Figure S1. Study site and treatment. (**A**) Yunnan pine forest where the surface soil was collected. (**B**) collecting soil. (**C**) Seiving soil through a 20 mesh screen; (**D**) preparing the experimental plot using sieved soil. (**E**) building drainage canals for the experimental plot; (**F**) separating the experimental plot by heat-resistant bricks; (**G**) charcoal treatment in which 200 g of smoldering charcoal was placed in a thin iron box and left on the soil quadrats for one hour; (**H**) natural burning treatment in which dry pine needles was placed on the soil surface and burned; (**I**) treatment with flame gun.

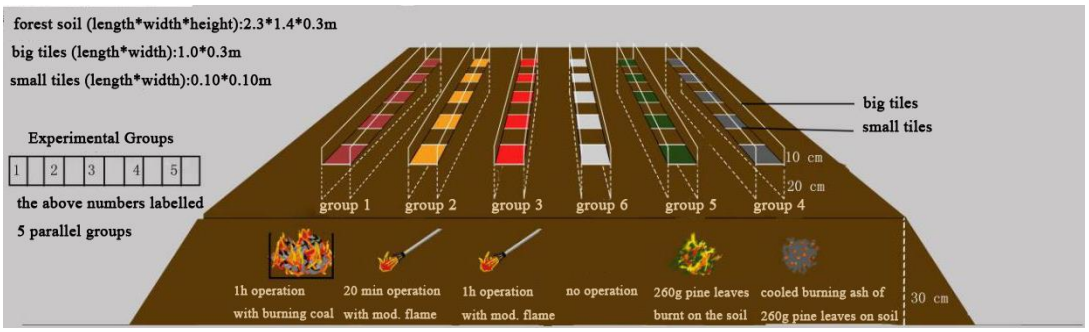

Figure S2. Drawing of the experimental plot illustrating how the various treatments are arranged.

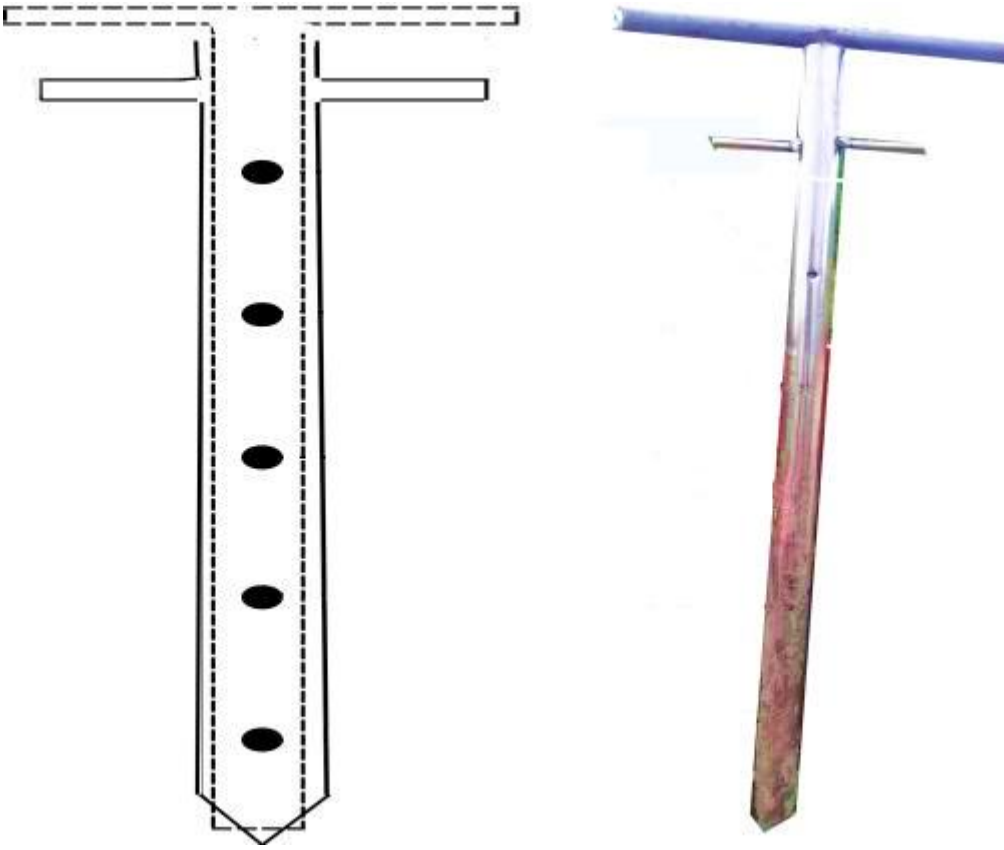

Figure S3. Handmade soil sampler (left: sketch, right: picture).

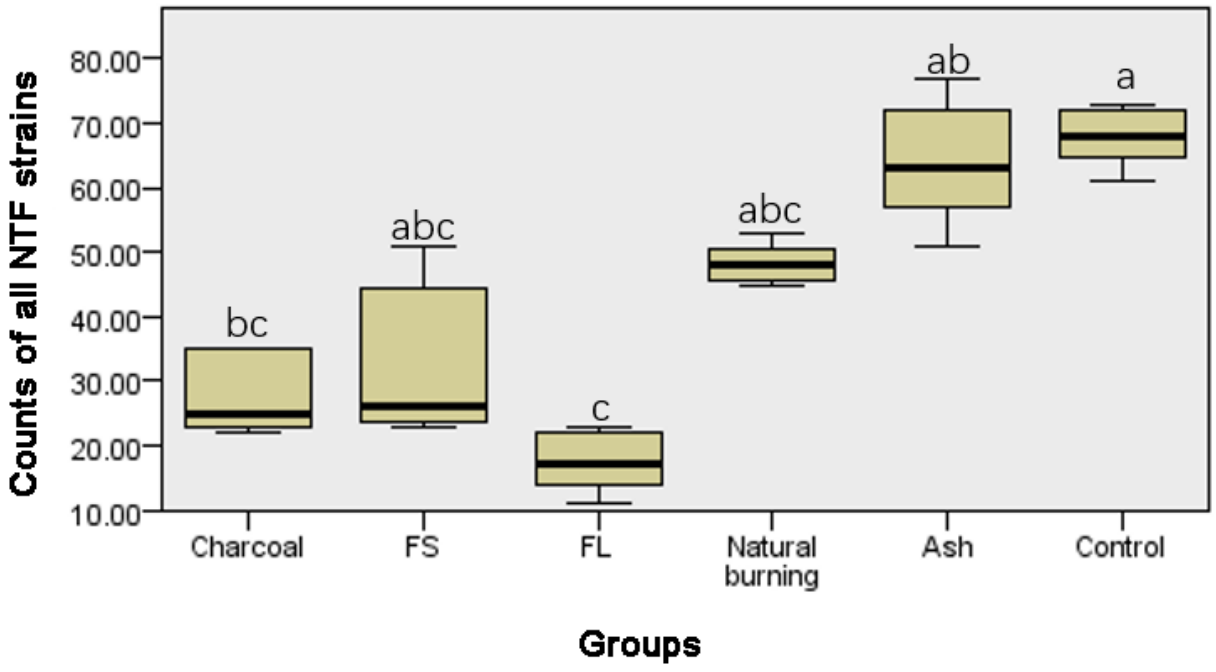

Figure S4. Counts of all nematode-trapping fungi (NTF) strains in each group. Error bars show the SD of the absolute values. Different letters above the bars indicate statistically significant variations ($p < 0.05$). FS: treated with flame gun and the burn duration was 20 min; FL: treated with flame gun and the burn duration was 60 min; Charcoal: treated with Charcoal; Ash: treated with cooled ash; Natural burning: treated

with dry pine needles placed directly on the soil and let burn naturally and ashes were left on the soil after burn; Control: without any treatment

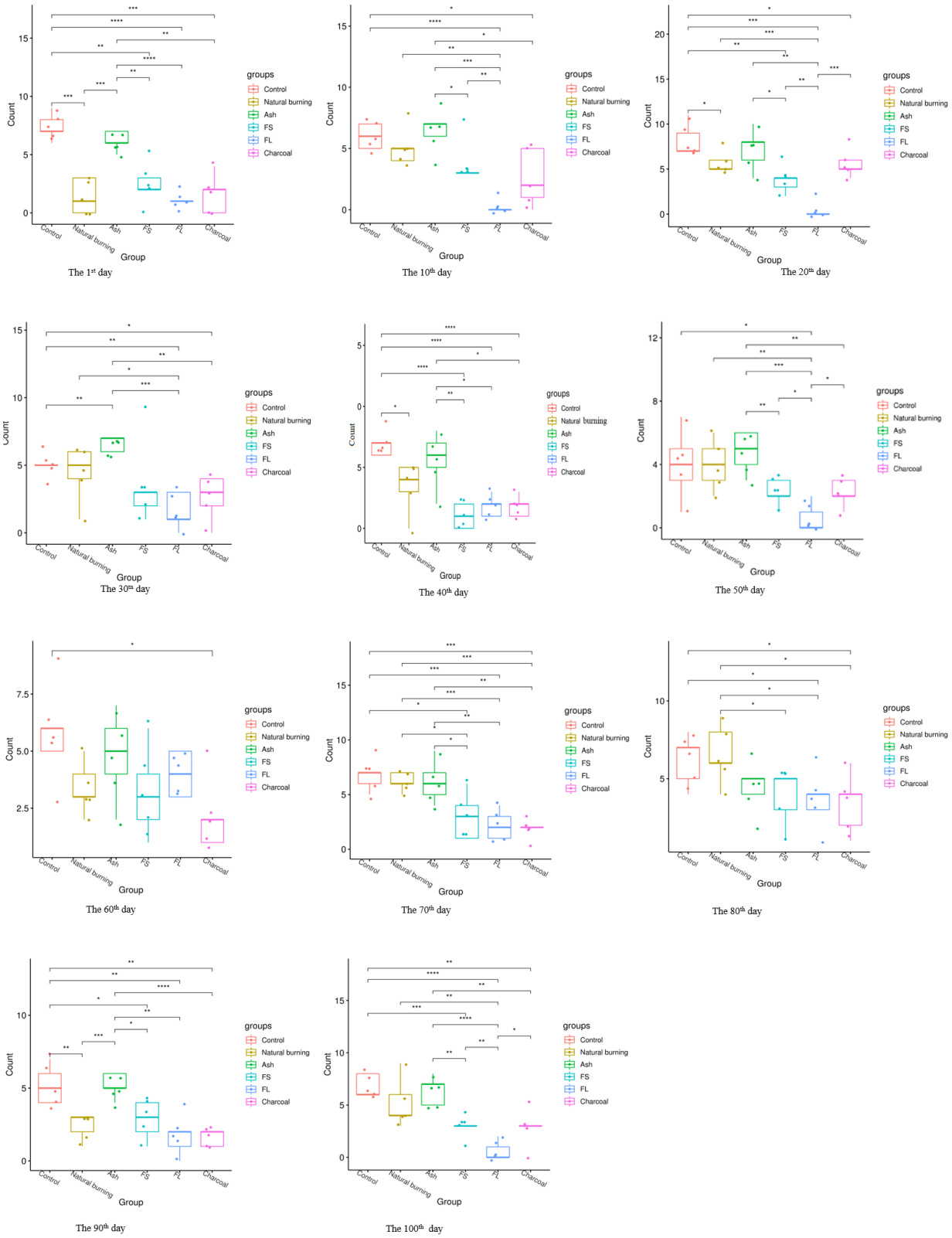

Figure S5. Difference in the counts of all nematode-trapping fungi (NTF) strains among groups at each time point with t test. *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$; ****: $p < 0.0001$. FS: treated with flame gun and the burn

duration was 20 min; FL: treated with flame gun and the burn duration was 60 min; Charcoal: treated with Charcoal; Ash: treated with cooled ash; Natural burning: treated with dry pine needles placed directly on the soil and let burn naturally and ashes were left on the soil after burn; Control: without any treatment.

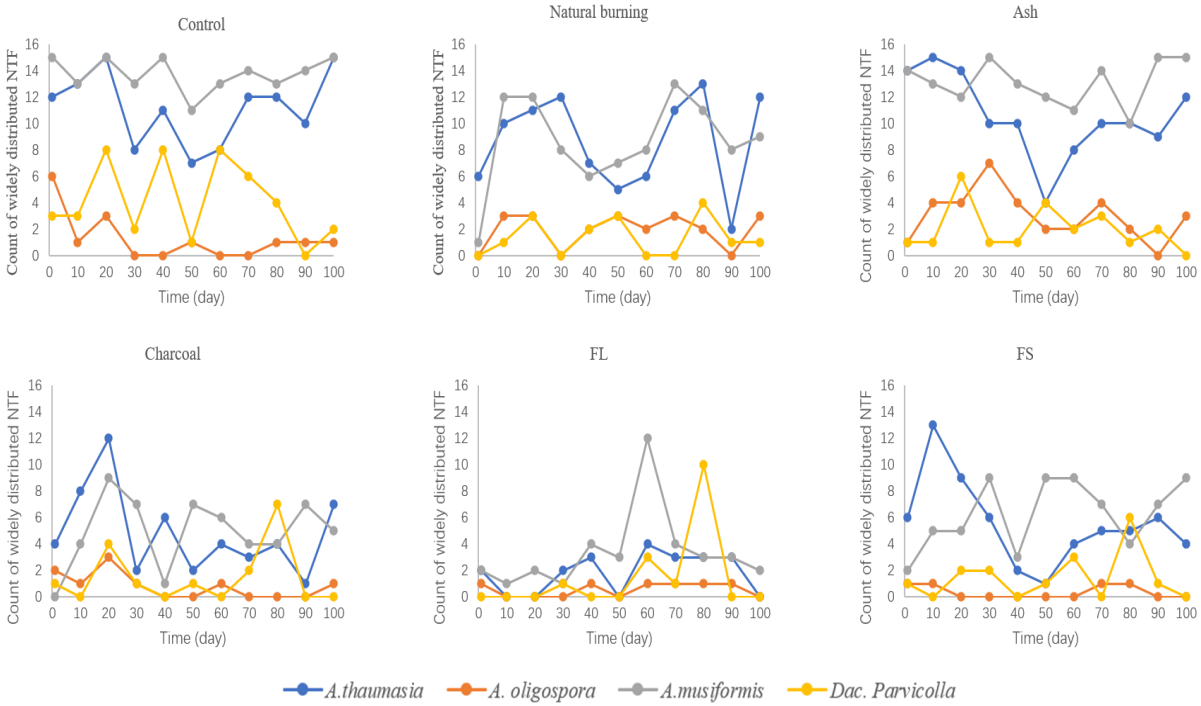

Figure S6. Variation over time in the counts of widely distributed species. FS: treated with flame gun and the burn duration was 20 min; FL: treated with flame gun and the burn duration was 60 min; Charcoal: treated with Charcoal; Ash: treated with cooled ash; Natural burning: treated with dry pine needles placed directly on the soil and let burn naturally and ashes were left on the soil after burn; Control: without any treatment.

Table S1. Soil physicochemical properties of each group at the three time points.

Time	Group	pH	Moisture	OM	TN	TP
D1	FL	4.36 ± 0.03 ab	8.26 ± 0.05 ab	95.99 ± 0.99 c	3.92 ± 0.05 c	225.97 ± 1.68 e
D1	FS	4.32 ± 0.025 ab	8.49 ± 0.01 ab	106.21 ± 1.58 b	4.50 ± 0.10 ab	238.71 ± 4.10 d
D1	Charcoal	4.42 ± 0.02 ab	6.14 ± 0.01 b	96.09 ± 2.14 c	4.59 ± 0.10 ab	484.09 ± 5.40 c
D1	Ash	4.79 ± 0.02 a	12.09 ± 0.08 a	115.10 ± 3.16 a	4.70 ± 0.21 a	636.80 ± 4.95 a
D1	Natural burning	4.80 ± 0.01 a	10.35 ± 0.13 ab	105.96 ± 2.58 b	4.61 ± 0.10 ab	641.67 ± 6.51 a
D1	Control	4.24 ± 0.02 b	12.05 ± 0.05 a	111.06 ± 2.75 a	4.42 ± 0.20 b	529.18 ± 3.84 b
D50	FL	4.42 ± 0.02 ab	33.82 ± 0.08 b	92.87 ± 0.81 b	3.46 ± 0.05 c	519.82 ± 1.74 b
D50	FS	4.43 ± 0.04 ab	35.20 ± 0.21 ab	93.61 ± 1.51 b	3.55 ± 0.08 c	520.22 ± 8.34 b
D50	Charcoal	4.53 ± 0.03 ab	35.79 ± 0.08 ab	96.50 ± 1.80 b	3.79 ± 0.19 b	559.51 ± 5.28 a
D50	Ash	5.48 ± 0.01 a	41.56 ± 0.49 a	111.90 ± 2.47 a	4.12 ± 0.14 a	766.29 ± 17.94 a
D50	Natural burning	5.03 ± 0.04 ab	36.33 ± 0.58 ab	108.81 ± 4.23 a	3.61 ± 0.12 bc	666.16 ± 4.80 a
D50	Control	4.31 ± 0.02 b	37.62 ± 1.46 ab	95.58 ± 2.91 b	3.62 ± 0.13 bc	736.88 ± 11.63 a
D100	FL	4.40 ± 0.00 b	35.42 ± 0.37 e	100.94 ± 0.92 c	3.73 ± 0.06 b	516.29 ± 5.78 d
D100	FS	4.41 ± 0.03 ab	37.32 ± 0.39 c	106.62 ± 1.47 b	3.62 ± 0.13 b	595.20 ± 5.37 c
D100	Charcoal	4.42 ± 0.01 ab	36.98 ± 0.08 d	101.96 ± 2.57 c	3.97 ± 0.06 a	509.65 ± 8.59 d
D100	Ash	5.19 ± 0.02 a	44.06 ± 0.11 a	119.17 ± 3.82 a	4.09 ± 0.10 a	705.42 ± 9.39 a

D100	Natural burning	4.78 ± 0.02 ab	39.76 ± 0.20 b	104.85 ± 2.40 bc	3.58 ± 0.08 b	610.15 ± 5.23 b
D100	Control	4.42 ± 0.03 ab	40.50 ± 0.50 a	106.12 ± 1.18 b	3.74 ± 0.21 b	462.31 ± 2.05 e

Note: Values are Mean ± standard error (n = 3); Different lowercase letters within the same line denote significant differences ($p < 0.05$) between treatments at the same time point. FS: treated with flame gun and the burn duration was 20 min; FL: treated with flame gun and the burn duration was 60 min; Charcoal: treated with Charcoal; Ash: treated with cooled ash; Natural burning: treated with dry pine needles placed directly on the soil and let burn naturally and ashes were left on the soil after burn; Control: without any treatment.

Table S2. The peak temperature at a depth of 5 cm in different groups.

Group Code	Peak Temperature (°C)
FL	402
FS	356
Charcoal	342
Ash	28
Natural burning	131
Control	28

Note: FS: treated with flame gun and the burn duration was 20 min; FL: treated with flame gun and the burn duration was 60 min; Charcoal: treated with Charcoal; Ash: treated with cooled ash; Natural burning: treated with dry pine needles placed directly on the soil and let burn naturally and ashes were left on the soil after burn; Control: without any treatment.

Table S3. Simple effects of soil Physicochemical properties on nematode-trapping fungi (NTF) communities.

Physicochemical Property	Explains(%)	Pseudo-F	*p*
OM	43.6	12.3	0.002
TN	22.9	4.7	0.022
TP	14.9	2.8	0.080
pH	9.4	1.7	0.216
MC	5.3	0.9	0.400

Note: OM: Organic matter; TN: Total nitrogen; TP: Total phosphorus; MC: Moisture content.