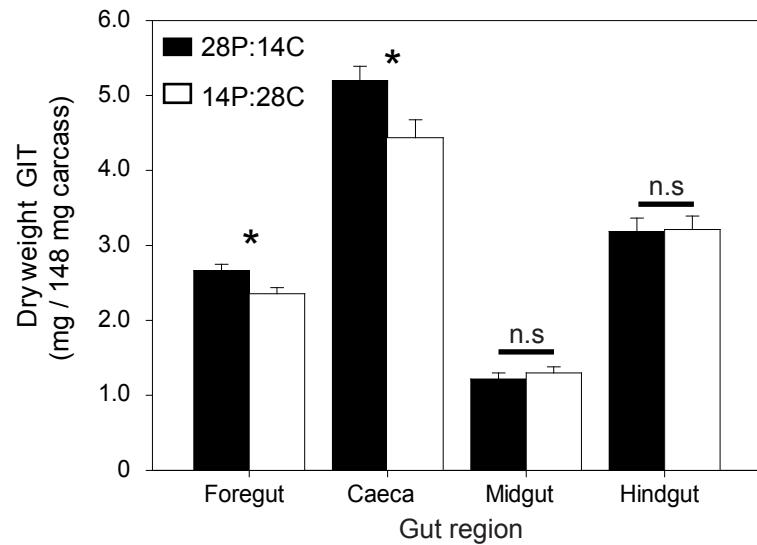


Supplementary Fig. 1. Dry mass allocation to the different regions of the gastrointestinal tract; foregut, caeca, midgut and hindgut, by locusts after feeding on 28P:14C or 14P:28C. Values are ANCOVA adjusted mean \pm SE for a 148 mg carcass. $n=68$ for each diet treatment.

* $P < 0.5$; ** $P < 0.01$; *** $P < 0.001$; n.s = $P > 0.05$.

Supplementary Fig.1



Supplementary Table 1. Results of ANCOVA for the mass of each region of the gastrointestinal tract for experiments 1 and 2. Under ‘Analysis’, covariate and *P* values are those for the homogeneity of slopes. Body mass is the mass of the insect minus the gastrointestinal tract. Significant *P* values (*P* < 0.05) are highlighted in bold.

Analysis	Source of variation	df	MS	F	P
Experiment 1					
<i>Foregut</i>	Treatment	4	1.42	4.41	0.004
Body mass <i>P</i> = 0.755	Body mass	1	6.33	19.59	< 0.001
	Residual	51	0.32		
<i>Caeca</i>	Treatment	1	25.57	5.25	0.001
Body mass <i>P</i> = 0.627	Body mass	1	79.08	16.25	< 0.001
	Residual	129	4.87		
<i>Midgut</i>	Treatment	1	0.47	0.86	0.496
Body mass <i>P</i> = 0.691	Body mass	1	2.21	4.0	< 0.001
	Residual	129	0.55		
<i>Hindgut</i>	Treatment	1	0.28	0.29	0.886
Body mass <i>P</i> = 0.9858	Body mass	1	16.36	17.02	< 0.001
	Residual	129	0.96		
Experiment 2					
<i>Foregut</i>	Treatment	1	3.07	5.80	0.017
Body mass <i>P</i> = 0.739	Body mass	1	8.44	15.94	< 0.001
	Residual	129	0.53		
<i>Caeca</i>	Treatment	1	22.77	8.48	< 0.001
Body mass <i>P</i> = 0.955	Body mass	1	46.63	17.37	< 0.001
	Residual	129	2.68		
<i>Midgut</i>	Treatment	1	0.22	0.49	0.484
Body mass <i>P</i> = 0.529	Body mass	1	6.82	15.33	< 0.001
	Residual	129	0.45		
<i>Hindgut</i>	Treatment	1	0.10	0.05	0.827
Body mass <i>P</i> = 0.591	Body mass	1	30.44	14.45	< 0.001
	Residual	129	2.11		

Supplementary Table 2. Comparison (ANCOVA) of total dry matter intake and the efficiency with which protein (P) and carbohydrate (C) were extracted (digestibility) by locusts from *T. australis* by locusts fed diets varying in their ratio of P:C. Under ‘Analysis’, covariate and *P* values are those for the homogeneity of slopes. Body mass is the mass of the entire insect. Significant *P* values (*P* < 0.05) are highlighted in bold.

Analysis	Source of variation	df	MS	F	P
<i>INTAKE-total dry matter</i>					
Body mass <i>P</i> = 0.167	Treatment	4	12,126.05	6.92	0.001
	Body mass	1	69,224.35	39.49	< 0.001
	Residual	47	1,753.14		
<i>P-digested (faeces)</i>					
P-ingested <i>P</i> = 0.377	Treatment	4	3.972	0.738	0.571
	Body mass	1	204.072	37.901	< 0.001
	Residual	47	5.384		
<i>C-digested (faeces)</i>					
C-ingested <i>P</i> = 0.320	Treatment	4	909.404	2.823	0.036
	Body mass	1	370.699	1.151	0.289
	Residual	47	322.165		

Supplementary Table 3. Comparison (ANCOVA) of total dry matter intake and nutrient (protein and carbohydrate) specific absorbance for insects reared on either 28P:14C or 14P:28C, when feeding on each grass. Under ‘Analysis’, covariate and *P* values are those for the homogeneity of slopes. Body mass is the mass of the entire insect. Significant *P* values (*P* < 0.05) are highlighted in bold.

Analysis	Source of variation	df	MS	F	P
INTAKE-total dry matter					
<i>Cynodon</i>	Treatment	1	4,005.86	4.56	0.039
Body mass <i>P</i> = 0.156	Body mass	1	17,779.14	20.26	< 0.001
	Residual	43	877.58		
<i>Themeda</i>	Treatment	1	94,099.87	41.69	< 0.001
Body mass <i>P</i> = 0.940	Body mass	1	238,224.23	105.55	< 0.001
	Residual	43	2,256.96		
<i>Wheat</i>	Treatment	1	11,527.45	25.85	< 0.001
Body mass <i>P</i> = 0.707	Body mass	1	22,094.69	49.55	< 0.001
	Residual	43	445.9017		
INTAKE-total wet matter					
<i>Cynodon</i>	Treatment	1	95,446.4	4.67	0.037
Body mass <i>P</i> = 0.287	Body mass	1	449,291.4	21.96	< 0.001
	Residual	43	20,458.8		
<i>Themeda</i>	Treatment	1	526,318.3	39.10	< 0.001
Body mass <i>P</i> = 0.664	Body mass	1	1,392,498.3	103.46	< 0.001
	Residual	43	13,459.6		
<i>Wheat</i>	Treatment	1	719,318.1	25.85	< 0.001
Body mass <i>P</i> = 0.715	Body mass	1	1,378,946.9	49.55	< 0.001
	Residual	43	27,828.2		

Nutrient specific absorption (intake-faeces)

Protein

<i>Cynodon</i>	Treatment	1	354.73	6.41	0.016
Body mass <i>P</i> = 0.149	Body mass	1	1,058.67	19.13	< 0.001
	Residual	43	55.33		
<i>Themeda</i>	Treatment	1	3,101.46	31.82	< 0.001
Body mass <i>P</i> = 0.642	Body mass	1	8,505.59	87.26	< 0.001
	Residual	43	97.47		
<i>Wheat</i>	Treatment	1	685.14	19.88	< 0.001
Body mass <i>P</i> = 0.801	Body mass	1	1,356.60	39.37	< 0.001
	Residual	43	34.46		

Carbohydrate

<i>Cynodon</i>	Treatment	1	184.25	7.35	0.010
Body mass <i>P</i> = 0.313	Body mass	1	68.62	2.74	0.107
	Residual	43	25.08		
<i>Themeda</i>	Treatment	1	530.97	4.30	0.044
Body mass <i>P</i> = 0.512	Body mass	1	2,427.94	19.68	< 0.001
	Residual	43	123.36		
<i>Wheat</i>	Treatment	1	189.47	8.43	0.006
Body mass <i>P</i> = 0.994	Body mass	1	288.17	12.82	< 0.001
	Residual	43	22.47		

Supplementary Table 4. Results of ANCOVA for nutrient specific digestibility of each grass. Under ‘Analysis’, covariate and *P* values are those for the homogeneity of slopes. Ingested is either the amount of protein (P) or carbohydrate (C) ingested as appropriate.

Analysis	Source of variation	df	MS	F	P
<i>P</i> –digested (faeces)					
P-ingested P = 0.528	Treatment	1	63.73	0.98	0.925
	Grass	2	696.13	10.65	< 0.001
	Treatment x Grass	2	146.85	2.25	0.110
	Body mass	1	14,489.27	221.69	< 0.001
	Residual	129			
<i>C</i> –digested (faeces)					
C-ingested P = 0.834	Treatment	1	196.79	3.79	0.054
	Grass	2	290.85	5.61	0.005
	Treatment x Grass	2	16.04	0.31	0.735
	Body mass	1	4,572.60	88.17	< 0.001
	Residual	129			

Supplementary Table 5. Results of ANCOVA for feeding behaviour; meal duration and intermeal intervals. Under ‘Analysis’, covariate and *P* values are those for the homogeneity of slopes.

Analysis	Source of variation	df	MS	F	P
Meal duration	Treatment	1	49.20	6.19	0.014
Body mass <i>P</i> = 0.876	Grass species*	2	183.22	23.07	< 0.001
	Treatment x grass	2	20.53	2.59	0.09
	Body size	1	9.16	1.15	0.285
	Residual	111	7.94		

*Post-hoc Tukey’s test *C. dactylon* v *T. australis* *P* < 0.001, *C. dactylon* v *T. aestivum* *P* = 0.646, *T. australis* v *T. aestivum* *P* < 0.001.

Intermeal duration

	Treatment	1	292.42	0.45	0.502
Body mass <i>P</i> = 0.561	Grass species*	2	5,318.50	8.25	< 0.001
	Treatment x grass	2	1,290.95	2.00	0.140
	Body size	1	752.64	1.17	0.282
	Residual	111	645.03		

*Post-hoc Tukey’s test *C. dactylon* v *T. australis* *P* = 0.843, *C. dactylon* v *T. aestivum* *P* = 0.012, *T. australis* v *T. aestivum* *P* = 0.002.