The effect of rotational cropping of industrial hemp (*Cannabis sativa* L.) on rhizosphere soil microbial communities

Table S1. Source of seeds and growth condition.

Crop	Source	Temperature (℃)	Humidity (%)	Quantity (plant)
Industrial hemp	Institute of Cash Crops, Heilongjiang Academy of Agricultural Sciences	25-35	50-70	216
Watermelon	College of Horticulture and Landscape Architecture, Northeast Agricultural University	24-30	50-65	400
Potato	Institute of Cash Crops, Heilongjiang Academy of Agricultural Sciences	24-32	55-70	1000
Bean	College of Agriculture, Heilongjiang University	26-32	50-65	700

Table S2. The time table of the cultivation during the 3 years.

	Greenhouse 1	Greenhouse 2	Greenhouse 3	Greenhouse 4
In 2019	Industrial hemp (May 1 - October 12)	Industrial hemp (May 1 - October 12)	Industrial hemp (May 1 - October 12)	Industrial hemp (May 1 - October 12)
In 2020	Water (April 20 - August 20)	Potato (May 20 - October 23)	Bean (May 20 - September 20)	Industrial hemp (May 1 - October 12)
In 2021	Industrial hemp (May 1 - October 12)	Industrial hemp (May 1 - October 12)	Industrial hemp (May 1 - October 12)	Industrial hemp (May 1 - October 12)

Table S3 Diversity and richness indexes of bacterial communities under crop rotation systems

Sample name	Chao1 index	ACE index	Shannon index	Simpson index	Shannoneven index	Coverage index
CK	463.53±13.39a	463.08±7.66a	3.44±0.36a	0.05±0.062b	0.57±0.06a	0.99±0.001a
HWH	447.72±20.58a	447.89±26.01a	3.88±0.12a	0.04±0.005b	0.66±0.02a	0.99±0.003a
HPH	478.61±53.80a	506.65±85.32a	3.52±0.75a	0.06±0.115b	0.59±0.12a	0.99±0.001a
HBH	457.72±44.17a	455.95±35.03a	3.66±0.66a	0.03±0.095b	0.54±0.10a	0.99±0.001a
HHH	459.11±42.29a	410.87±29.48b	3.49±0.27b	0.14±0.026a	0.47±0.04b	0.99±0.001a

Note: CK, no crops planted; HWH, industrial hemp (year 1) - watermelon (year 2)- industrial hemp (year 3); HPH, industrial hemp (year 1) - potato (year 2) - industrial hemp (year 3); HBH, industrial hemp (year 1) - bean (year 2) - industrial hemp (year 3); HHH, industrial hemp in all three years. Values are means ± standard deviation. The same letters within a column indicate no significant differences between the means ($p > 0.05$). Different letters within a column indicate significant differences ($p < 0.05$).

Table S4 Diversity and richness indexes of fungal communities under crop rotation systems

Sample name	Chao1 index	ACE index	Shannon index	Simpson index	Shannoneven index	Coverage index
CK	3806.26±99.42a	3790.45±93.44a	6.68±0.04a	0.0055±0.0004ab	0.82±0.003a	0.98±0.007a
HWH	3824.53±96.96a	3824.73±74.95a	6.66±0.03ab	0.0055±0.0004ab	0.82±0.003a	0.98±0.001a
HPH	3850.32±82.12a	3832.76±44.66a	6.53±0.09ab	0.0058±0.0029ab	0.79±0.024a	0.98±0.001a
HBH	3749.29±79.94ab	3702.00±85.37ab	6.47±0.05ab	0.0056±0.0004ab	0.81±0.006a	0.97±0.001a
HHH	3569.80±67.61b	3571.17±25.74b	6.26±0.05b	0.0078±0.0007a	0.71±0.006b	0.98±0.001a

Note: CK, no crops planted; HWH, industrial hemp (year 1) - watermelon (year 2)- industrial hemp (year 3); HPH, industrial hemp (year 1) - potato (year 2) - industrial hemp (year 3); HBH, industrial hemp (year 1) - bean (year 2) - industrial hemp (year 3); HHH, industrial hemp in all three years. Values are means ± standard deviation. Same letters within a column indicate no significant differences between the means ($p > 0.05$). Different letters within a column indicate significant differences ($p < 0.05$).

Table S5. The relative abundance of bacterial communities at the phylum level

	CK	**HWH**	**HPH**	**HBH**	**HHH**
Proteobacteria	34.11±0.88a	32.41±0.96ab	33.56±1.33a	31.47±1.42b	28.40±0.92b
Acidobacteria	23.17±0.89a	20.96±0.93b	19.44±2.13b	21.19±1.15b	19.64±1.06b
Bacteroidetes	12.90±1.42a	12.87±0.97a	12.53±0.76a	10.33±0.91b	10.48±1.63a
Verrucomicrobia	5.76±0.77a	5.49±0.34a	5.95±0.31a	5.83±0.31a	4.59±0.27b
Actinobacteria	8.19±0.29a	6.07±0.49b	6.65±0.17b	5.25±0.39b	3.81±0.58c
Planctomycetes	3.54±0.55a	3.05±0.15a	2.62±0.26a	2.36±0.09a	2.74±0.11a
Gemmatimonadetes	3.52±0.09a	2.38±0.07b	2.33±0.25b	3.64±0.18a	2.90±0.27b
Chloroflexi	4.25±0.10a	3.01±0.21b	2.67±0.04b	2.32±0.16b	2.61±0.32b
Candidatus_Saccharibacteria	2.21±0.09a	2.01±0.23a	1.52±0.19a	1.83±0.24a	2.17±0.32a
Firmicutes	1.67±0.01b	1.96±0.12b	1.13±0.07c	2.91±0.59a	1.36±0.32b
candidate_division_WPS-1	1.53±0.03a	0.96±0.11a	1.11±0.16a	1.01±0.19a	1.34±0.16a
Nitrospirae	2.22±0.08a	1.91±0.07a	1.81±0.11a	1.64±0.12a	0.82±0.06b
Cyanobacteria_Chloroplast	1.34±0.33a	0.67±0.34a	0.99±0.11a	1.09±0.76a	0.72±0.15a

Note: CK, no crops planted; HWH, industrial hemp (year 1) - watermelon (year 2)- industrial hemp (year 3); HPH, industrial hemp (year 1) - potato (year 2) - industrial hemp (year 3); HBH, industrial hemp (year 1) - bean (year 2) - industrial hemp (year 3); HHH, industrial hemp in all three years Values are mean ± standard deviation. Same letters within a column indicate no significant differences between the means ($P > 0.05$). Different letters within a column indicate significant differences ($P < 0.05$).

Table S6. The relative abundance of fungal communities at the phylum level

	CK	HWH	HPH	HBH	HHH
Ascomycota	90.09±3.16a	3.16±2.82a	90.45±3.74b	2.82±5.44b	79.80±6.62b
Basidiomycota	15.52±2.58a	2.58±1.45b	9.06±1.26b	1.45±1.34b	9.54±1.51b
Mortierellomycota	2.20±0.28a	0.28±0.14b	1.53±0.13b	0.14±0.12b	1.63±0.29b
Mucoromycota	0.50±0.27a	0.27±0.27a	0.58±0.09ab	0.27±0.12a	0.24±0.03a
Chytridiomycota	0.79±0.02a	0.01±0.06a	0.59±0.03a	0.06±0.03a	0.70±0.08a

Note: CK, no crops planted; HWH, industrial hemp (year 1) - watermelon (year 2)- industrial hemp (year 3); HPH, industrial hemp (year 1) - potato (year 2) - industrial hemp (year 3); HBH, industrial hemp (year 1) - bean (year 2) - industrial hemp (year 3); HHH, industrial hemp in all three years Values are mean ± standard deviation. Same letters within a column indicate no significant differences between the means ($P > 0.05$). Different letters within a column indicate significant differences ($P < 0.05$).