Electronic Supplementary Material (ESI) for Food & Function Journal.

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Supplementary data

Table S1. Effect of substrates (UF) isolated from legumes on SCFA and NH_4^+ concentrations and their interaction with removal time during *in vitro* fermentation for 48 h.

Substrates	Acetate	Propio-nate	Butyrate	Total SCFA	% of total SCFA			BCR*	NH_4^+
					Acetate	Propionate	Butyrate		
	(mmoles g^{-1} DM)								
Legumes									
Chp	2.9^{b}	1.4^{b}	0.6^{b}	5.2^{b}	56.4^{a}	26.3^{b}	11.9^{c}	0.150^{a}	3.4^{b}
Lent	3.4^{a}	1.8^{a}	1.0^{a}	6.5^{a}	54.8^{b}	27.1^{a}	13.9^{a}	0.118^{b}	3.2^{c}
Mung	2.6^{c}	1.1^{c}	0.6^{b}	4.6^{c}	56.7^{a}	24.3^{c}	13.0^{b}	0.168^{a}	3.6^{a}
Prob.	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00
MSD	0.21	0.10	0.05	0.36	0.81	0.59	0.40	0.02	0.13
Removal time (h)									
0	0.52^{f}	0.22^{f}	0.11^{f}	0.89^{f}	56.72^{a}	24.76^{c}	12.99^{ab}	0.05^{d}	1.95^{f}
4	0.86^{f}	0.39^{f}	0.19^{f}	1.51^{f}	57.11^{ab}	25.73^{bc}	13.03^{ab}	0.04^{d}	2.52^{e}
8	1.40^{e}	0.62^{e}	0.31^{e}	2.47^{e}	56.56^{b}	24.86^{cd}	12.71^{bc}	0.19^{b}	3.42^{c}
12	1.93^{d}	0.84^{d}	0.42^{d}	3.42^{d}	56.62^{b}	24.47^{d}	12.21^{bc}	0.23^{a}	3.93^{ab}
15	2.66^{c}	1.30^{c}	0.58^{c}	4.77^{c}	55.76^{b}	27.13^{a}	12.07^{c}	0.18^{b}	3.71^{b}
21	4.57^{b}	2.15^{b}	1.06^{b}	8.16^{b}	55.99^{b}	26.20^{ab}	12.96^{ab}	0.14^{c}	3.11^{d}
48	5.58^{a}	2.84^{a}	1.44^{a}	10.41^{a}	53.75^{c}	27.17^{a}	13.64^{a}	0.16^{bc}	4.17^{a}
Prob.	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
MSD	0.433	0.213	0.098	0.741	1.655	1.214	0.819	0.039	0.276
Prob. Subst X Removal time	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0007

Table S2. Effect of substrates (UF) isolated from Nuts_F and Nuts_CC on SCFA and NH_4^+ concentrations and their interaction with removal time during *in vitro* fermentation for 48 h.

Substrates	Acetate	Propio-nate	Butyrate	Total SCFA	% of total SCFA			BCR*	NH_4^+
					Acetate	Propionate	Butyrate		
	(mmol/g^{-1} DM)								
Nuts									
Alm	1.7^{b}	0.9^{b}	0.3^{b}	3.2^{b}	55.1^{a}	25.9^{b}	11.2^{a}	0.23^{a}	3.8^{a}
Mac	1.6^{c}	0.9^{b}	0.3^{b}	3.1^{b}	53.9^{b}	27.2^{ab}	11.2^{a}	0.23^{a}	3.8^{a}
PNut	2.4^{a}	1.3^{a}	0.4^{a}	4.3^{a}	55.0^{a}	27.6^{a}	10.6^{b}	0.19^{b}	3.9^{a}
Prob.	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
MSD	0.09	0.05	0.02	0.16	0.11	1.35	0.59	0.02	0.10
Particle Size									
CC (Larger)	1.7^{b}	0.9^{b}	0.3^{a}	3.2^{b}	54.2^{a}	25.9^{b}	11.7^{a}	0.24^{a}	4.0^{a}
F (Smaller)	2.1^{a}	1.2^{a}	0.3^{a}	3.9^{a}	55.2^{b}	27.9^{a}	10.3^{b}	0.20^{b}	3.6^{b}
Prob.	<0.0001	<0.0001	0.6352	<0.0001	0.0142	<0.0001	<0.0001	<0.0001	<0.0001
MSD	0.06	0.04	0.02	0.11	0.76	0.92	0.40	0.01	
Removal time (h)									
0	0.4^{g}	0.19^{f}	0.11^{f}	0.79^{g}	56.8^{ab}	24.4^{c}	13.9^{a}	0.06^{c}	2.2^{e}
4	0.7^{f}	0.33^{e}	0.17^{e}	1.28^{f}	56.6^{ab}	25.7^{bc}	13.4^{a}	0.05^{c}	2.9^{d}
8	1.1^{e}	0.40^{e}	0.24^{d}	1.87^{e}	58.5^{a}	21.0^{d}	12.9^{a}	0.27^{b}	3.6^{c}
12	1.4^{d}	0.59^{d}	0.28^{cd}	2.47^{d}	55.8^{b}	23.9^{c}	11.4^{b}	0.32^{a}	4.1^{b}
15	1.6^{c}	0.73^{c}	0.31^{c}	2.89^{c}	55.4^{b}	25.0^{c}	10.9^{b}	0.31^{a}	4.2^{b}
21	2.6^{b}	1.32^{b}	0.37^{b}	4.67^{b}	55.6^{b}	27.8^{b}	8.2^{c}	0.25^{b}	4.1^{b}
48	3.2^{a}	1.99^{a}	0.57^{a}	6.29^{a}	50.7^{c}	31.8^{a}	9.3^{c}	0.24^{b}	4.6^{a}
Prob.	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
MSD	0.19	0.111	0.050	0.34	2.28	2.78	1.21	0.031	0.22
Prob. Subst X Removal time	<0.0001	<0.0001	0.0024	<0.0001	<0.0001	0.0001	0.0387	<0.0001	<0.0001

*BCR = Ratio of branched-chain fatty acids (iso-butyrate, iso-valerate) and n-valerate to straight-chain fatty acids (acetate, propionate, butyrate)

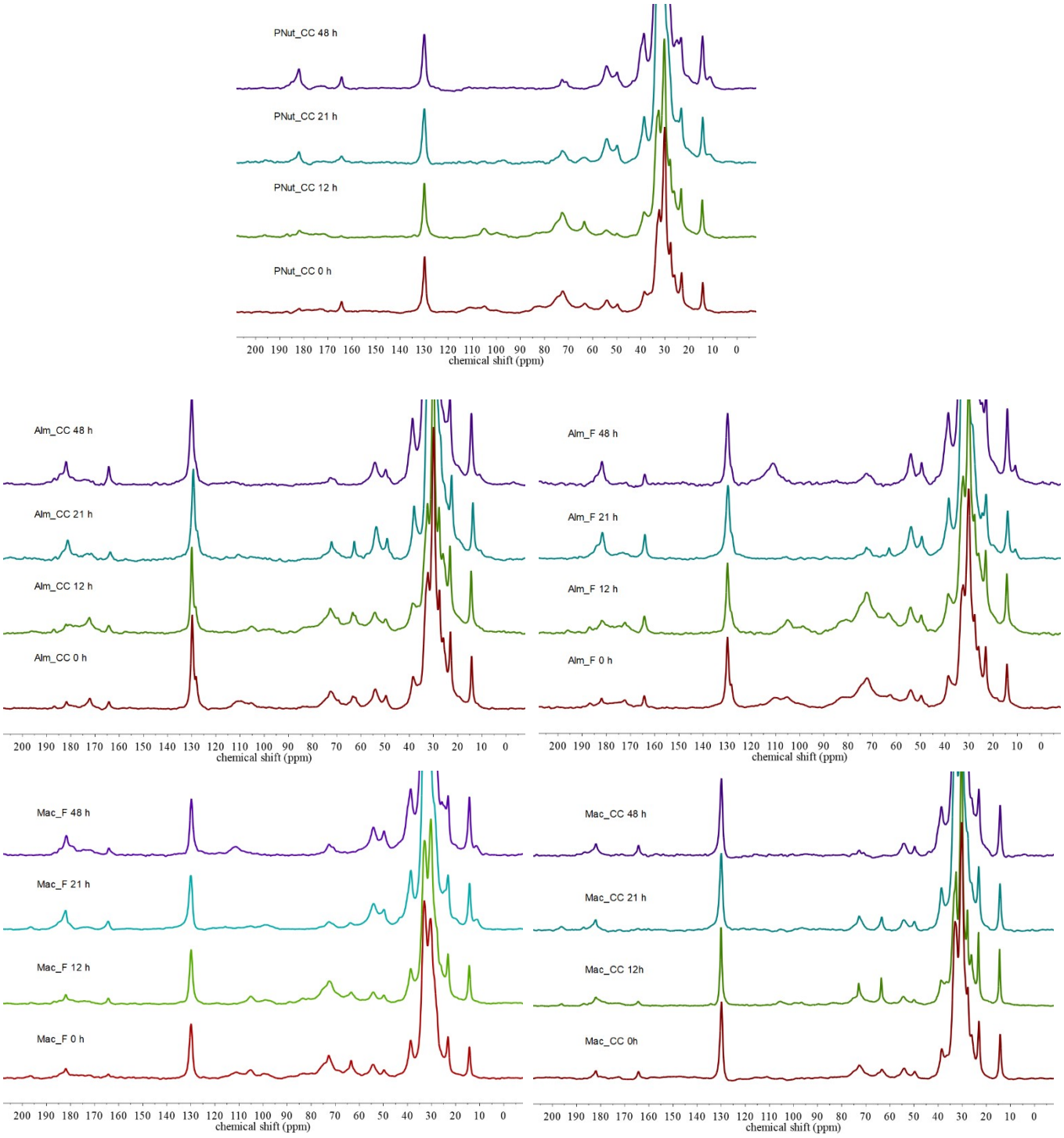

Fig S1. Solid-state ^{13}C CPSP/MAS NMR spectra of Nuts_F and Nuts_CC residues after 0, 12, 21 or 48h fermentation (equivalent spectra for PNut_F are shown in Fig 4)

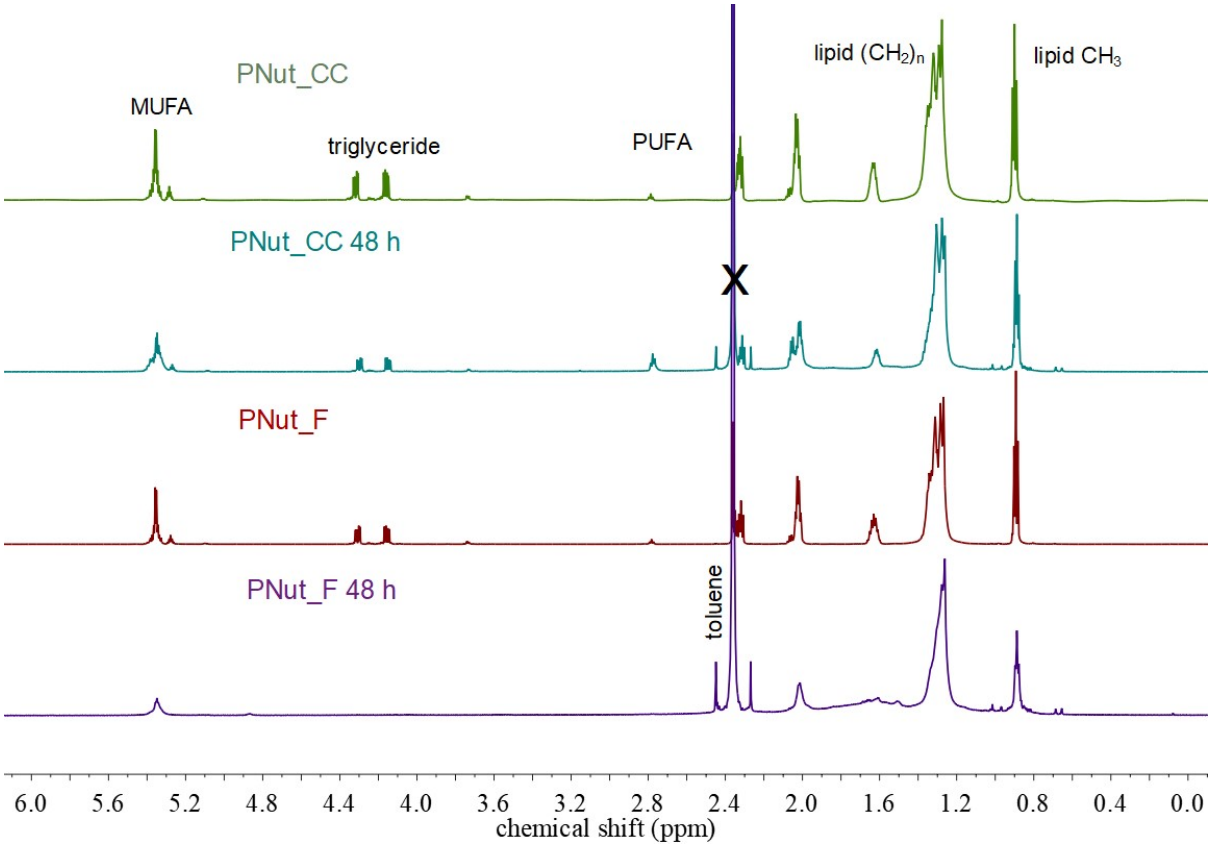

Fig S2. ^{1}H Solution-state NMR spectra of PNut_F (250-500 µm) and PNut_CC (710-1000 µm) before and after 48h fermentation.

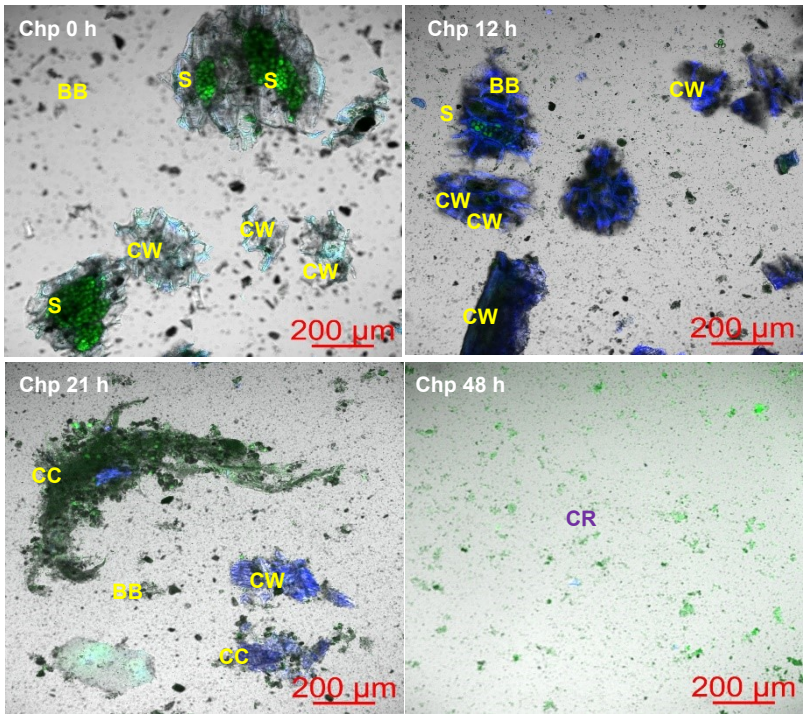

Fig S3. Microstructure features of Chp_F after *in vitro* fermentation for 0, 12, 21 and 48h. S = starch; CW = cell walls; CC = cell clusters; BB = bacterial biomass; CR=cell remnants

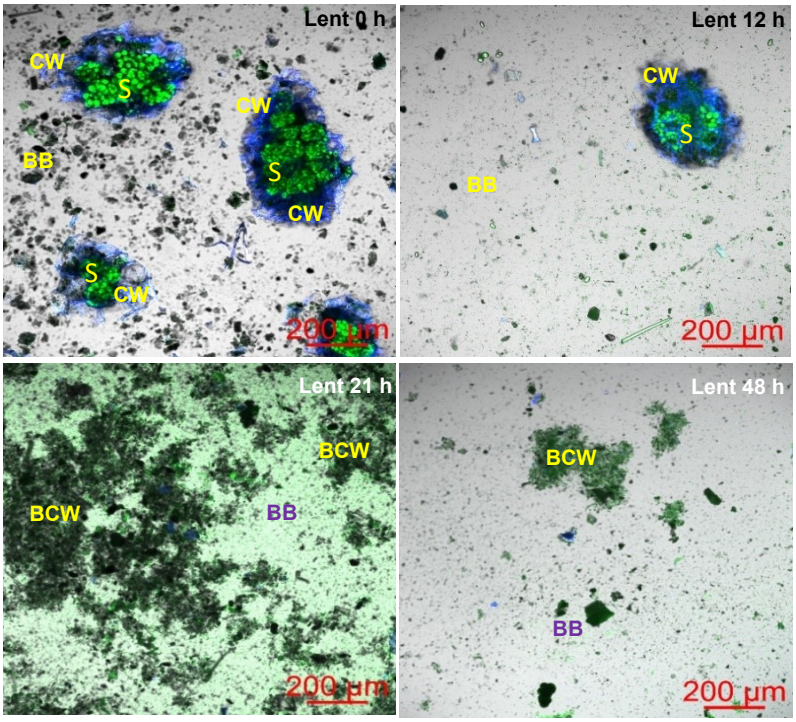

Fig S4. Microstructure features of Lent after 0, 12, 21 and 48h *in vitro* fermentation. CW = cell walls; S = starch; BB = bacterial biomass; BCW = broken cell walls

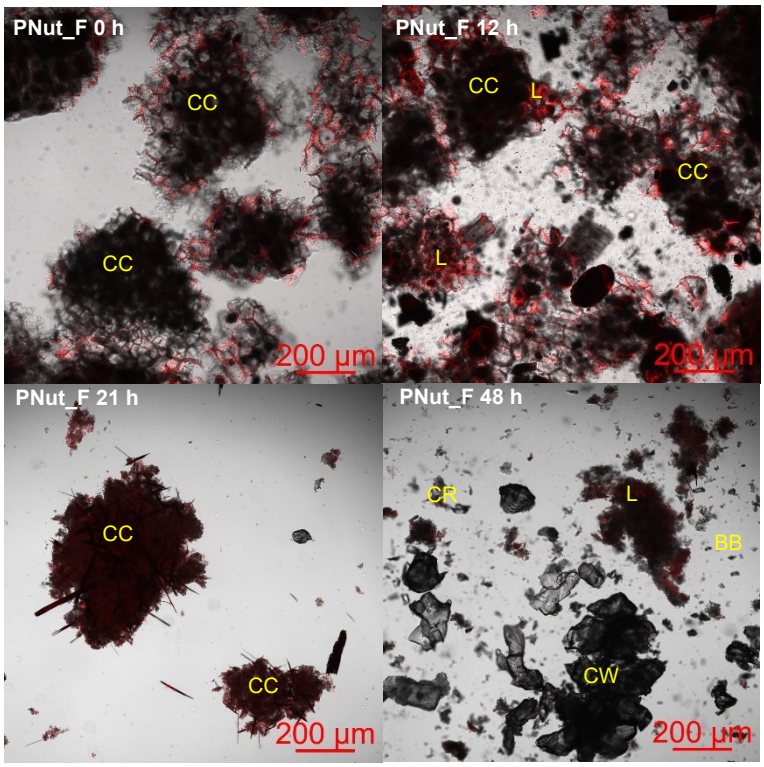

Fig S5. Microstructure features of PNut_F after 0, 12, 21 and 48h *in vitro* fermentation. L = lipid; CW=cell walls; CC = cell clusters; BB = bacterial biomass; CR = cell remnants

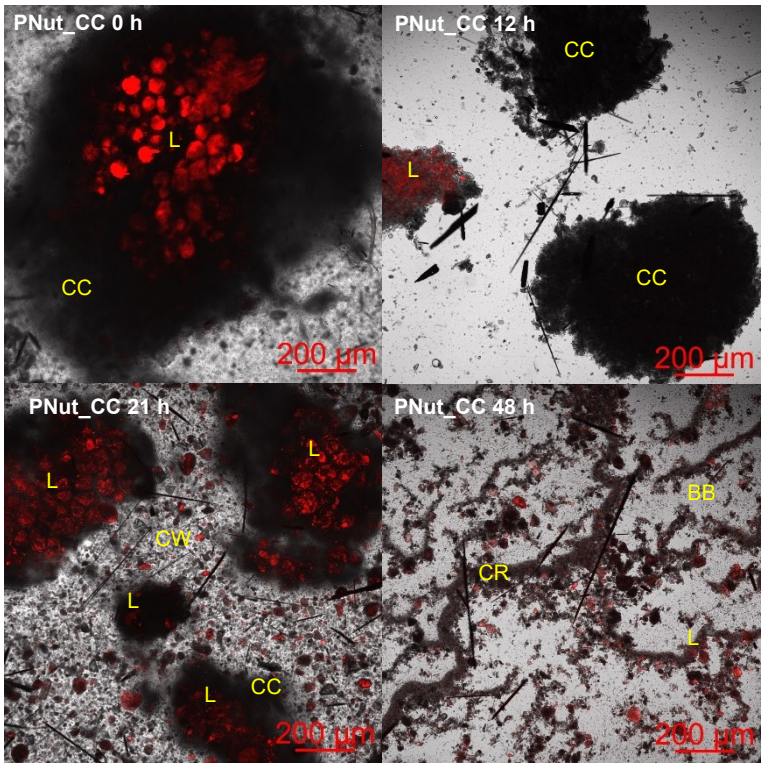

Fig S6. Microstructure features of PNut_CC after 0, 12, 21 and 48h *in vitro* fermentation. L = lipid; CW = cell walls; CC = cell clusters; BB = bacterial biomass; CR = cell remnants

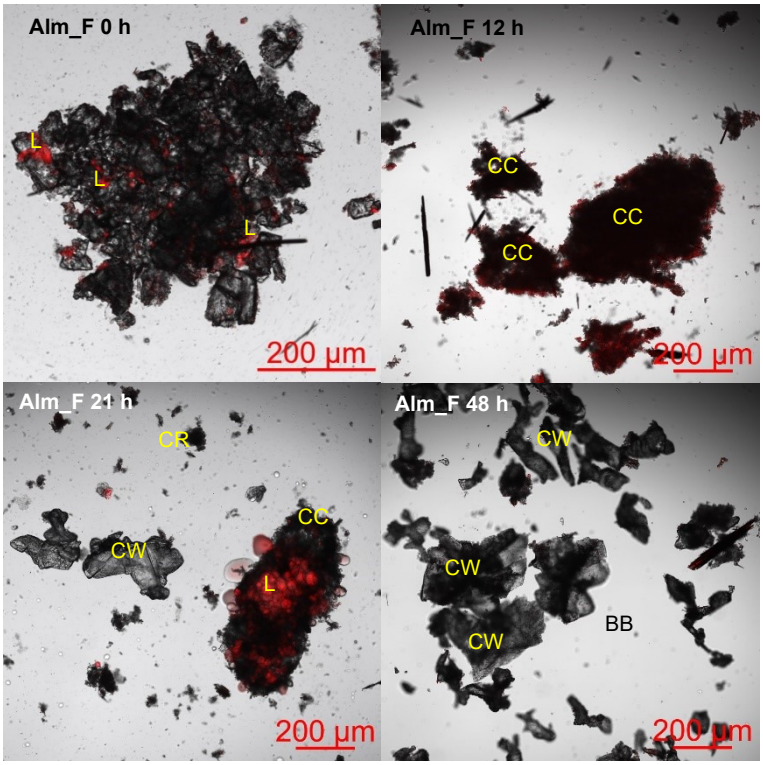

Fig S7. Microstructure features of Alm_F after 0, 12, 21 and 48h *in vitro* fermentation. L = lipid; CW = cell walls; CC = cell clusters; BB = bacterial biomass; CR = cell remnants

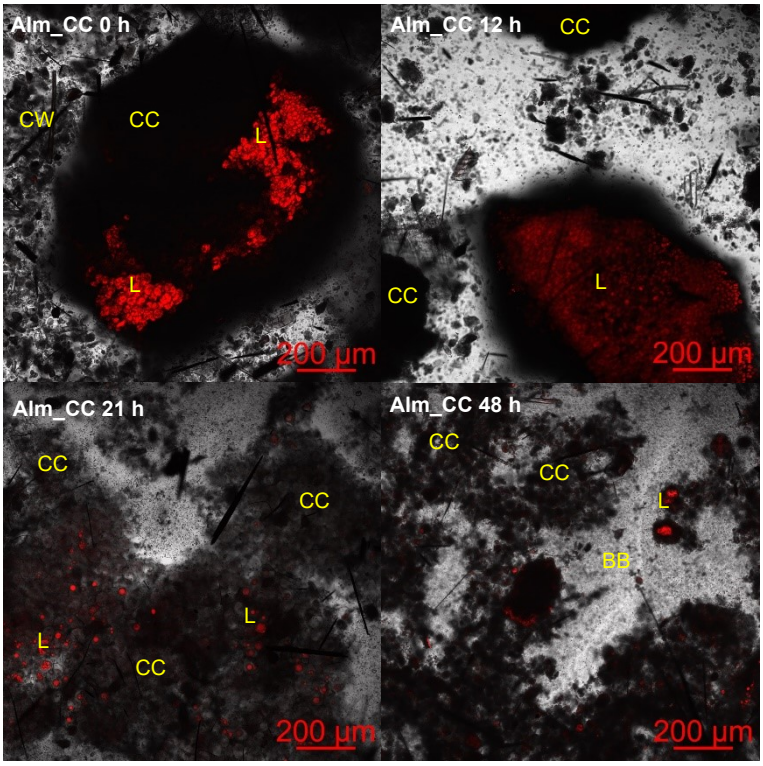

Fig S8. Microstructure features of Alm_CC after 0, 12, 21 and 48h *in vitro* fermentation. L = lipid; CW = cell walls; CC = cell clusters; BB = bacterial biomass; CR = cell remnants