



# Dynamics of 18 (*Sophora Japonica*) Tree Individual Trunk Volume along Elevation Gradient in Ye County

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## Abstract

Applying communities diversity techniques and SPSS statistic analysis, this study quantify how that correlation between 18 (*Sophora japonica*) individual trunk volume and elevation along elevation. We concluded that there is a significantly positive correlation between 18 (*Sophora japonica*) individual trunk volume and elevation ( $P < 0.01$ ). Elevation is a key factor driver (*Sophora japonica*) individual trunk volume increased along elevation from 50m to 200m. Therefore, understanding dynamic connection between 18 (*Sophora japonica*) individual trunk volume and elevation can be not just applied to preserve of 18 (*Sophora japonica*) individual trunk volume, but also applied to sustainable of tree diversity and ecological processes of trunk volume of different tree individual specie along elevation at spiral-temporal-environmental scales in the future of Ye County in 2018.

**Keywords:** *Sophora japonica*; Individual trunk volume; Elevation gradient; Correlation; International pharmaceutical materials.

## 1. Introduction

The correlation between individual structure and elevation include tree structure and traits [1-3], structure and diversity of tree individual specie [4], tree individual structure and diversity and functioning [5, 6], tree individual structure in the different vegetation [7], tree diversity and structure [8], tree communities and individual height [9] in the dynamic environments along elevation at spatial-temporal-environmental scales in the different ecosystems. However, there are the correlation between of (*Sophora japonica*) tree individual trunk volume and elevation gradient in Ye County in 2018.

Unfortunately, the concept of tree individual structure is used as a framework for investigating the linkages between (*Sophora japonica*) individual and elevation in Ye County [9]. Moreover, more and more experiments have assessed the relationship between tree individual structure and elevation along elevation or environment or disturbance gradient [7-13]. For instance, Liao, *et al.* [9] found that (*Sophora japonica*) community's and individual

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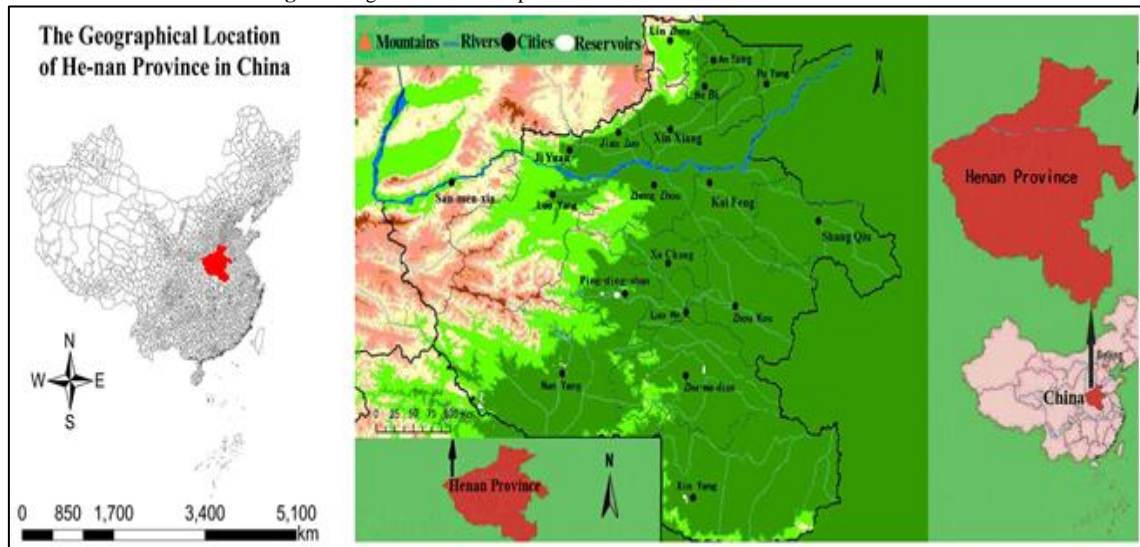
height were significantly correlated with elevation. Liao, *et al.* [11], Liao, *et al.* [12], found that the importance values of tree species's structure were significantly correlated with elevation along elevation on the northern and southern slope of the *Fu-Niu* Mountain [10, 11]. Liao, *et al.* [13] proposed that individual plant species biomass were significantly correlated with elevation in the wetland area of *Yi-Luo* River watershed [12]. Liao [14] suggested that biodiversity were significantly negatively correlated with disturbance [13]. Meanwhile, *Sophora japonica* is an important international pharmaceutical materials along elevation in *Ye County* [9].

Therefore, the objective was to define the correlation between (*Sophora japonica*) individual trunk volume and elevation at spatial-temporal-environmental scales in the different natural landscape and natural forest ecosystem types in *Ye County* in 2018.

## 2. The Physical Geographic Conditions and Study Methods

*Ye County* is an important county in *Ping-ding-shan Region*. The urbanization of ecosystem is results of the historical natural and human activities in *Ye County*. It is regional urbanization mostly in the height of more than 600 m (Figures1-2-3-4, Table 1-2). Three fields of plant diversity of investigations were conducted in 2018, investigating plant individual specie diversity in *Ye County* (Figures1-2-3-4; Table 1-2).

Fig-1. A Digital Cadastre Map of Location of He-nan Province in China



A field investigation was conducted in 2018, to study dynamics of (*Sophora japonica*) tree individual trunk volume and elevation along elevation in *Ye County*. The (*Sophora japonica*) community's ecosystem of *Ye County* is a dominated from 50 m to 650 m. Possessing steep environments along elevation, this area is idea for studying (*Sophora japonica*) tree individual trunk volume (Figures 1-2-3-4; Table 1-2).

Fig-2. Quadrate settings

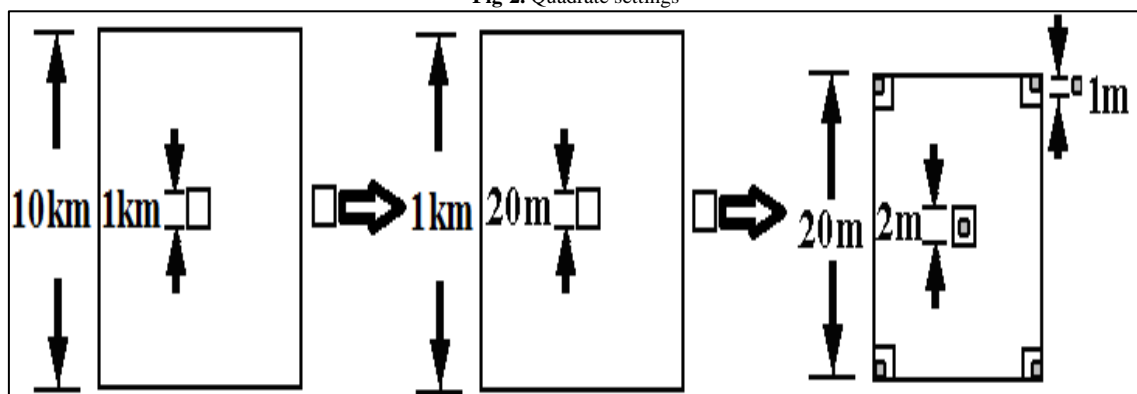
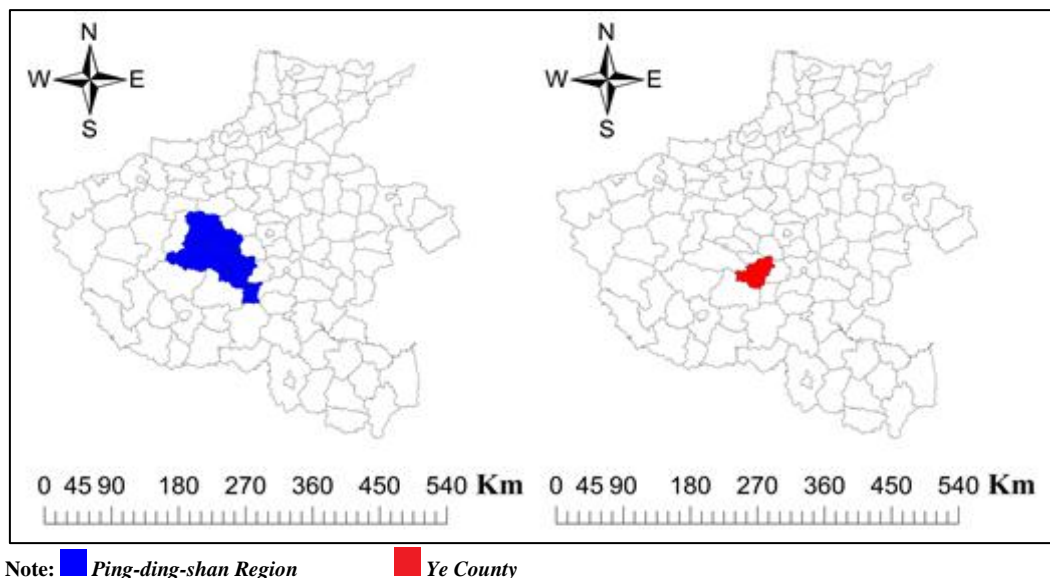


Table-1. The natural-physical geographic conditions and vegetation in *Ye County*

Location and Elevation	Climatic/Area	Vegetation (Plant Functional Groups)
Latitude(°): 33.42-33.68	Precipitation (mm):724	Trees:Ulmaceae/Cupressaceae/Moraceae/Moraceae /Platanaceae, <i>Sophora japonica</i> , et al.
Longitude(°): 113.27-113.46	Temperature(°C) (Mean) :15.2	Shrubs:Rhamnaceae/Verbenaceae/Buxaceae/Oleaceae /Rosaceae/Vitaceae/Bignoniaceae/Cornaceae, et al.
Elevation(m) †: 50-650	Sunlight: 2230h Area(km <sup>2</sup> ):1387	Herbs:Compositae/Leguminosae/Urticaceae/Gramineae/Con volvulaceae/Cyperaceae/Liliaceae/Umbelliferae, et al.

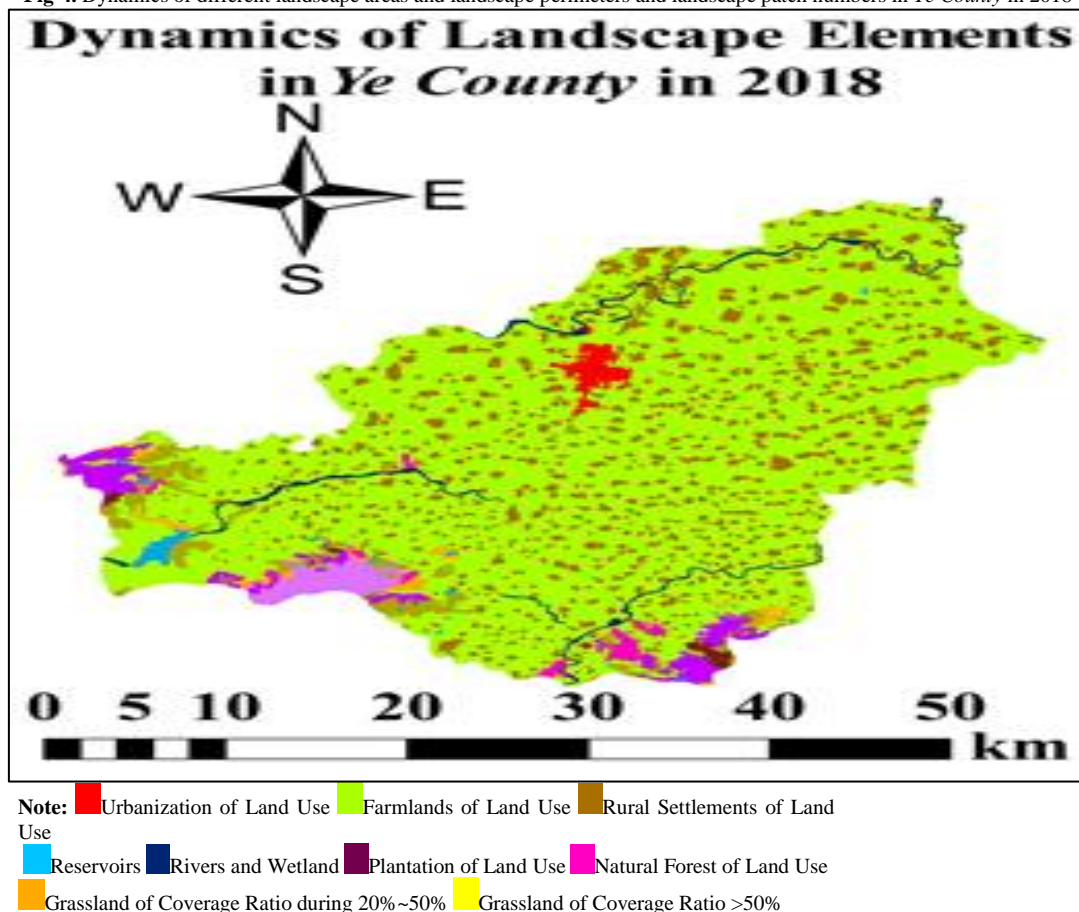
**Fig-3.** The Geographical Location of Ping-ding-shan Region in He-nan Province and the Geographical Location of Ye County in He-nan Province



†Above sea level.

Applying plant community ecology techniques, GIS of techniques, a number of landscape maps, SPSS statistic analysis, we investigated all plant species (dominant and companion communities) on the southern, southeastern, western, eastern, northern, southwestern, northeastern, and northwestern at spiral-temporal-environmental scales along elevation gradient in Ye County in 2018 (Figures 1-2-3-4; Table 1-2).

**Fig-4.** Dynamics of different landscape areas and landscape perimeters and landscape patch numbers in Ye County in 2018



There are 8 study plots establishing in per 10 m elevation by different azimuth and direction (East, West, South, Southeast, Southwest, North, Northeast, and Northwest) in 2018. A total of 60 plots were set in three times investigating. Each study plot (Figures 1-2-3-4), consisted of one 20 × 20 m tree layer quadrat, five (the center and four corners of the study plot) 2 × 2 m shrub layer quadrates and 1 × 1 m herb layer quadrates. Thus, there were 180 tree layer, 900 shrub layer, and 900 herbaceous layer quadrates (Fig.1-2-3; Tab.2-3). Moreover, different plant species identified during this investigation were assigned into three communities according to plant life form: 1) tree communities; 2) shrub communities; 3) herb communities [10-13].

Table-2. Investigation index along the elevation and disturbance gradient variable

Investigation	Disturbance Types /Intensity/Frequency	Layer	Community	Species	Height	Crow	Diameter
Different plant community investigation	Differential Artificial disturbance /Natural disturbance	Trees /shrubs /herbs	Coverage/ community's age structure	Species/ individual number	Different Layer's Height	Crow Height /width	Different basal diameter

### 3. Results

The study showed three rules of the correlation between (*Sophora japonica*) tree communities and elevation along different elevation gradients (Figure5; Table 3).

Firstly, these shows there are 18 (*Sophora japonica*) tree individual trunk volume along differential elevation gradient between 50 and 200 m in Ye County.

Secondly, this study show that 18 (*Sophora japonica*) tree individual trunk volume increased along elevation gradients. Meanwhile, the study analyzed the relationship between of 18 (*Sophora japonica*) tree individual trunk volume and elevation in Ye County. Regression equation is “ $y=0.0856x-2.7264$ , ( $R^2=0.719$ )”.

Thirdly, there is a significantly positive correlation between 18 (*Sophora japonica*) tree individual trunk volume and elevation ( $P<0.01$ ) in Ye County in 2018.

Thus, the research explained that elevation is the dominant environment factor driver of 18 (*Sophora japonica*) tree individual trunk volume increased along elevation gradient from 50 m to 200 m in Ye County.

Fig-5. Dynamics of 18 tree individual trunk volume along elevation gradient

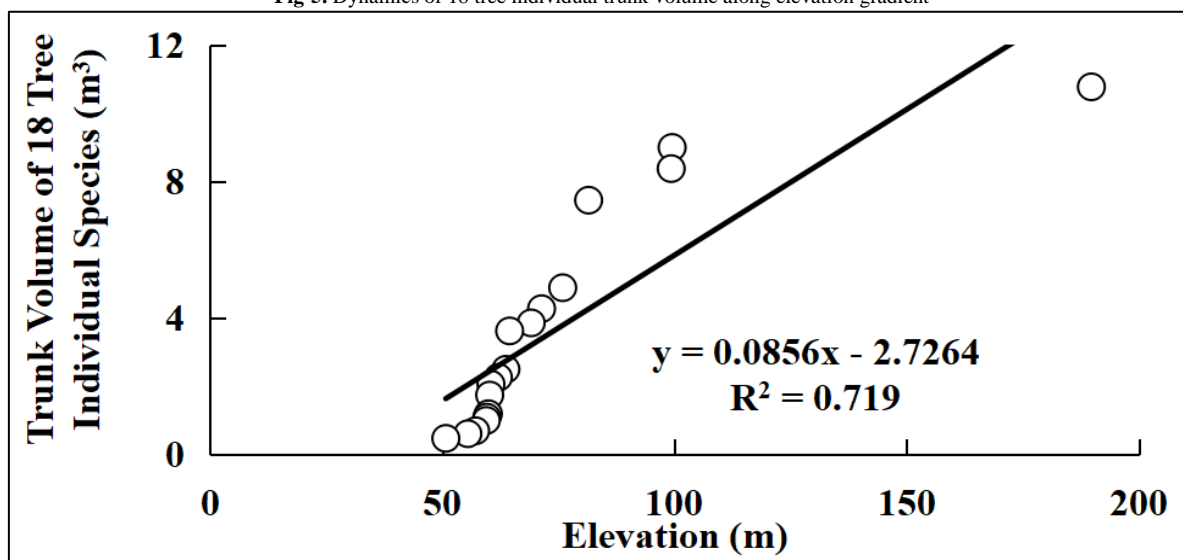


Table-3. Correlating to tree individual trunk volume and elevation gradient

Tree Individual Trunk Volume	Correlation between 18 ( <i>Sophora japonica</i> ) tree individual trunk volume and elevation gradient
( <i>Sophora japonica</i> ) Tree Individual Trunk Volume	0.848**

Note: \*,  $P<0.05$ ; \*\*,  $P<0.01$ .

### 4. Discussion

This study showed that three vital areas will substantially further effects to gain a rigorous understanding of three rules:

1. There are 18 (*Sophora japonica*) tree individual trunk volume along elevation gradient between 50 and 200 m of Ye County in 2018. Meanwhile, 18 (*Sophora japonica*) dominant tree individual trunk volume increased along elevation gradient. Regression equation is “ $y=0.0856x-2.7264$ , ( $R^2=0.719$ )”.

2. This study showed that there is a significantly positive correlation between 18 (*Sophora japonica*) tree individual trunk volume and elevation gradient ( $P<0.01$ ).

3. This study showed that elevation was the dominant environmental factor driver of 18 (*Sophora japonica*) individual trunk volume increased along elevation gradient.

Thus, the results indicate that elevation was the dominant environment driver of 18 (*Sophora japonica*) tree individual trunk volume increased along elevation. This study supported the experiments or models that elevation gradient is an important factor affecting dynamics of tree individual distribution [14], tree individual specie variation [15], composition and biomass of tree [16], dynamics of tree specie (structure and composition and diversity of tree) [17-19], structure and economics of tree individual leaf [20, 21], structure and regeneration of tree individual specie [22], structure growth and physiological responses of tree specie [23], tree structure growth rates

[24], dynamics of individual density and carbon and diversity [25, 26], different tree individual structure [27-34], along dynamic environment gradient in the different natural vegetation ecosystems along the different elevation gradient in *Ye County* in the future.

## 5. Conclusion

In this paper, the study explained that there is a significantly positive correlation between 18 (*Sophora japonica*) tree individual trunk volume and elevation gradient ( $P < 0.01$ ). This study explained that elevation is the key environmental factor driver of 18 (*Sophora japonica*) tree individual trunk volume of international pharmaceutical materials increased along elevation gradient from 50 m to 200 m in *Ye County* in 2018. Therefore, understanding dynamic connecting between 18 (*Sophora japonica*) tree individual trunk volume and elevation gradient can be not just applied to preserve of (*Sophora japonica*) tree individual specie diversity, but also applied to sustainable of biodiversity and processes of (*Sophora japonica*) tree individual trunk volume along elevation gradient at spatial-temporal-environmental scales in *Ye County* in the future.

## Acknowledgement

This work was supported by A Grade of Key Disciplines of Environmental Science Foundation of *Ping-ding-shan* University, B Grade of Key Disciplines of Materials Science of *Ping-ding-shan* University, Science and Technology Department of *He-nan* Province Foundation of China (KJT-17202310242), The Contracts of the Agreement on the Census of Forest Germplasm Resources in *Ping-ding-shan* City (PXY-HX-2017008, KY-2017103101), Science and Technology Department of *He-nan* Province Foundation of China (KJT-092102110165).

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