

Soil Cover Improves Soil Quality in a Young Walnut Forest in the Sichuan Basin, China

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Supplementary tables and figures

Table S1 Composition (%) of the number of soil faunal individuals in the soil cover treatments.

Groups	Composition (%)				
	WF	BF	SN	MS	CK
Nematoda					
Secernentea	19.0 ⁺⁺⁺	20.1 ⁺⁺⁺	24.8 ⁺⁺⁺	21.6 ⁺⁺⁺	17.0 ⁺⁺⁺
Adenophorea	23.3 ⁺⁺⁺	19.4 ⁺⁺⁺	35.8 ⁺⁺⁺	16.0 ⁺⁺⁺	29.4 ⁺⁺⁺
Arthropoda					
Arachnida					
Monosphyronida	0.3 ⁺		0.2 ⁺	0.3 ⁺	
Araneomorphae	1.1 ⁺⁺	0.6 ⁺		0.8 ⁺	
Mesostigmata	1.1 ⁺⁺	4.7 ⁺⁺	2.5 ⁺⁺	0.8 ⁺	2.6 ⁺⁺
Prostigmata	17.2 ⁺⁺⁺	21.9 ⁺⁺⁺	12.0 ⁺⁺⁺	19.4 ⁺⁺⁺	17.0 ⁺⁺⁺
Oribatida	8.0 ⁺⁺	8.5 ⁺⁺	6.1 ⁺⁺	8.1 ⁺⁺	4.3 ⁺⁺
Protura					
Eosentomidae	0.3 ⁺			0.8 ⁺	0.4 ⁺
Onychiuridae	3.4 ⁺⁺		1.1 ⁺⁺	5.9 ⁺⁺	4.3 ⁺⁺
Sminthuridae	6.0 ⁺⁺	6.0 ⁺⁺	2.1 ⁺⁺	4.9 ⁺⁺	4.3 ⁺⁺
Isotonfidae	3.4 ⁺⁺	0.9 ⁺	1.9 ⁺⁺	2.2 ⁺⁺	
Entomobryide			3.6 ⁺⁺	1.0 ⁺⁺	
Poduridae	1.7 ⁺⁺	5.3 ⁺⁺		1.5 ⁺⁺	3.8 ⁺⁺
Insecta					
Sphaeropsocidae	0.3 ⁺	0.6 ⁺	0.2 ⁺	0.3 ⁺	1.3 ⁺⁺
Liposcelididae	0.3 ⁺	0.3 ⁺		0.2 ⁺	
Phlaeothripidae	0.9 ⁺	0.9 ⁺	0.6 ⁺	1.0 ⁺⁺	0.4 ⁺
Cicindelidae	3.4 ⁺⁺	4.1 ⁺⁺	2.5 ⁺⁺	2.2 ⁺⁺	3.0 ⁺⁺
Carabidae	1.7 ⁺⁺		2.1 ⁺⁺	0.5 ⁺	
Staphylinidae	4.9 ⁺⁺	4.1 ⁺⁺	1.9 ⁺⁺	2.9 ⁺⁺	5.1 ⁺⁺
Chrysomelidae larvae		0.3 ⁺	0.2 ⁺	0.8 ⁺	
Limnebiidae				2.9 ⁺⁺	
Ptinidae	1.7 ⁺⁺	0.9 ⁺	0.6 ⁺	1.5 ⁺⁺	1.3 ⁺⁺
Eucleidae	0.9 ⁺	0.3 ⁺	1.1 ⁺⁺	0.8 ⁺	
Formicidae	0.9 ⁺	0.9 ⁺	0.6 ⁺	3.4 ⁺⁺	6.0 ⁺⁺

⁺⁺⁺dominant; ⁺⁺common; ⁺ rare. WF: white film; BF: black film; SN: shade netting; MS: maize straw; and CK: control. Values are the averages of three plot replicates during the 27-month study period.

Table S2 Eigenvalues, variance explained, and eigenvectors from the first three principal components (PC₁, PC₂, and PC₃) of a principal component analysis (PCA) based on the full set of variables during the 27-month study period.

Variable	PC ₁	PC ₂	PC ₃
SOM (g kg ⁻¹)	0.658	0.414	0.097
Total N (g kg ⁻¹)	0.546	-0.689	0.156
Available N (mg kg ⁻¹)	0.614	-0.341	-0.037
Total P (g kg ⁻¹)	0.510	-0.509	0.008
Available P (mg kg ⁻¹)	0.517	-0.459	0.247
Total K (g kg ⁻¹)	0.495	0.123	0.553
Available K (mg kg ⁻¹)	0.015	0.348	0.831
pH	-0.439	0.480	0.152
<i>N</i>	0.825	0.295	-0.196
<i>S</i>	0.643	0.648	-0.146
MBC (mg kg ⁻¹)	0.791	0.371	-0.282
Eigenvalue	3.79	2.24	1.26
Variance explained (%)	34.5	20.4	11.4

Values in red correspond to eigenvectors with > 90% of the maximum weight per PC. SOM: soil organic matter; *N*: number of soil faunal groups; *S*: number of soil faunal individuals; and MBC: microbial biomass carbon. n=1485.

Table S3 Association between principal component analysis eigenvectors of the six selected variables (Pearson's r) during the 27-month study period.

Variable	SOM (g kg ⁻¹)	Total N (g kg ⁻¹)	Available K (mg kg ⁻¹)	<i>N</i>	<i>S</i>
Total N (g kg ⁻¹)	0.177				
Available K (mg kg ⁻¹)	0.236	-0.112			
<i>N</i>	0.503	0.217	-0.060		
<i>S</i>	0.632	-0.093	0.132	0.720	
MBC (mg kg ⁻¹)	0.562	0.094	-0.057	0.794	0.724

Value in red is Pearson's $r > 0.750$. SOM: soil organic matter; *N*: number of soil faunal groups; *S*: number of soil faunal individuals; and MBC: microbial biomass carbon. n=810.

Table S4 Summary statistics during the 27-month study period for the minimum number of soil variables required for soil quality assessment.

Variable	n	Minimum	Maximum	Mean	Standard deviation
SOM (g kg ⁻¹)	135	11.7	90.7	32.5	16.8
Total N (g kg ⁻¹)	135	0.574	2.64	1.68	0.402
Available K (mg kg ⁻¹)	135	37.1	296	101	36.7
S	135	3.00	41.0	16.1	9.23
MBC (mg kg ⁻¹)	135	205	1245	642	229

SOM: soil organic matter; S: number of soil faunal individuals; and MBC: microbial biomass carbon.

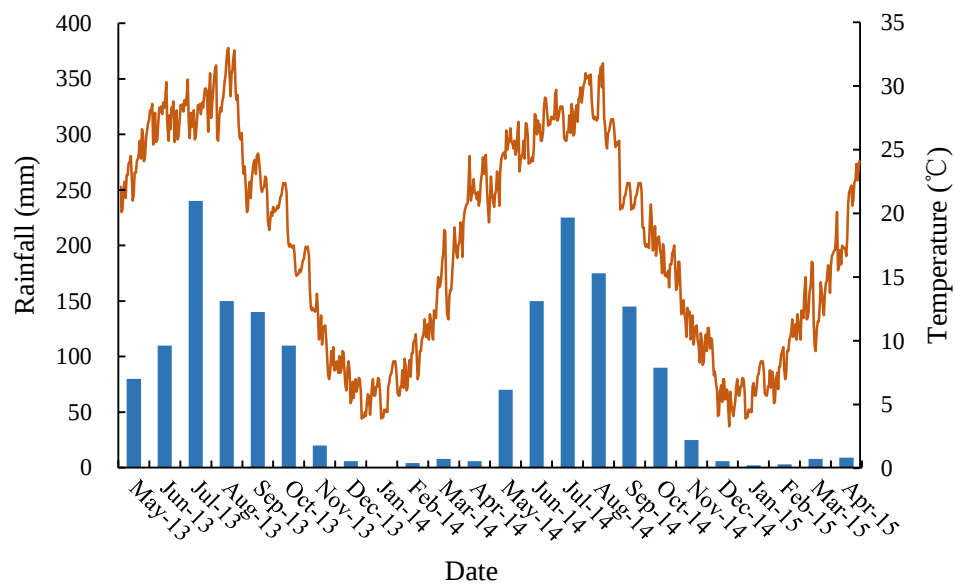


Figure S1. Rainfall (bars) and soil temperature (line plot) in the 0-5 cm soil layer from May 2013 to April 2015.

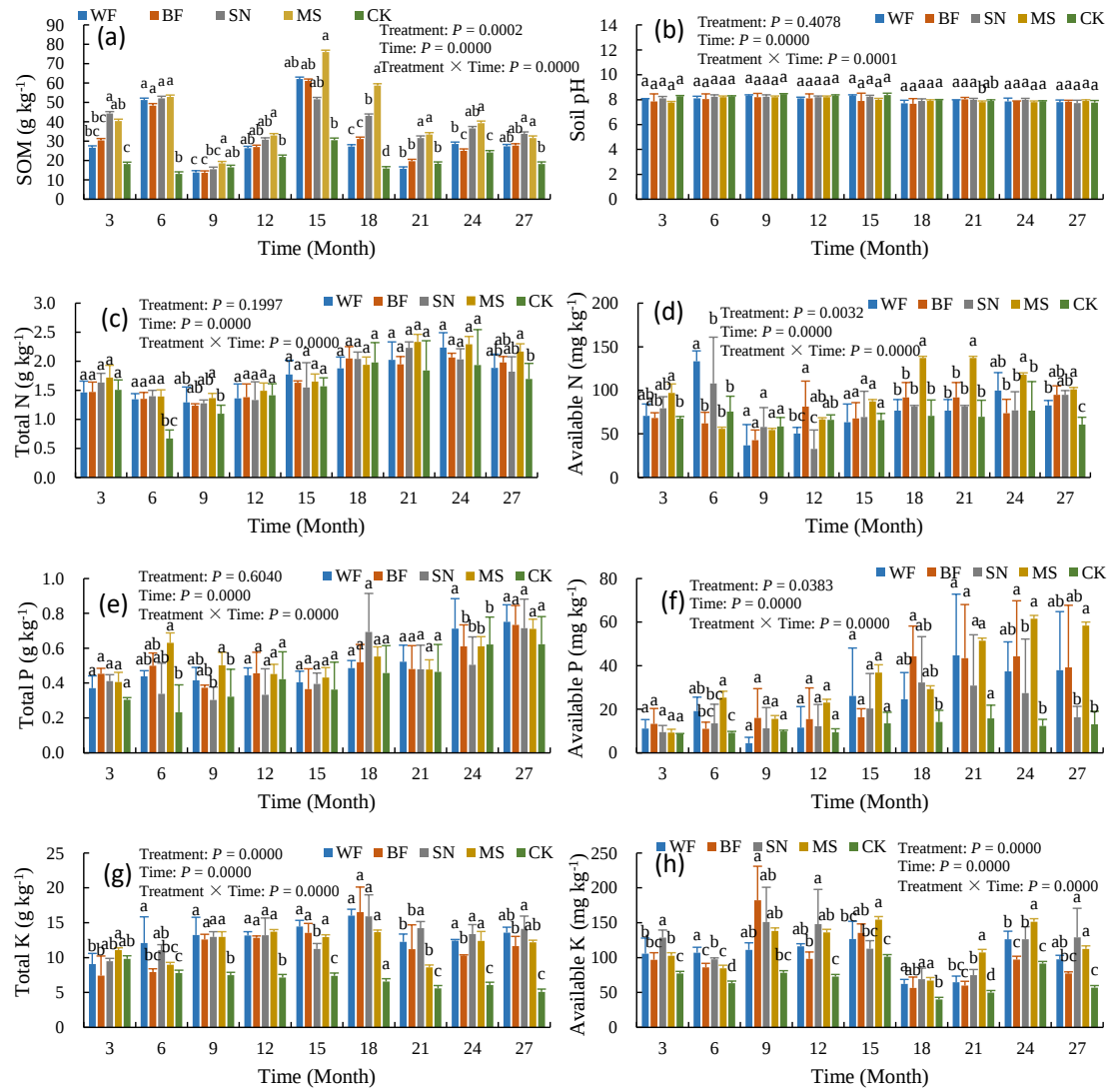


Figure S2. Dynamics of the soil nutrient contents and pH in the control and soil cover treatments at each sampling time. Different lowercase letters denote treatment differences at $P < 0.05$. SOM: soil organic matter; WF: white film; BF: black film; SN: shade netting; MS: maize straw; and CK: control. Values are the averages of three plot replicates $\pm$ SD; $n=1080$.

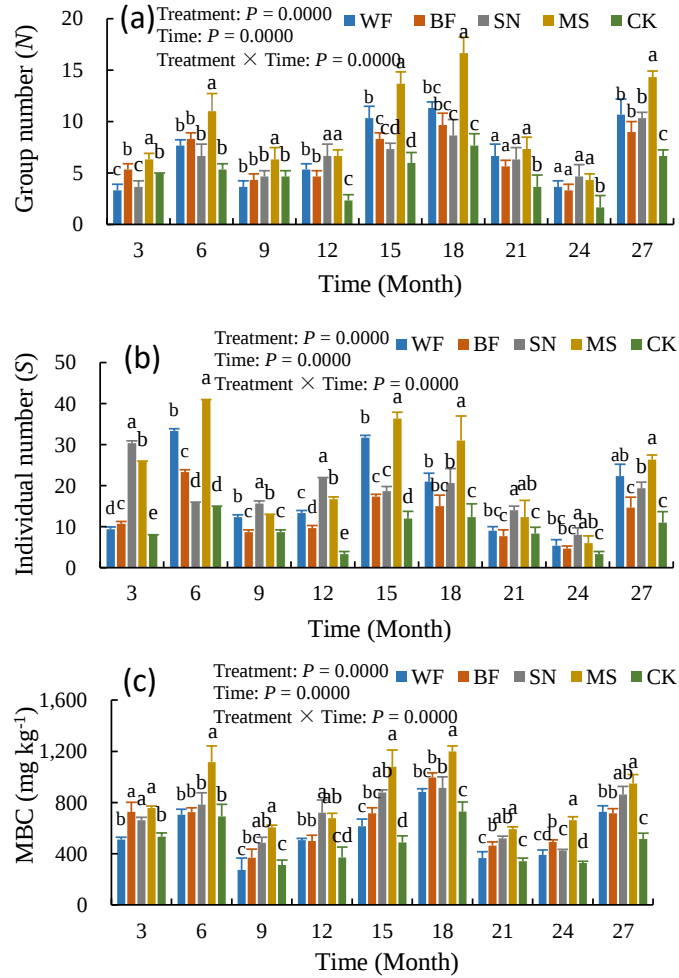


Figure S3. Dynamics of the number of faunal groups (a) and individuals (b) and microbial biomass carbon (c) in the control and soil cover treatments at each sampling time. Different lowercase letters denote treatment differences at $P < 0.05$. SOM: soil organic matter; WF: white film; BF: black film; SN: shade netting; MS: maize straw; and CK: control. Values are the averages of three plot replicates $\pm$ SD; $n=405$.