 0.84$ )	0.025 ( $p = 0.46$ )	0.072 ( $p = 0.20$ )
	$P_{24}$ (mmol/g DM incubated)	0.077 ( $p = 0.19$ )	0.097 ( $p = 0.14$ )	0.080 ( $p = 0.18$ )	0.015 ( $p = 0.57$ )	0.037 ( $p = 0.37$ )	0.044 ( $p = 0.33$ )
	$P_{40}$ (mmol/g DM incubated)	0.085 ( $p = 0.17$ )	0.062 ( $p = 0.24$ )	0.038 ( $p = 0.36$ )	0.017 ( $p = 0.54$ )	0.044 ( $p = 0.33$ )	0.044 ( $p = 0.33$ )
	$P_{max}$ (mmol/g DM incubated)	0.057 ( $p = 0.26$ )	0.030 ( $p = 0.42$ )	0.0078 ( $p = 0.68$ )	0.010 ( $p = 0.64$ )	0.051 ( $p = 0.29$ )	0.0078 ( $p = 0.68$ )
	$c$ (h <sup>-1</sup> )	0.011 ( $p = 0.62$ )	0.0018 ( $p = 0.84$ )	0.031 ( $p = 0.41$ )	0.019 ( $p = 0.52$ )	0.024 ( $p = 0.47$ )	0.022 ( $p = 0.49$ )
Oats 2	$P_8$ (mmol/g DM incubated)	0.085 ( $p = 0.16$ )	0.10 ( $p = 0.12$ )	0.061 ( $p = 0.23$ )	0.00084 ( $p = 0.89$ )	0.000043 ( $p = 0.98$ )	- <sup>3</sup>
	$P_{24}$ (mmol/g DM incubated)	0.10 ( $p = 0.12$ )	0.15 ( $p = 0.053$ )	0.069 ( $p = 0.21$ )	0.0021 ( $p = 0.83$ )	0.000022 ( $p = 0.98$ )	-
	$P_{40}$ (mmol/g DM incubated)	0.085 ( $p = 0.16$ )	0.14 ( $p = 0.070$ )	0.045 ( $p = 0.31$ )	0.0059 ( $p = 0.71$ )	0.00098 ( $p = 0.88$ )	-
	$P_{max}$ (mmol/g DM incubated)	0.034 ( $p = 0.38$ )	0.071 ( $p = 0.20$ )	0.0075 ( $p = 0.68$ )	0.018 ( $p = 0.52$ )	0.0064 ( $p = 0.70$ )	-
	$c$ (h <sup>-1</sup> )	0.044 ( $p = 0.31$ )	0.050 ( $p = 0.28$ )	0.12 ( $p = 0.096$ )	0.038 ( $p = 0.35$ )	0.045 ( $p = 0.31$ )	-
Wheat	$P_8$ (mmol/g DM incubated)	0.14 ( $p = 0.076$ )	-	-	-	-	-
	$P_{24}$ (mmol/g DM incubated)	0.11 ( $p = 0.12$ )	-	-	-	-	-
	$P_{40}$ (mmol/g DM incubated)	0.063 ( $p = 0.24$ )	-	-	-	-	-
	$P_{max}$ (mmol/g DM incubated)	< 0.010 ( $p = 0.90$ )	-	-	-	-	-
	$c$ (h <sup>-1</sup> )	0.0084 ( $p = 0.67$ )	-	-	-	-	-

<sup>1</sup>  $P_8$ : gas production at 8 h of incubation,  $P_{24}$ : gas production at 24 h of incubation,  $P_{40}$ : gas production at 40 h of incubation,  $P_{max}$ : theoretically maximal gas production,  $c$ : gas production rate; <sup>2</sup>  $R^2$  value.; <sup>3</sup> -: not determined.