Supplementary Material

1 Materials and methods

1.1 Physical and chemical properties of soil

1.1.1 Determination of soil Available Phosphorus (AP)

2.5 g of sieved air-dried soil sample was used and shaken with 0.5 $mol \cdot L^{-1}$ sodium bicarbonate extraction for 30min. It was then filtered with phosphorous free filter paper, and the filter liquor was removed by suction. 5ml of Mo antimony colorimetric was added after dilution with 35ml of distilled water, mixed well, and incubated for 30min. The absorbance was measured at 700 nm. The sample without soil was used as the blank control.

1.1.2 Determination of soil Available Potassium (AK)

0.2 g air-dried soil was put into 2 ml LEP tube. It was added 1.6ml ammonium acetate solution, shaken and extracted at room temperature for 1h, centrifuged for 10minutes with 10000rin. Taken 1 ml supernatant into 10 ml centrifuge tube, added 2 ml distilled water, diluted and shaken well, and determined with flame photometer. The soil available potassium content was calculated by the following equation:

$$AK\ (mg/kg) = C \times \text{Dilution multiple} \times V_1/W \times 10^{-3} \times 39 \times 1000$$

Note: C (μmol/L) is the sample concentration; V (0.0016L) is the volume of added extract, W (g) is the sample mass.

Table S1 Basic information of 14 aged apple orchards

Sample	Longitude	Latitude
T1	109°48'14"	35°78'95"
T2	109°37'88"	35°78'43"
T3	109°40'92"	35°72'12"
T4	109°44'74"	35°64'21"
T5	109°45'08"	35°61'93"
T6	109°52'31"	35°74'04"
T7	109°52'80"	35°61'37"

T8	109°59'03"	35°70'62"
T9	109°57'73"	35°81'32"
T10	109°58'82"	35°79'13"
T11	109°56'82"	35°78'84"
T12	109°54'25"	35°86'33"
T13	109°56'02"	35°84'69"
T14	109°51'61"	35°79'73"

Table S2 Optimize sequence information

Amplified Region	Base-num	Mean length
ITS1F_ITS2R	2426088	258.78

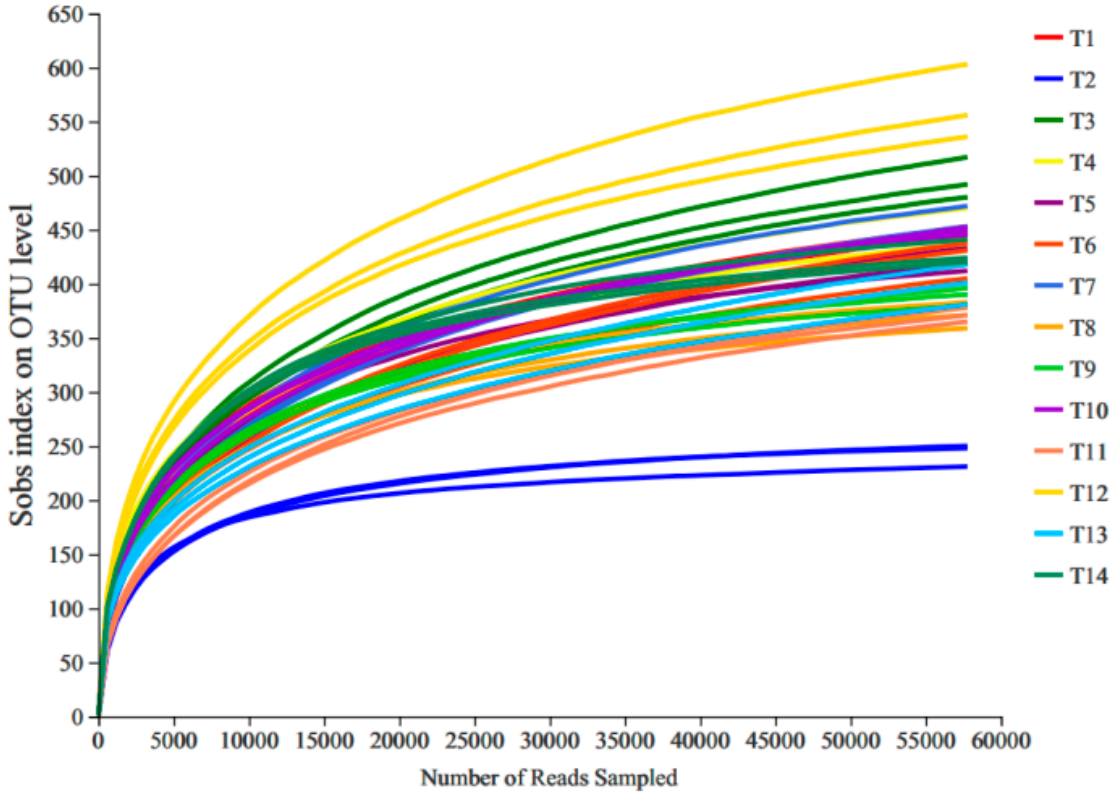

Figure S1 Rarefaction curves in soil samples from different aged apple orchards

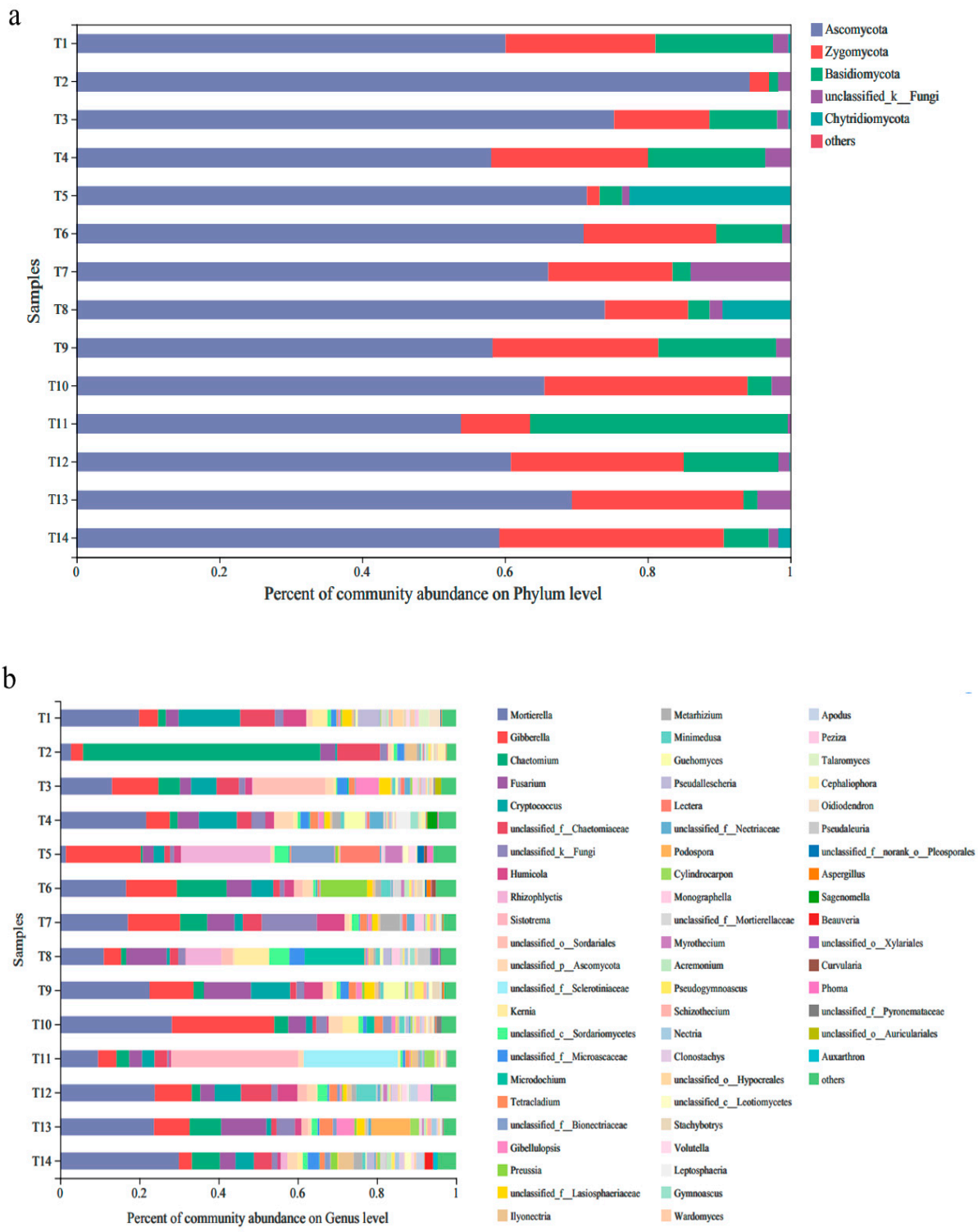

Figure S2 Analysis of soil fungal community composition in different aged apple orchards

Note: a: The composition of fungal community structure characterized by phylum level; b: The composition of fungal community structure characterized by genus level; T1: Gao Bao Village; T2: Lu Bai Village; T3: Bei Anshan Village; T4: Lunar Eclipse Village; T5: Bei Gu Village; T6: Yang Wu Village; T7: Bed Guang Rong Village; T8:

Bai Jia Zui Village; T9: Northwest Ding Village; T10: Shang Cao Di Village; T11: Shang Huang Zhang Village; T12: Gu Xian Village; T13: Jing Yao Ke Village; T14: A Si Village;