

International Journal of Research in Pharmaceutical and Nano Sciences

Journal homepage: www.ijrpns.com



DYNAMICS OF 18 (*SOPHORA JAPONICA*) TREE INDIVIDUAL SPECIES'S CROWN VOLUME ALONG ELEVATION GRADIENT IN YE COUNTY

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ABSTRACT

Applying plant communities diversity techniques and SPSS statistic analysis, we quantify how that the relationship between 18 (*Sophora japonica*) tree individual species's crown volume and elevation along different elevation gradient in Ye County in the paper. We concluded that there is a significantly positive correlation between 18 (*Sophora japonica*) tree individual species's crown volume and elevation ($P < 0.01$). Elevation is the dominant environment driver of (*Sophora japonica*) tree individual species's crown volume increased along elevation from 50m to 200m in Ye County in 2018. Therefore, understanding dynamic connecting of 18 (*Sophora japonica*) tree individual species's crown volume and elevation can be not just applied to preserve of (*Sophora japonica*) species, but also applied to sustainable of biodiversity and processes of tree species's crown volume along elevation gradient.

KEYWORDS

Relationship, (*Sophora japonica*) individual species, Crown volume, Elevation gradient and International pharmaceutical materials.

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INTRODUCTION

The relationship between tree individual species's structure and elevation include tree trait scaling and individual traits¹, tree structure and tree regeneration², tree growth and tree physiological changes³, tropical tree growth rates⁴, tree density and tree carbon⁵, tree leaf stomata and woody leaf trichomes⁶, tree canopy structure⁷ in the

environmental (size-dependent variations¹, latitudinal², warming³, elevation⁴, climate changes⁵, ecological environment^{6,7}) dynamics along elevation in the different ecosystems. However, there are the relationship between crown volume of (*Sophora japonica*) tree individual species and elevation along elevation gradient in *Ye County*.

Unfortunately, the concept of different tree community's structure is used as a framework for investigating the linkages between (*Sophora japonica*) communities and elevation habitats in *Ye County*⁷. Moreover, more and more experiments or models have assessed the relationship between plant individual species and elevation along elevation or environment or disturbance gradient⁷⁻¹³. For example, Liao, et al, (2011a; 2014) found that importance values of woody species's structure were significantly correlated with elevation along elevation gradient on the northern and southern slope of the *Fu-Niu* Mountain^{10,11}. Liao, et al, (2011b) proposed that plant species biomass were significantly correlated with elevation gradient in the typical wetland area of *Yi-Luo* River watershed¹². Liao, et al, (2014b) suggested that biodiversity were significantly negatively correlated with disturbance gradient¹³. Meanwhile, *Sophora japonica* is an important international pharmaceutical materials.

Therefore, the objective of this research was to define the relationship between crown volume of (*Sophora japonica*) tree individual species and elevation at different spiral-temporal-environmental scales in the forest ecosystem of *Ye County* in 2018.

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 anthropogenic activities in *Ye County*. It is regional urbanization mostly in the height of more than 600 m (Figures No.1-4, Table No.1-2). Three fields of plant diversity of investigations were conducted in 2018, investigating the indigenous plant diversity in *Ye County* (Figures No.1-4, Table No.1-2).

A field investigation was conducted in 2018, to study the dynamics of (*Sophora japonica*) tree community's height and elevation along elevation in the ecosystem of *Ye County*. The (*Sophora japonica*) tree community's ecosystem of *Ye County* is the dominated by natural ecosystem with tree species from 50 m to 650 m. Possessing steep environmental gradients along the different elevation gradient, this area is idea for studying (*Sophora japonica*) communities and species (Figures No.1-4, Table No.1-2).

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) along elevation on the southern, southeastern, western, eastern, northern, southwestern, northeastern, and northwestern along elevation at spiral-temporal-environmental scales in *Ye County* in 2018 (Figures No.1-4, Table No.1-2).

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 No.1-4), 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 (Figure No.1-3, Table No.2-4). 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 communities¹⁰⁻¹³.

RESULTS AND DISCUSSION

The study showed three rules of the relationship between (*Sophora japonica*) tree communities and elevation along different elevation gradients (Figure No.5, Table No.3).

Firstly, these shows there are crown volume of 18 (*Sophora japonica*) tree individual species along

differential elevation between 50 and 200 m in *Ye County*.

Secondly, this study show that the crown volume of 18 (*Sophora japonica*) tree individual species increased along elevation gradients of *Ye County* in 2018. Meanwhile, the study analyzed the relationship between crown volume of 18 (*Sophora japonica*) tree individual species and elevation gradient. Regression equation is “ $y=16.966x - 568.54$, ($R^2=0.7538$)”.

Thirdly, this study showed that there is a significantly positive correlation between crown volume of 18 (*Sophora japonica*) tree species and elevation ($P<0.01$).

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

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

There are crown volume of 18 (*Sophora japonica*) tree individual species along elevation gradient between 50 and 200 m of *Ye County* in 2018. Meanwhile,

the dominant (*Sophora japonica*) tree community increased along elevation gradients of *Ye County* in 2018. Regression equation is “ $y=16.966x - 568.54$, ($R^2=0.7538$)”.

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

This study showed that elevation was the dominant environment driver of crown volume of 18 (*Sophora japonica*) tree individual species increased along elevation.

Thus, the results indicate that elevation was the dominant environment driver of crown volume of 18 (*Sophora japonica*) tree individual species increased along elevation gradient. this study supported the experiments or models that elevation gradient is an important environmental factor affecting dynamics of tree communities distribution¹⁴, tree community variation¹⁵, species richness distribution¹⁶, dynamics of tree diversity (tree stand structure and tree community composition)^{17,18} in the natural ecosystems along the local elevation gradients in *Ye County* in the future.

Table No.1: The natural-physical geographic conditions and vegetation in *Ye County*

S.No	Location and Elevation	Climatic/Area	Vegetation (Plant Functional Groups)
1	Latitude(°): 33.42-33.68	Precipitation (mm):724	Trees: Ulmaceae/Cupressaceae/Moraceae/Moraceae /Platanaceae, <i>Sophora japonica</i> , et al.
2	Longitude(°): 113.27-113.46	Temperature(°C) (Mean) :15.2	Shrubs: Rhamnaceae/Verbenaceae/Buxaceae/Oleaceae /Rosaceae/Vitaceae/Bignoniaceae/Cornaceae, et al.
3	Elevation(m) †: 50-650	Sunlight: 2230h Area(km ²):1387	Herbs:Compositae/Leguminosae/Urticaceae/Gramineae/Convolvul aceae/Cyperaceae/Liliaceae/Umbelliferae, et al.

Table No.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

Table No.3: Correlating to crown volume of (*Sophora japonica*) species and elevation

S.No	Tree Individual Species	Relationship between crown volume of 18 (<i>Sophora japonica</i>) tree species and elevation
1	Crown Volume of (<i>Sophora japonica</i>) Tree Individual Species	0.868**

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

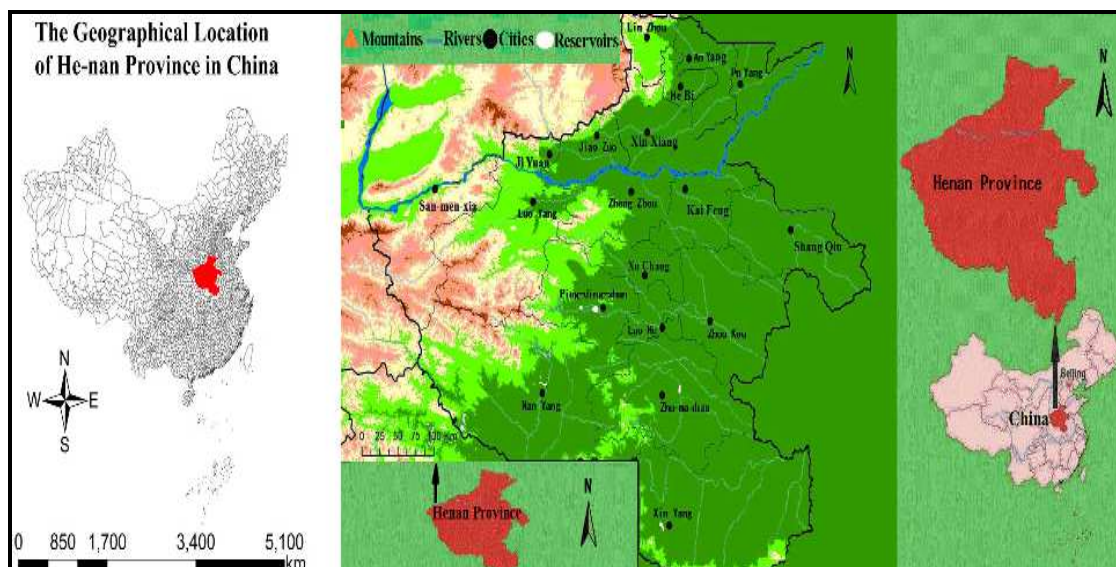


Figure No.1: A Digital Cadastre Map of Location of He-nan Province in China

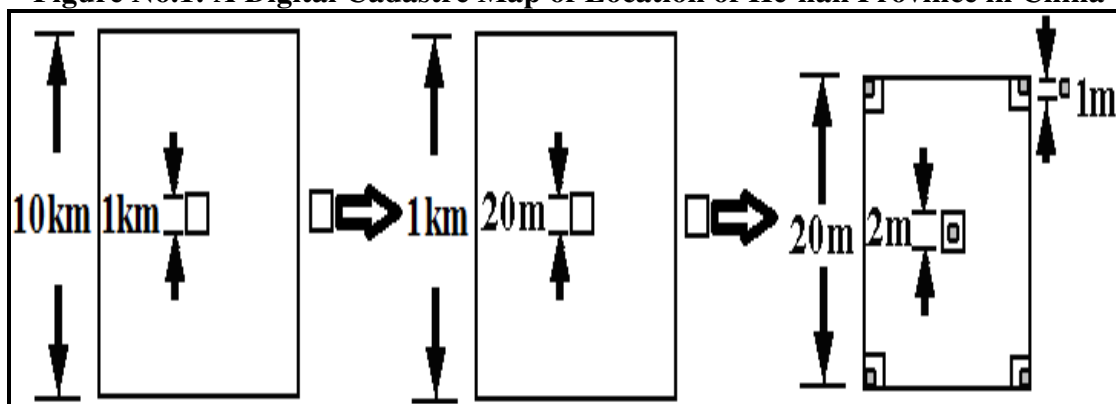


Figure No.2: Quadrate settings

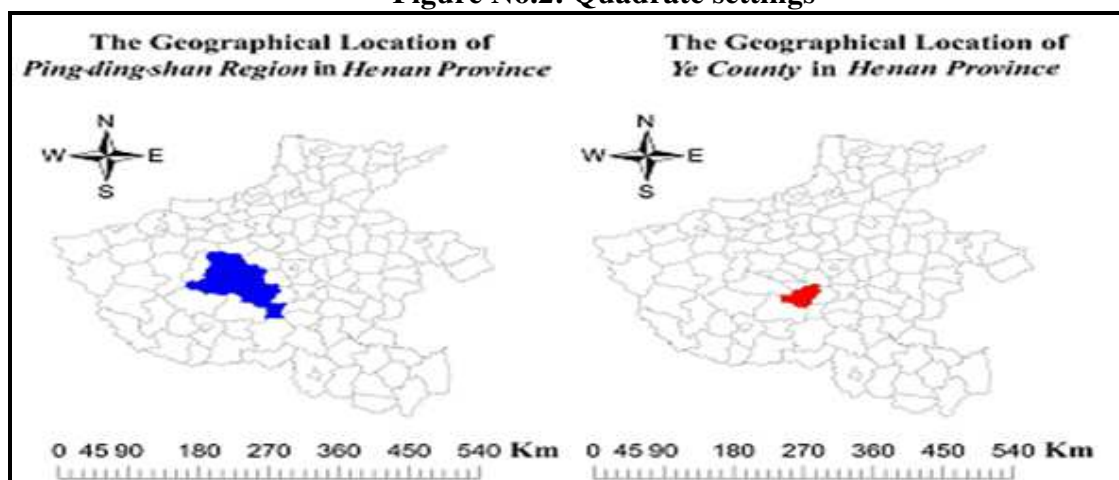


Figure No.3: The Geographical Location of Ping-ding-shan Region in He-nan Province and the Geographical Location of Ye County in He-nan Province

Note: ■ Ping-ding-shan Region ■ Ye County

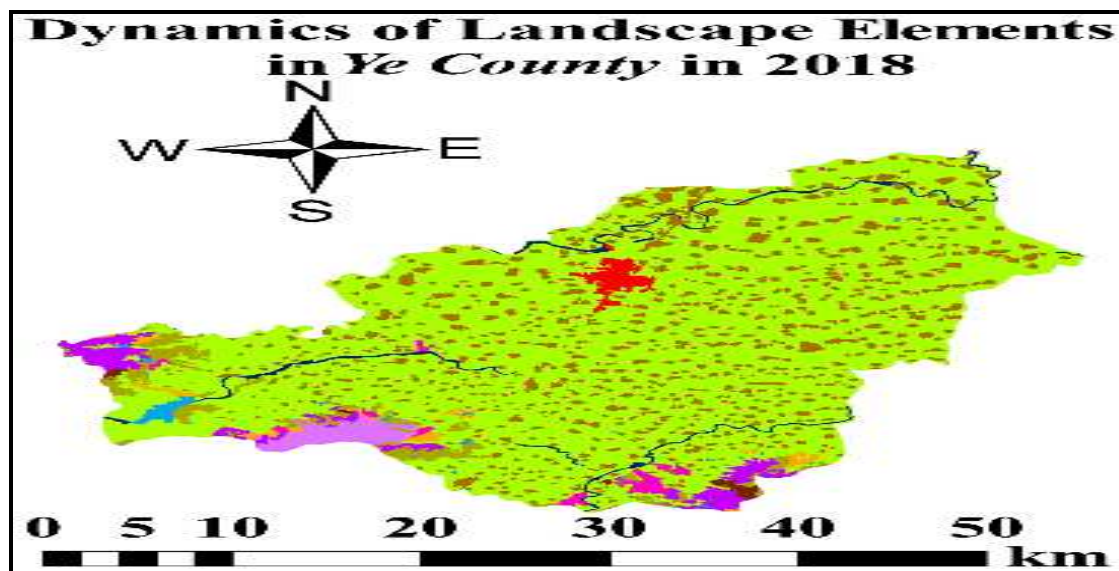


Figure No.4: Dynamics of different landscape areas and landscape perimeters and landscape patch numbers in Ye County in 2018

Note: ■ Urbanization of Land Use ■ Farmlands of Land Use ■ Rural Settlements of Land Use
■ Reservoirs ■ Rivers and Wetland ■ Plantation of Land Use ■ Natural Forest of Land Use
■ Grassland of Coverage Ratio during 20%~50% ■ Grassland of Coverage Ratio >50%

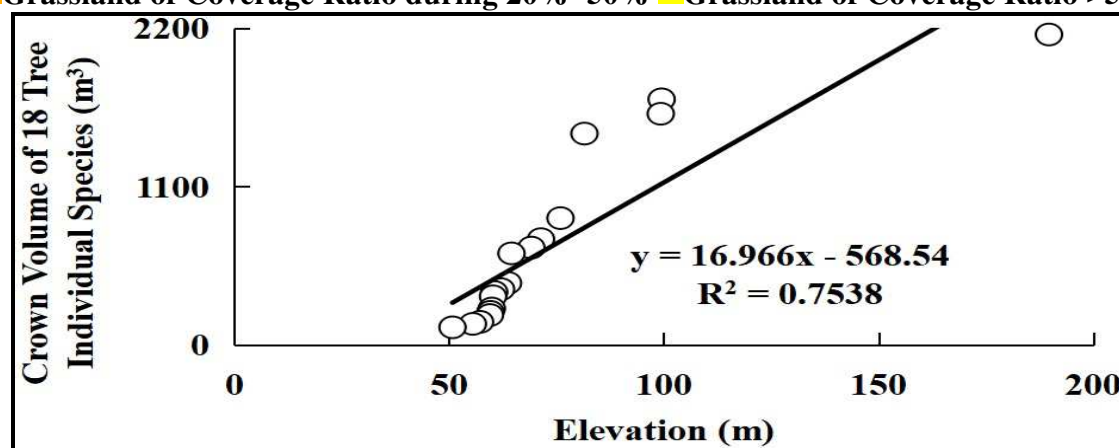


Figure No.5: Dynamics of crown volume of 18 tree individual species along elevation

CONCLUSION

In this paper, the study explained that there is a significantly positive correlation between crown volume of 18 (*Sophora japonica*) tree individual species and elevation gradient ($P < 0.01$). The research explained that elevation is the dominant natural environment driver of crown volume of 18 (*Sophora japonica*) tree individual species of international pharmaceutical materials increased along elevation gradient from 50 m to 200 m in Ye

County in 2018. Therefore, understanding dynamic connecting of 18 (*Sophora japonica*) tree individual species's crown volume and elevation can be not just applied to preserve of (*Sophora japonica*) species, but also applied to sustainable of biodiversity and processes of (*Sophora japonica*) tree species's crown volume along the different elevation gradient at spiral-temporal-environmental scales in Ye County.

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).

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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Please cite this article in press as: Bing-Hua Liao et al. Dynamics of 18 (*sophora japonica*) tree individual species's crown volume along elevation gradient in ye county, *International Journal of Research in Pharmaceutical and Nano Sciences*, 8(2), 2019, 62-68.