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Supplementary Material

Roles of cigar microbes in flavor formation during roasted-rice leachate fermentation

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Supplementary figure

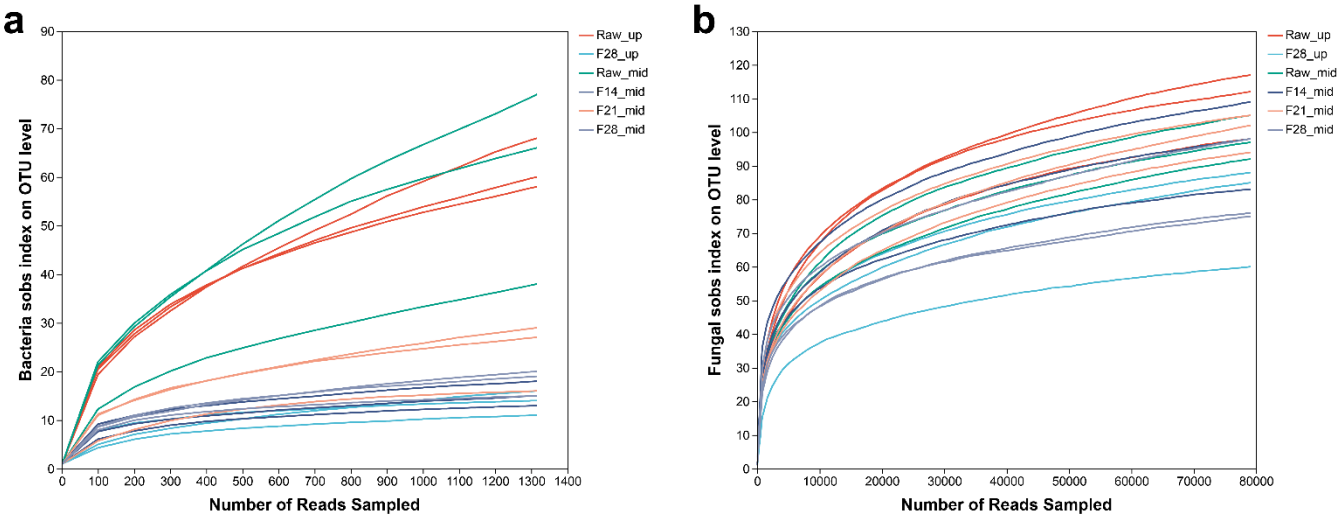

Figure S1 Bacterial (a) and fungal (b) dilution curve for cigar tobacco leaves with roasted-rice leachate fermentation

Supplementary tables

Table S1. Volatile flavor compounds of cigar tobacco leaves with roasted-rice leachate fermentation

Category	Name	Raw-up (μg/g)	F28-up (μg/g)	Raw-mid (μg/g)	F14-mid (μg/g)	F21-mid (μg/g)	F28-mid (μg/g)
Acids	Linoelaidic acid	N/A	0.030±0.001	N/A	N/A	N/A	N/A
	Hydroxydehydrostevic acid	N/A	N/A	N/A	N/A	0.052±0.014	N/A
Alcohols	Phytol	0.211±0.178	0.336±0.002	0.142±0.025	0.071±0.013	0.267±0.059	0.362±0.023
	Hexahydrofarnesol	0.452±0.041	0.261±0.004	0.669±0.051	0.274±0.029	0.326±0.162	0.310±0.009
Aldehydes	Benzaldehyde	0.165±0.021	0.389±0.010	0.177±0.049	0.277±0.000	0.141±0.007	0.173±0.004
	Citral	N/A	N/A	N/A	N/A	0.013±0.004	N/A
	Benzeneacetaldehyde	0.100±0.012	N/A	0.098±0.006	N/A	N/A	N/A
	Nonanal	0.0218±0.098	0.041±0.022	0.153±0.020	0.038±0.004	0.069±0.007	0.038±0.011
Alkanes	2,6,10-Trimethyltridecane	0.132±0.003	0.203±0.036	0.342±0.080	0.143±0.041	0.171±0.007	0.174±0.017
	Aromandendrene	N/A	0.026±0.004	N/A	N/A	N/A	N/A
	1-Nonene	0.046±0.003	N/A	N/A	N/A	N/A	N/A
	Neophytadiene	6.385±2.694	2.224±0.202	7.252±1.289	60.262±0.006	4.654±0.423	6.055±1.713
Esters	Formic acid, octyl ester	N/A	N/A	N/A	N/A	0.077±0.009	N/A
	Hexadecanoic acid, ethyl ester	0.078±0.015	0.304±0.073	0.204±0.065	0.621±0.060	0.138±0.017	0.579±0.018
	Tetradecanoic acid, ethyl ester	0.059±0.014	0.053±0.005	0.065±0.013	0.096±0.002	0.038±0.001	0.144±0.021
	Nonanoic acid, ethyl ester	0.048±0.001	N/A	N/A	N/A	N/A	N/A
	Dihydroactinidiolide	0.272±0.088	0.188±0.014	0.394±0.049	0.166±0.006	0.130±0.017	0.272±0.015
Furan	Phytofuran	0.272±0.064	0.298±0.047	0.226±0.073	0.349±0.048	0.439±0.023	0.344±0.007
Ketones	Ethosuximide	0.062±0.004	0.122±0.008	0.095±0.018	0.450±0.009	0.098±0.005	0.093±0.001
	Solanone	7.460±0.639	16.062±0.006	7.857±0.037	4.604±0.074	7.189±0.234	10.946±0.186
	Franesyl acetone	0.222±0.018	0.089±0.014	0.233±0.052	0.093±0.013	N/A	0.150±0.016
	Nerylacetone	1.395±0.018	N/A	0.842±0.140	0.333±0.052	0.243±0.021	0.761±0.011
	Hexahydropseudoionone	1.596±0.236	0.162±0.006	2.542±0.015	0.114±0.074	1.885±0.113	0.090±0.013
	Megastigmatrienone	1.252±0.164	0.606±0.020	2.145±0.377	0.566±0.038	0.914±0.043	1.837±0.106
Pyrazines	Nicotine, 1-N-oxide	0.008±0.003	0.005±0.001	N/A	N/A	0.535±0.024	N/A
	Pyridine, 3-(2-piperidinyl)-	N/A	0.015±0.002	N/A	N/A	0.339±0.015	N/A
	Myosmine	0.092±0.027	0.196±0.023	N/A	0.848±0.115	0.142±0.006	0.968±0.005
	L-Nicotine	66.437±0.614	116.839±0.313	89.376±2.130	92.318±2.442	120.065±1.129	183.178±3.681

N/A: not detected

27 **Table S2.** The relative abundance of principal microbes in cigar leaves during roasted-rice leachate fermentation

Principal microbes	Raw-up (%)	F28-up (%)	Raw-mid (%)	F14-mid (%)	F21-mid (%)	F28-mid (%)
Bacterial community						
p__Proteobacteria	6.31±1.99	0.31±0.24	8.00±7.59	7.00±9.49	3.97±2.11	0.19±0.05
g__Pseudomonas	0.86±0.34	0.09±0.10	4.65±5.79	0.02±0.02	2.09±1.46	0.02±0.01
g__Pectobacterium	0.97±0.58		0.05±0.04	0.02±0.02	0.01±0.00	
g__Pantoea	2.34±1.37	0.05±0.07	1.53±1.85	6.83±9.36	0.84±1.01	0.06±0.02
g__Massilia	0.10±0.04		0.03±0.01		0.02±0.01	
g__Delftia	1.08±0.36		0.33±0.46			
g__Ralstonia	0.12±0.09		0.05±0.04		0.68±0.92	
g__Sphingomonas	0.26±0.11	0.01±0.01	0.29±0.04	0.01±0.01	0.09±0.02	0.01±0.01
g__norank_f__Mitochondria	0.08±0.04	0.01±0.01	0.52±0.20	0.04±0.03	0.09±0.06	0.04±0.02
g__Methylobacterium-Methylorubrum	0.14±0.08	0.01±0.00	0.44±0.04	0.03±0.01	0.04±0.01	
p__Firmicutes	0.17±0.01	85.69±5.03	0.06±0.01	77.26±11.64	62.46±14.65	77.04±5.33
g__Staphylococcus	0.01±0.00	81.54±7.01	0.01±0.00	59.46±14.17	47.8±12.86	63.97±2.48
g__Vagococcus	0.08±0.02					
g__Weissella		1.32±0.61		2.85±0.46	1.91±0.76	1.70±1.03
g__Lactobacillus		0.10±0.03		0.82±0.67	0.69±0.31	0.69±0.23
g__Atopostipes		1.12±0.80		0.06±0.07	0.10±0.02	2.52±1.38
g__Aerococcus		0.41±0.35		1.79±0.36	1.72±1.15	2.36±1.79
g__Oceanobacillus		0.71±0.49		11.43±5.25	9.66±4.08	4.68±1.76
p__Actinobacteriota	0.04±0.02	11.66±4.78	0.08±0.03	4.28±2.81	1.38±0.72	12.16±3.76
g__unclassified_f__Micrococcaceae		1.52±1.09		0.02±0.01	0.06±0.02	2.68±1.29
g__Corynebacterium		10.11±3.83		3.97±2.65	1.25±0.72	9.27±2.58
Fungal community						
p__Ascomycota	85.74±1.69	72.07±2.75	56.33±1.13	44.61±19.9	77.01±5.48	64.72±21.24
g__Cladosporium	1.09±0.43	0.15±0.10	0.37±0.08	0.74±0.25	0.48±0.050	0.32±0.12
g__Alternaria	2.71±1.31	0.17±0.12	1.19±0.23	0.21±0.05	0.65±0.42	0.07±0.02
g__Aspergillus	80.22±0.76	48.54±15.92	53.71±1.15	26.31±9.92	67.66±5.73	58.35±20.21
g__Debaryomyces		20.24±19.46		11.23±6.82	4.55±1.34	4.71±2.16
g__Trichomonascus		0.71±0.74		1.97±1.78	0.14±0.05	0.19±0.07
g__unclassified_f__Nectriaceae		1.19±0.37	0.17±0.14	1.51±0.50	2.6±0.18	0.30±0.09
p__Basidiomycota	14.26±1.69	27.92±2.76	43.67±1.13	55.39±19.90	22.98±5.48	35.27±21.24
g__Cutaneotrichosporon		0.01±0.00		1.88±2.56	0.01±0.00	0.15±0.07
g__Trichosporon		0.10±0.04		1.02±1.07	0.10±0.04	0.61±0.22
g__Wallemia	13.69±1.79	27.73±2.75	43.49±1.14	52.27±22.54	22.52±5.35	34.45±21.23

28 The empty figure means relative abundance lower than 0.01%