International Journal of Pharmacognosy and Pharmaceutical Sciences
Online ISSN: 2706-7017; Print ISSN: 2706-7009
Received: 01-05-2019; Accepted: 02-06-2019; Published: 09-06-2019
www.pharmacognosyjournal.net
Volume 1; Issue 2; 2019; Page No. 01-04

Dynamics of (*Sophora japonica*) Community's tree individual number along elevation gradient in *Ye County*

Bing-Hua Liao[1*], Miao Liu[2], Chong-Zheng Huang[3], Qiu-Xia Zhang[4], Zhen Chang[5], Sheng Wang[6], Xiao-man Wang[7], Qing-Xian Liu[8], Jun-ge Zhang[9], Qing-Xia Liu[10]

[1-5] Key Laboratory of Ecological Restoration in Hilly Areas, School of Chemical and Environmental Engineering, Ping-ding-shan University, Ping-ding-shan City, Henan University, Henan Province, China

[1, 3, 6-10] The State Key Laboratory of Cotton Biology, Henan Key Laboratory of Plant Stress Biology, School of Life Sciences, Henan University, Henan Province, China

DOI: https://doi.org/10.33545/27067009.2019.v1.i2a.13

Abstract
Applying plant communities diversity techniques and SPSS statistical analysis, we quantify how that the relationship between (*Sophora japonica*) community's tree individual number and elevation along elevation gradient in *Ye County*. We concluded that there is a significantly negative correlation between (*Sophora japonica*) community's tree individual number and elevation (P<0.01). Elevation is the dominant environment driver of (*Sophora japonica*) community's tree individual number decreased along elevation from 50m to 200m. Thus, understanding dynamic connecting of (*Sophora japonica*) community's tree individual number and elevation can be not just applied to preserve of (*Sophora japonica*) communities, but also applied to sustainable of biodiversity and eco-processes along elevation gradient.

Keywords: *Sophora japonica* tree communities, elevation gradient, relationship, negative correlation, tree individual number, international pharmaceutical materials

Introduction

The relationship between tree community's tree individual number and elevation include vascular plant distribution pattern and biodiversity [1], plant vertical distribution [2], species richness [3], population and species richness [4], beta-diversity of epiphyte [5], shrub species richness [6], vegetation structure promotes different biodiversity [7] along elevation gradient in the different ecosystems. However, there are the relationship between tree individual number of (*Sophora japonica*) tree communities and elevation gradient along different environments in *Ye County* of China. By the way, *Sophora japonica* is a vital international pharmaceutical materials in *Ye County*.

Unfortunately, the differential tree community's structure is used as a framework for investigating the linkages between communities and elevation habitats [8]. Moreover, many experiments or models have assessed the relationship between tree species and elevation along elevation or disturbance gradient [8, 13]. For instants, Liao, *et al*. (2019) found that (*Sophora japonica*) community's individual height were significantly correlated with elevation [8]. Liao *et al*. (2011a; 2014) found that importance values of tree species 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 biomass were significantly correlated with elevation gradient in typical wetland area of *Yi-Luo* River watershed [12]. Liao *et al*. (2014b) suggested that plant diversity were significantly negatively correlated with disturbance gradient [13].

Therefore, the objective of this research was to define the relationship between (*Sophora japonica*) community's tree individual number and elevation gradient at spatial-temporal-environmental levels in the forest ecosystem of *Ye County* in 2019.

The physical geographic conditions and study methods

Ye County is a key ecological 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 (Figures1-4; Table 1-2). Three fields of community diversity of investigations were conducted in 2019, investigating the indigenous plant diversity in *Ye County*, which is ideal for studying distribution and features of plant functional groups diversity (Figures1-4; Table 1-2).

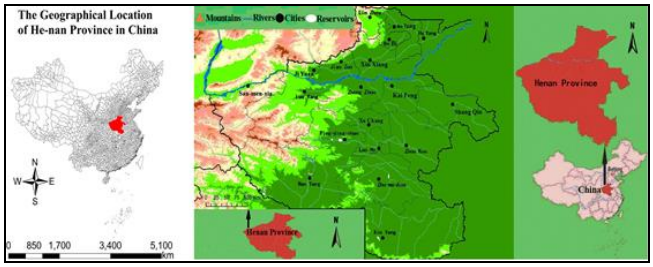


Fig 1: A Digital Cadastre Map of Location of *He-nan Province* in China

A field investigation was conducted, to study dynamics of (*Sophora japonica*) tree indivisssdual number of tree functional groups along elevation in the ecosystem. The (*Sophora japonica*) tree functional groups is the dominated by natural ecosystem with tree individual number from 50 m to 650 m. Possessing steep different environmental gradients, this area is idea for studying tree individual

number of (*Sophora japonica*) functional groups along elevation in *Ye County* in 2019 (Figures 1-4; Table 1-2).

Table 1: The physical geographic conditions and vegetation in *Ye County*

Location and Elevation	Climatic/Area	Vegetation (Plant Functional Groups)
Latitude(º): 33.42-33.68	Precipitation (mm):724	Trees: Ulmaceae/Cupressaceae/Moraceae/Moraceae /Platanaceae, *Sophora japonica*, *et al*.
Longitude(º): 113.27-113.46	Temperature(ºC) (Mean) :15.2	Shrubs: Rhamnaceae/Verbenaceae/Buxaceae/Oleaceae /Rosaceae/Vitaceae/Bignoniacea/Cornaceae, *et al*.
Elevation(m) †:50-650	Sunlight: 2230h	Herbs:Compositae/Leguminosae/Urticaceae/Gramineae/Convolvulaceae/Cyperaceae/Liliaceae/Umbellferae, *et al*.
	Area(km^2):1387	

†Above sea level.

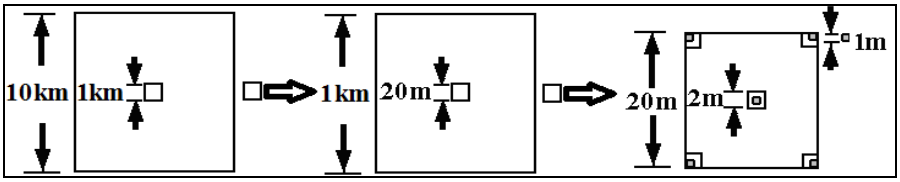
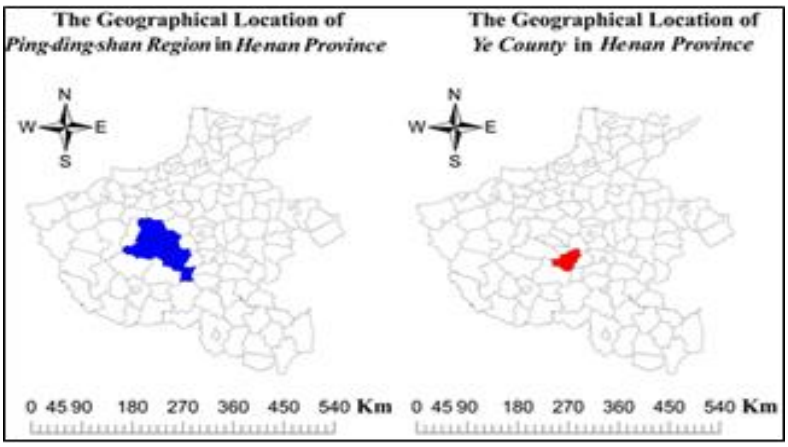


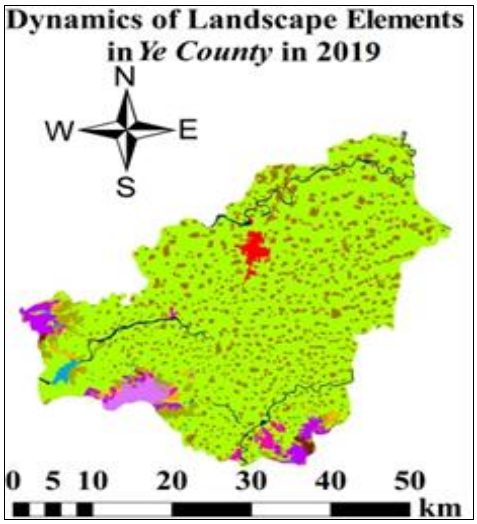
Fig 2: Quadrate settings



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

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*

Applying plant community ecology techniques, GIS of techniques, a number of rasterizing of landscape maps, SPSS statistic analysis, we investigated all plant species (dominant and companion tree communities) along elevation gradients on the southern, southeastern, western, eastern, northern, southwestern, northeastern, and northwestern of *Ye County* in 2019 along elevation gradient (Figures 1-4; Table 1-2).



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%

Fig 4: Dynamics of different landscape areas and landscape perimeters and landscape patch numbers in *Ye County* in 2019

There are 8 study plots establishing in per 10 m elevation by different azimuth and direction (East, West, South, Southeast, Southwest, Northwest, North, Northeast) in 2019. A total of 60 plots were set in three times investigating. Each study plot (Figures 1-4), consisted of one 20 × 20 m tree layer quadrate, 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.1-3; Tab.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 communities [9, 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

Results

The study showed three rules of the relationship between tree individual number of (*Sophora japonica*) tree groups and elevation along elevation gradient.

Firstly, these shows there are 18 tree functional groups of (*Sophora japonica*) along elevation between 50 and 200 m. This study show that tree individual number of 18 (*Sophora japonica*) functional types decreased along elevation in *Ye County*.

Secondly, this study showed that there is a negative correlation between tree individual number of 18(*Sophora japonica*) functional groups and elevation (P<0.01).

Thirdly, the study analyzed the relationship between tree individual number of 18 (*Sophora japonica*) tree community's functional groups and elevation gradient. Regression equation is "y=-0.0285x + 5.9547, (R^2=0.406)" (Figure5; Table 3).

Thus, the research explained that elevation is the dominant natural environment driver of tree individual number of 18 (*Sophora japonica*) tree functional groups decreased along different elevation gradient from 50m to 200 m in *Ye County* in 2019.

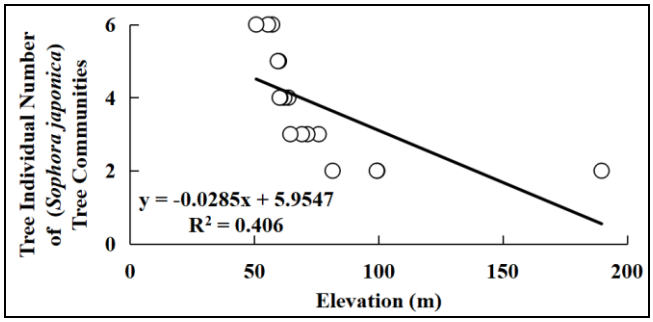


Fig 5: Dynamics of tree individual number of 18 (*Sophora japonica*) tree communities along elevation gradient in *Ye-County*.

Table 3: Correlating to tree individual number of functional groups and elevation.

Tree Function Groups along Different Elevation Gradient	Links between tree individual number of 18 (*Sophora japonica*) tree functional groups and elevation.
Sophora japonica	-0.637**

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

Discussion

This study showed that three key areas will substantially further effects to gain a rigorous understanding of three rules in *Ye County* in 2019:

1. There are 18 tree functional types of (*Sophora japonica*) communities along differential elevation gradient between 50 m and 200 m. Tree individual number of 18 (*Sophora japonica*) tree functional types decreased along elevation gradient of *Ye County* in 2019. Regression equation is "y=-0.0285x + 5.9547, (R^2=0.406)".
2. This study showed that elevation was the dominant environment driver of tree individual number of (*Sophora japonica*) functional types decreased along elevation.
3. This study showed that there is a significantly negative correlation between tree individual number of 18 (*Sophora japonica*) functional types and elevation (P<0.01).

Therefore, this study supported the experiments or models that elevation gradient is the most important environmental factor affecting dynamics of tree individual number of tree functional groups distribution [10, 11, 14], functional groups variation [12], species richness distribution [10, 12], dynamics of tree diversity (composition of tree stand structure and functional groups) [17, 18], dynamics of biodiversity [19, 20], *Sophora japonica* tree's trunk volume and crown volume [21, 22, 23] in the natural ecosystems along different elevation gradient at spatial-temporal-environmental scales.

Conclusion

The results indicate that elevation was the dominant environment driver of tree individual number of 18 (*Sophora japonica*) tree functional groups increased along elevation gradient in this study. This research explained that there is a significantly negative correlation between tree individual number of (*Sophora japonica*) tree functional groups and elevation gradient from 50m to 200 m (P<0.01). Thus, the study explained that elevation is the dominant environment driver of tree individual number of 18 (*Sophora japonica*) tree functional groups of the international pharmaceutical materials decreased along elevation at spatial-temporal-environmental scales in *Ye County* in 2019.

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; KJT-182102110166, KJT - 152400410330), Education Department Project of *He-nan* Province Foundation of China (15A610016).

Reference

1. Gebrehiwot K, Demissew S, Woldu Z. Elevational changes in vascular plants richness, diversity, and distribution pattern in Abune Yosef mountain range, Northern Ethiopia. Plant diversity, 2019; 41:220-228.
2. Acebey AR, Krömer T, Kessler M. Species richness and vertical distribution of ferns and lycophytes along an elevational gradient in Los Tuxtlas, Veracruz, Mexico. Flora, 2017; 235:83-91.
3. Silva FKG, Lopes SDF, Lopez LCS. Patterns of species richness and conservation in the Caatinga along elevational gradients in a semiarid ecosystem. Journal of Arid Environ -ments, 2014; 110:47-52.
4. Kessler M. The impact of population processes on patterns of species richness: Lessons from elevational gradients. Basic and Applied Ecology, 2009, 10:295-299.
5. Nascimbene J, Spitale D. Patterns of beta-diversity along elevational gradients inform epiphyte conservation in alpine forests under a climate change scenario.Biological Conser -vation, 2017; 216:26-32.
6. Lambert SE, Jones CS, Schenk HJ. Distribution of axis-splitting in Mojave Desert shrub species along an elevational gradient. Journal of Arid Environments, 2011; 75:106-111.
7. Santoandré S, Filloy J, Zurita GA, Bellocq MI. Ant taxonomic and functional diversity show differential response to plantation age in two contrasting biomes. Forest Ecology and Management, 2019, 437:304-313.
8. Ma ZL, Chen HYH, Kumar P, Gao B. Species mixture increases production partitioning to belowground in a natural boreal forest. Forest Ecology and Management, 2019; 432:667-674.
9. Liao BH, Liu YP, Zuo H. *et al*. Elevation Dynamics of (*Sophora japonica*) Community's Height in *Ye County*. International Journal of Research Pharmaceutical and Nano Sciences. 2019; 8(1):48-54.
10. Liao BH, Wang XH. Plant functional group classifications and a generalized hierarchical framework of plant functional traits. African Journal of Biotechnology, 2010; 9:9208-9213.
11. Liao BH, Ding SY, Hu N. *et al*. Dynamics of environmental gradients on plant functional groups composition on the northern slope of the *Fu-Niu* Mountain Nature Reserve. African Journal of Biotechnology, 2011a; 10:18939-18947.
12. Liao BH, Liu QF, Lu D. *et al*. Dynamics of environmental gradients on plant functional groups composition species in near-natural community ecological restoration on the southern slope of the *Fu-Niu* Mountain Nature Reserve. Journal of Science, 2014a; 4:306-312.
13. Liao BH, Ding SY, Liang GF. *et al*. Dynamics of plant functional groups composition along environmental gradients in the typical area of *Yi-Luo* River watershed. African Journal of Biotechnology, 2011b; 10:14485-14492.
14. Liao BH. A new model of dynamic of plant diversity in changing farmlands, implications for the management of plant biodiversity along differential environmental gradient in the spring. African Journal of Environmental Science and Technology, 2014b; 8:171-177.
15. Bates JD, Davies KW. Quaking aspen woodland after conifer control: Tree and shrub dynamics. Forest Ecology and Management, 2018; 409:233-240.
16. Nettesheim FC, Garbin ML, Pereira MG, Araujo DSD, Grelle CEV. Local -scale elevation patterns of Atlantic forest tree community variation and assembly drivers in a conservation hotspot in southeastern Brazil. Flora, 2018; 248:61-69.
17. Acebey AR, Krömer T, Kessler M. Species richness and vertical distribution of ferns and lycophytes along an elevational gradient in Los Tuxtlas, Veracruz, Mexico. Flora, 2017; 235:83-91.
18. Kamimura VA, Moraes PLR, Ribeiro HL, Holy CA, Assis MA. Tree diversity and elevational gradient: The case of Lauraceae in the Atlantic rainforest. Flora, 2017; 234:84-91.
19. Naidu MT, Kumar OA. Tree diversity, stand structure, and community composition of tropical forests in Eastern Ghats of Andhra Pradesh, India. Journal of Asia-Pacific Bio -diversity, 2016; 9:328-334.
20. Asbeck T, Pyttel P, Frey J, Bauhus J. Predicting abundance and diversity of tree- related microhabitats in Central European montane forests from common forest attributes. Forest Ecology and Management, 2019; 432:400-408.
21. Liao BH, Liu YP, Zuo H. *et al*. Dynamics Crown Volume of 18 (*Sophora japonica*) Tree Communities along Elevation Gradient in *Ye County*. Open Journal of Ecology, 2019; 9:209- 215.
22. Liao BH, Liu YP, Zuo H. *et al*. Dynamics of 18 (*Sophora japonica*) Tree Community's Total Trunk Volume along Elevation Gradient in *Ye County*. International Journal of Current Advanced Research, 2019; 8:19063-19066.
23. Liao BH, Liu YP, Zuo H. *et al*. Dynamics of 18 (*Sophora japonica*) Tree Individual Species's Crown Volume along Elevation Gradient in *Ye County*. International Journal of Research Pharmaceutical and Nano Sciences, 2019; 8:62-68.